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Implementation of Competency-Based Assessment in Technical and Vocational Education and Training (TVET): A Systematic Review of Models, Quality Assurance, and Learner Outcomes

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ABSTRACT: Competency-based assessment (CBA) has become a key approach in Technical and Vocational Education and Training (TVET) systems worldwide, driven by the need to improve workforce readiness, align education with industry needs, and enhance employability outcomes. This study presents a systematic review of literature examining how competency-based assessment is implemented in TVET, with particular focus on assessment models, quality assurance mechanisms, and learner outcomes. A structured review process was followed according to systematic review protocols, and relevant peer-reviewed studies published between 2016 and 2025 were identified from major academic databases, including Scopus, Web of Science, and ERIC. A total of 35 studies were selected and analysed thematically. The findings show that competency-based assessment is commonly carried out through workplace-based, simulation-based, portfolio-based, and performance-based demonstrations, all emphasising the practical application of skills in real or simulated settings. The review further highlights that the effectiveness of CBA largely depends on strong quality assurance mechanisms, such as standardised competency frameworks, assessor competence, moderation procedures, and industry collaboration. Regarding learner outcomes, competency-based assessment helps develop technical skills, employability competencies, workplace readiness, and learner confidence, while also fostering self-directed and lifelong learning. However, challenges like inconsistent assessment practices, limited institutional capacity, and insufficient assessor training remain. The study concludes that strengthening quality assurance systems and improving collaboration between TVET institutions and industry stakeholders are vital for enhancing the effectiveness and credibility of competency-based assessment systems.

1. INTRODUCTION

Technical and Vocational Education and Training (TVET) has become increasingly important in addressing global economic and labour market challenges, particularly those related to youth unemployment, skills mismatches, and workforce productivity. As economies continue to evolve due to technological advancements, globalisation, and industrial transformation, employers increasingly demand workers with practical competencies alongside theoretical knowledge. In this context, TVET systems play a crucial role in developing skilled human capital capable of meeting labour market needs and contributing to sustainable economic development (Allais, 2023). By emphasising occupational skills, technical expertise, and applied learning, TVET helps bridge the gap between education and employment while supporting national competitiveness and economic growth.

In response to these demands, many countries have adopted competency-based education and training (CBET) approaches within their TVET systems. Competency-based education emphasises learners' ability to demonstrate measurable skills and competencies rather than merely completing time-based academic programmes. Under this approach, learning outcomes are defined in accordance with occupational standards that reflect real-world workplace requirements, ensuring that graduates possess the skills necessary for

effective professional performance (Gessler & Peters, 2020). Competency-based models, therefore, aim to enhance the relevance of training programmes by aligning educational outcomes with industry expectations and workforce demands.

The effectiveness of competency-based TVET systems depends significantly on the quality of curriculum design and the degree of alignment between training programs and labour market needs. TVET curricula must integrate theoretical knowledge with practical skill development through workplace training, industry projects, and experiential learning opportunities. Continuous collaboration between training institutions, industry partners, and policymakers is essential to ensure that curricula remain responsive to technological developments and changing occupational requirements. (Billett et al., 2020). Through such partnerships, competency standards and qualification frameworks can be regularly updated to reflect emerging skills demands, thereby improving the relevance and credibility of vocational qualifications.

Recent technological innovations have further transformed TVET delivery and training approaches. Digital learning platforms, virtual and augmented reality technologies, simulation-based training, and industry internships have expanded opportunities for learners to acquire practical skills in authentic or simulated environments. These innovations enable learners to practice complex tasks and technical procedures in safe, controlled settings, thereby improving the effectiveness of vocational education and training programs. (Zhao, 2025). Moreover, technology-enhanced learning environments expand access to vocational education and enable institutions to deliver flexible, inclusive training opportunities. Such innovations also contribute to achieving the United Nations Sustainable Development Goals (SDGs), particularly those related to quality education, decent work, and economic growth.

Despite the growing recognition of TVET as a key driver of economic development, several challenges continue to affect the effectiveness of vocational education systems worldwide. These challenges include unequal access to vocational training, gender disparities in technical fields, limited industry engagement, and inadequate institutional resources. Furthermore, the growing emphasis on sustainability and environmental responsibility requires TVET systems to incorporate green skills and sustainable practices into their training programs. (Marope et al., 2015). Addressing these challenges requires comprehensive reforms that strengthen the design, delivery, and evaluation of TVET programs.

Within competency-based TVET systems, assessment plays a central role in determining whether learners have achieved the required competencies. Competency-based assessment (CBA) focuses on evaluating learners' ability to demonstrate practical skills, knowledge, and professional attitudes in authentic or simulated workplace contexts. Unlike traditional assessment methods that rely primarily on written examinations, competency-based assessment emphasises performance-based evaluation through practical demonstrations, workplace observation, portfolios, and project-based tasks. (Gessler & Peters, 2020). These assessment approaches provide a more accurate representation of learners' readiness for employment and ensure that certification reflects actual competence rather than theoretical knowledge alone.

However, the implementation of competency-based assessments in TVET systems varies considerably across countries and institutions. Differences exist in assessment models, assessor training systems, moderation procedures, and quality assurance mechanisms. Some TVET systems rely heavily on workplace-based assessments in collaboration with industry partners, while others implement simulation-based assessments in institutional training environments. These variations raise important questions regarding the reliability, validity, and effectiveness of competency-based assessment practices in preparing learners for employment.

Although previous research has explored competency-based education and vocational training reforms, relatively few studies have systematically synthesised the literature on competency-based assessment within TVET. Existing research has often focused on curriculum design, policy frameworks, or training models, while the assessment dimension has received comparatively less attention. Furthermore, studies examining assessment practices are often conducted in specific national contexts, making it difficult to identify broader trends and patterns across different TVET systems.

Therefore, a systematic synthesis of existing research is necessary to understand better how competency-based assessment is implemented in vocational education systems and the outcomes it produces for learners. By analysing recent literature, it is possible to identify key assessment models, evaluate quality assurance mechanisms, and examine the extent to which competency-based assessment contributes to improved learner outcomes and employability.

This study, therefore, conducts a systematic review of the literature published between 2016 and 2025 to examine the implementation of competency-based assessment in Technical and Vocational Education and Training systems. The review focuses on three key dimensions: assessment implementation models, quality assurance mechanisms, and learner outcomes. By synthesising empirical and conceptual research, the study aims to provide a comprehensive understanding of competency-based assessment practices and to identify key challenges and opportunities for improving assessment systems in TVET institutions.

2. RESEARCH OBJECTIVES

This systematic review examines the implementation of competency-based assessment in Technical and Vocational Education and Training systems. Specifically, the study seeks to:

1. Identify major models used to implement competency-based assessments in TVET institutions.
2. Examine quality assurance mechanisms used to ensure reliability and validity in competency-based assessment practices.
3. Analyse learner outcomes associated with competency-based assessment in vocational education.

3. METHODOLOGY

This study employed a systematic literature review approach to examine the implementation of competency-based assessment in Technical and Vocational Education and Training (TVET). A systematic literature review provides a structured, transparent method for identifying, evaluating, and synthesising relevant research on a specific topic. Compared with traditional narrative reviews, systematic reviews follow clearly defined procedures that reduce bias and improve the reliability and replicability of the research process. The methodology adopted in this study followed the systematic literature review framework proposed by (Okoli & Schabram, 2010). In addition, the review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency in the identification, screening, and selection of relevant studies. (Moher et al., 2009). The systematic review process is summarised in Table 1.

Table 1 Systematic Literature Review Process

Step	Description
Search Protocol	A structured search protocol was developed to guide the systematic review process. The protocol defined the databases used for literature searching, the keywords applied, the procedures for screening articles, and the inclusion and exclusion criteria for selecting relevant studies. Establishing a clear protocol ensured consistency and transparency throughout the review process (Okoli & Schabram, 2010).
Search Protocol Execution	The literature search was conducted using major academic databases, including Scopus, Web of Science, and ERIC (Education Resources Information Centre). These databases were selected for their extensive coverage of peer-reviewed research in education and vocational training. The search focused on studies published between 2016 and 2025 to capture recent developments in competency-based education and assessment practices. A combination of keywords and Boolean operators was used, including "competency-based assessment," "competence assessment," "competency-based education," "TVET," "technical and vocational education and training," and "vocational education." The initial database search identified 612 records.
Practical Screening	After conducting the database search, duplicate records were removed, and the remaining articles were screened based on their titles and abstracts. This stage aimed to identify studies relevant to competency-based assessment in TVET contexts. Several filters were applied during the screening process, including language, publication type, and publication year. Only peer-reviewed journal articles written in English and published between 2016 and 2025 were included for further consideration. Following the screening process, 87 articles were identified as potentially relevant and selected for full-text review.
Quality Appraisal	A detailed quality appraisal process was conducted to evaluate the relevance and methodological rigour of the selected studies. Both formal and informal evaluation methods were applied, including assessing the clarity of the research design, its relevance to competency-based assessment in TVET, and the quality of the reported findings. Following the full-text evaluation, 52 studies were excluded for being irrelevant or lacking sufficient methodological detail.
Search and Selection Results	The study selection process followed the PRISMA framework, which provides a standardised procedure for reporting systematic reviews (Moher et al., 2009; Siddaway et al., 2019). The PRISMA methodology summarises the number of studies identified, screened, included, and excluded at each stage of the review process. The PRISMA flow diagram illustrates the identification, screening, eligibility assessment, and final inclusion of studies in the systematic review. After the screening and quality appraisal stages, a final dataset of 35 studies was selected for inclusion in the review. The PRISMA flow diagram illustrates the process of literature identification, screening, eligibility assessment, and final study inclusion.

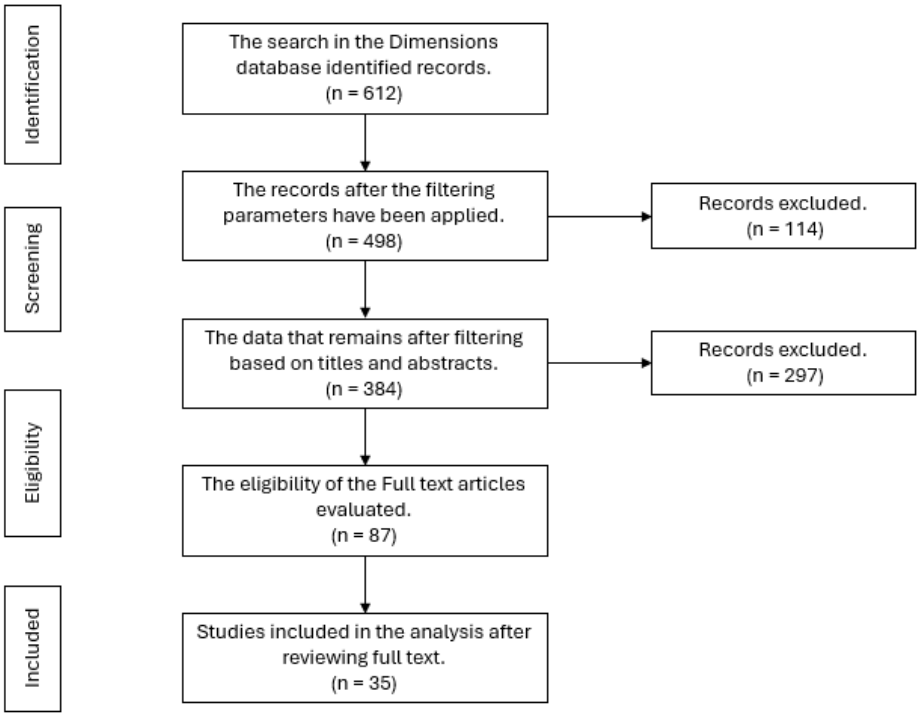

Figure 1. PRISMA diagram of the flow of the search and selection process

3.1. Synthesis of studies

After extracting data from the selected articles, the Excel spreadsheet was organised into several analytical categories to facilitate the synthesis of findings. The extracted information was grouped into four main categories: (1) study characteristics, including author, year, country, and research design; (2) competency-based assessment models, which describe the types of assessment approaches used in TVET institutions; (3) quality assurance mechanisms, including moderation procedures, assessor training, and assessment standards; and (4) learner outcomes, which highlight the reported impacts of competency-based assessment on students' skills development, employability, and workplace readiness.

The collected data were qualitatively analysed using thematic analysis to identify common patterns and recurring themes across the selected studies. Thematic analysis is widely used in systematic reviews to interpret qualitative findings and synthesise evidence from multiple studies. (Braun & Clarke, 2006). During the analysis, key concepts related to competency-based assessment were coded and categorised to identify relationships among assessment models, quality assurance practices, and learner outcomes.

Through this process, several major themes emerged that explain how competency-based assessment is implemented within Technical and Vocational Education and Training systems. These themes include assessment implementation models, quality assurance mechanisms supporting competency-based assessment, and the impact of competency-based assessment on learner outcomes. The identified themes were then integrated into a conceptual framework to illustrate the relationships between competency-based assessment practices, institutional quality assurance processes, and learner development in TVET contexts. The following section presents and discusses the themes identified during the systematic review.

4. RESULTS AND DISCUSSION

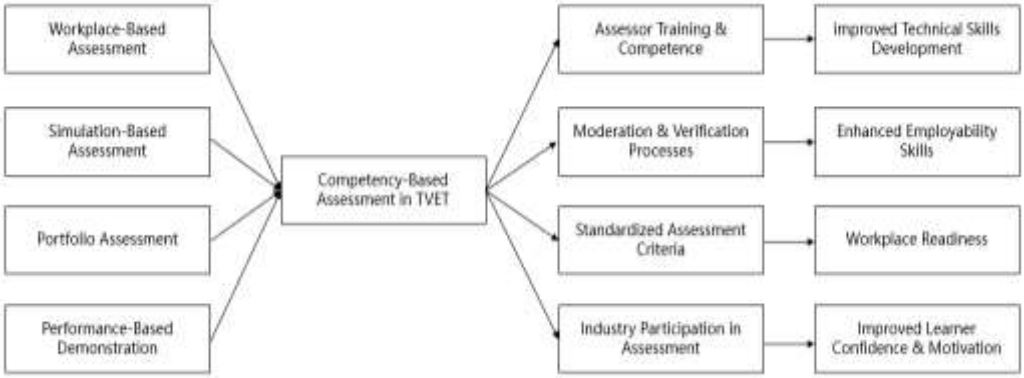

Figure 2 Conceptual Framework of Competency-Based Assessment in TVET

Figure 2 presents a framework that explains the complex relationship between competency-based assessment and learner outcomes in Technical and Vocational Education and Training (TVET). The model is based on insights gathered from previous research and illustrates a structured combination of essential elements that demonstrate how competency-based assessment contributes to skill development and workplace readiness. The framework (Figure 2) shows that competency-based assessment influences learning outcomes through interconnected themes that represent different dimensions of assessment practices in vocational education. These themes are supported by empirical evidence and collectively contribute to improving the learning process and enhancing vocational competence. Previous studies have highlighted the importance of authentic assessment practices, workplace-aligned evaluation methods, and industry engagement in improving vocational learning outcomes. (Billett et al., 2020; Gessler & Peters, 2020; Wheelahan et al., 2022).

Effective competency-based assessment requires implementing assessment strategies that have been demonstrated to support practical skill development. Research in vocational education identifies several key assessment approaches, including workplace-based, simulation-based, portfolio-based, and performance-based demonstrations. These approaches allow learners to demonstrate their competencies in authentic or simulated work environments, enabling assessors to evaluate practical skills and professional knowledge more accurately. Billett (2019) emphasised that authentic workplace tasks are essential to ensuring that vocational training reflects real occupational requirements. Similarly, simulation-based learning environments allow students to practice complex technical tasks in controlled settings, thereby strengthening their competence before entering real workplaces.

Another important dimension within the framework is the role of quality assurance mechanisms that ensure the reliability and credibility of competency-based assessment practices. These mechanisms include assessor training, moderation procedures, standardised competency standards, and industry participation in assessment processes. (Gessler & Peters, 2020) highlighted that assessor competence is critical in maintaining the validity of vocational assessment systems. Moderation processes ensure consistency across assessors and institutions, while standardised competency criteria provide clear benchmarks that guide the evaluation of learner performance. Industry involvement further strengthens the relevance of assessment practices by aligning competency standards with actual workplace expectations.

The interaction between assessment models and quality assurance mechanisms ultimately improves learner outcomes. These outcomes include enhanced technical skill development, improved employability skills, greater workplace readiness, and increased learner confidence. When learners are assessed through authentic tasks that reflect real occupational activities, they gain opportunities to apply knowledge in practical contexts and develop competencies required in professional environments. Wheelahan et al. (2022) argued that competency-based education supports the development of both technical and transferable skills, which are essential for employment in modern labour markets.

By focusing on interconnected themes within competency-based assessment practices, learners can improve their practical competence, problem-solving abilities, and application of technical knowledge. This improvement can lead to better performance in practical assessments, workplace training tasks, and vocational certification evaluations. Ultimately, this contributes to improved employability outcomes and successful transition into the labour market ((Billett et al., 2020; Gessler & Peters, 2020; Wheelahan et al., 2022). The continuous improvement cycle illustrated in the framework demonstrates how each component reinforces the others, creating a holistic approach to vocational learning and skills development. In the following sections, each theme within the framework is discussed in greater detail.:

4.1. Competency-Based Assessment Models

The previously presented framework (depicted in Figure 2) emphasises the importance of implementing effective competency-based assessment models to ensure successful skill development in Technical and Vocational Education and Training (TVET). Competency-based assessment plays a central role in evaluating learners' practical skills, professional knowledge, and workplace readiness within vocational education systems. Unlike traditional assessment methods that primarily measure theoretical knowledge, competency-based assessment requires learners to demonstrate their ability to perform authentic occupational tasks aligned with industry standards. As a result, this approach ensures that vocational education remains closely connected to labour market requirements and workforce development needs. (Gessler & Peters, 2020; Wheelahan et al., 2022). By adopting competency-based assessment frameworks, TVET institutions can provide structured pathways for learners to develop the competencies required in professional environments progressively. (Allais, 2023; Billett et al., 2020).

Competency-based assessment approaches are designed to ensure that learners achieve clearly defined occupational competencies and professional standards. Research in vocational education suggests that assessment practices such as workplace-based assessment, simulation-based assessment, portfolio assessment, and performance-based demonstrations are widely used within competency-based education systems to evaluate learner competence ((Billett et al., 2020; Gessler & Peters, 2020). These assessment models emphasise authentic learning tasks and practical demonstrations of competence rather than relying solely on traditional written examinations. By focusing on real-world applications and occupational problem-solving tasks, competency-based assessment supports the development of both technical and transferable skills required in contemporary labour markets. (Misbah et al., 2020; Wheelahan et al., 2022).

Workplace-based assessment is widely recognised as one of the most effective approaches within competency-based vocational education systems. Through workplace-based assessment, learners are evaluated while performing real tasks in professional environments under the supervision of trained assessors or industry experts. This method allows learners to apply theoretical knowledge in authentic work contexts while receiving feedback from experienced practitioners. According to Billett (2019), workplace learning environments provide valuable opportunities for learners to develop occupational competence through participation in real work activities. Similarly, studies have shown that integrating workplace learning with competency-based assessment improves employability skills, professional identity development, and the transition from education to employment (Gessler & Peters, 2020).

Simulation-based assessment is another important component of competency-based vocational training systems. Simulation environments replicate workplace conditions in controlled educational settings, allowing learners to practice complex tasks without the risks of real industrial environments. Simulation-based learning enables learners to experiment with problem-solving strategies and develop technical competencies in a safe, structured environment. Research has demonstrated that simulation-based assessments enhance learner engagement and improve the acquisition of practical skills required in technical professions. (Misbah et al., 2020; Wheelahan et al., 2022). Furthermore, simulation technologies such as virtual laboratories and digital training environments have increasingly been integrated into TVET programs to support competency-based skill development in areas such as engineering, healthcare, and industrial technologies. (Leong, 2024).

Portfolio assessment also represents a key approach within competency-based assessment frameworks. In this method, learners compile evidence of their competencies over time through projects, assignments, workplace documentation, and reflective activities. Portfolio assessment enables educators and assessors to evaluate learner progress across multiple tasks and provides a comprehensive record of competency development. According to (Athéna, 2023)Portfolios allow learners to demonstrate their competencies through authentic artefacts and real project work, thereby capturing a broader representation of vocational competence. This method also supports reflective learning practices by encouraging learners to evaluate their own progress and professional development. (Wheelahan et al., 2022).

Performance-based demonstrations are another commonly used assessment method within competency-based education systems. Through performance demonstrations, learners must complete specific occupational tasks to demonstrate their competence. Assessment criteria are typically aligned with occupational competency standards defined by industry bodies or professional organisations. Such demonstrations allow assessors to observe learners' technical abilities, problem-solving skills, and professional behaviours as they perform real work tasks. Research suggests that performance-based assessment provides reliable evidence of learner competence and supports the development of practical expertise in vocational fields ((Huerta Rosales, 2018; Indaryani et al., 2018).

Overall, these assessment approaches illustrate how competency-based assessment models function as an integrated system within TVET. By combining workplace-based assessment, simulation-based learning environments, portfolio evaluation, and performance-based demonstrations, vocational institutions can effectively assess learners' competencies and ensure that training outcomes align with industry expectations. These models, therefore, serve as the foundation for developing skilled graduates capable of meeting the demands of modern labour markets.

4.2. Quality Assurance Mechanisms in Competency-Based Assessment

The previously presented framework (as depicted in Figure 2) highlights the critical role of quality assurance mechanisms in ensuring the effectiveness, reliability, and credibility of competency-based assessment (CBA) in Technical and Vocational Education and Training (TVET). Quality assurance is a foundational component that ensures assessment practices align with occupational standards, industry expectations, and educational objectives. In competency-based systems, where assessment focuses on demonstrating practical skills and workplace competencies, maintaining consistency and fairness in assessment decisions is essential. This aligns with Garraway's (2022) findings, which emphasiseClick or tap here to enter text. that robust quality assurance processes are necessary to ensure the validity and reliability of competency-based assessment practices across vocational education systems. Without robust quality assurance frameworks, competency-based assessment may lead to inconsistent judgment, thereby undermining the credibility of vocational qualifications.

One key component of quality assurance in competency-based assessment is the use of standardised competency frameworks and occupational standards. These frameworks provide clear criteria against which learner performance is evaluated, ensuring that assessment decisions are consistent across different institutions and assessors. Research indicates that aligning assessment practices with clearly defined competency standards enhances transparency and objectivity in assessment processes. (Yusop et al., 2022). Standardisation also facilitates the comparability of qualifications across institutions and supports the recognition of skills in both national and international labour markets.

Assessor competence represents another critical dimension of quality assurance in competency-based assessment systems. Assessors play a central role in evaluating learner performance, and their ability to apply assessment criteria consistently and accurately directly influences the reliability of assessment outcomes. Studies have shown that inadequate assessor training can lead to variability in assessment judgments and reduced confidence in competency-based certification systems. (Jubaedah et al., 2017).

Therefore, continuous professional development and structured training programs for assessors are essential to ensure they possess the technical expertise, pedagogical knowledge, and assessment literacy needed to evaluate competencies effectively.

Moderation and verification processes are also fundamental to maintaining the quality and consistency of competency-based assessment. Moderation involves reviewing assessment decisions to ensure alignment with established standards, while verification processes confirm that assessment procedures have been implemented correctly. These mechanisms help minimise bias, improve reliability, and ensure fairness in assessment practices. According to Garraway (2022)Moderation practices such as peer review, external verification, and benchmarking play a significant role in enhancing the credibility and trustworthiness of competency-based assessment systems.

Another important aspect of quality assurance is integrating continuous assessment and feedback mechanisms. Competency-based assessment is inherently iterative, requiring ongoing evaluation of learner performance rather than relying solely on summative examinations. Continuous feedback allows learners to identify areas for improvement and refine their skills over time. Research highlights that formative assessment practices within competency-based frameworks improve learner performance and support skill mastery by providing timely and constructive feedback. (Mukhtar & Ahmad, 2015). This ongoing process contributes to a more comprehensive evaluation of learner competence and supports continuous learning.

Industry collaboration is also a key element in ensuring quality assurance within competency-based assessment systems. Engagement with industry stakeholders ensures that assessment criteria and competency standards reflect current workplace requirements. Studies indicate that involving employers and industry experts in the design and implementation of assessments enhances the relevance and authenticity of competency-based assessment practices. (Demissie, 2026). Industry participation also strengthens alignment between training outcomes and labour market needs, ensuring that graduates are equipped with skills directly applicable in professional contexts.

Furthermore, institutional capacity and resource availability significantly influence the effectiveness of quality assurance mechanisms in TVET systems. Adequate infrastructure, access to modern equipment, and sufficient learning resources are essential for conducting reliable competency-based assessments. Research suggests that limited institutional capacity and inadequate facilities can hinder the implementation of effective assessment practices, thereby affecting the overall quality of vocational training (Niyonasenze et al., 2025). Therefore, investment in institutional development and resource provision is necessary to strengthen quality assurance systems.

Monitoring and evaluation systems also play a vital role in maintaining quality assurance in competency-based assessment. Regular audits, performance reviews, and systematic evaluation processes enable institutions to identify gaps in assessment practices and implement necessary improvements. These systems support continuous quality enhancement and promote accountability within TVET institutions. In addition, digital tools and data-driven approaches are increasingly being adopted to improve the efficiency, transparency, and consistency of assessment processes. (Vargas et al., 2025).

In summary, the subthemes in the framework demonstrate that quality assurance in competency-based assessment is a comprehensive, multidimensional process. It involves standardised competency frameworks, assessor competence, moderation and verification systems, continuous feedback mechanisms, industry collaboration, and institutional support. When these elements are effectively integrated, they ensure that competency-based assessment systems are reliable, valid, and aligned with industry expectations. Strong quality assurance mechanisms not only enhance the credibility of assessment outcomes but also contribute to the overall effectiveness of TVET systems in producing skilled and competent graduates ready to meet the demands of the modern workforce.

4.3. Learner Outcomes of Competency-Based Assessment

The previously presented framework (depicted in Figure 2) highlights the significant impact of competency-based assessment (CBA) on learner outcomes in Technical and Vocational Education and Training (TVET). Competency-based assessment plays a central role in shaping learners' technical skills, employability competencies, and overall workforce readiness. By emphasising practical competence rather than theoretical knowledge alone, CBA enables learners to engage in authentic learning experiences that mirror real workplace environments. This aligns with recent studies indicating that competency-based approaches enhance learners' ability to transfer knowledge into practice and improve job readiness. (Gessler & Peters, 2020; Misbah et al., 2020; Olofsson, 2025). Furthermore, competency-based education has been widely recognised as a key mechanism for addressing skill mismatches and improving workforce preparedness in rapidly evolving labour markets (Allais, 2023).

One of the primary outcomes of competency-based assessment is the development of technical and occupational skills. Through assessment approaches such as workplace-based learning, simulation tasks, and performance-based demonstrations, learners can apply theoretical knowledge in real or simulated contexts. This experiential learning process allows learners to refine their technical competencies and gain practical experience essential for employment. Research has shown that competency-based assessment improves skill mastery by providing repeated opportunities for practice, feedback, and performance evaluation. (Mikkonen et al., 2017; Misbah et al., 2020) As a result, learners develop a deeper understanding of occupational tasks and are better equipped to meet industry standards.

In addition to technical skills, competency-based assessment significantly contributes to the development of employability skills. These include communication, teamwork, problem-solving, critical thinking, and adaptability, which are increasingly important in modern workplaces. Competency-based assessment requires learners to engage in authentic tasks that involve collaboration, decision-making, and real-world problem-solving. Studies indicate that such learning environments foster the development of transferable skills that enhance learners' employability and career prospects ((Billett et al., 2020). These competencies enable learners to function effectively in diverse work settings and adapt to changing job requirements.

Another important outcome of competency-based assessment is improved workplace readiness. By aligning assessment practices with industry standards and occupational competencies, CBA ensures that learners are prepared to perform effectively in professional environments. Workplace-based assessment provides learners with direct exposure to real work settings, allowing them to develop professional attitudes, work ethics, and practical experience. Research suggests that learners who participate in competency-based assessment demonstrate higher levels of confidence and readiness when transitioning from education to employment. (Gessler & Peters, 2020; Olofsson, 2025). This transition is further strengthened through collaboration between training institutions and industry partners.

Learner motivation and confidence are also positively influenced by competency-based assessment practices. When learners are given opportunities to demonstrate their competencies through meaningful and authentic tasks, they experience a sense of achievement that enhances their self-efficacy. Continuous feedback during competency-based assessment helps learners identify their strengths and areas for improvement, thereby increasing engagement and motivation. Recent studies have highlighted that formative assessment practices embedded within competency-based frameworks contribute to improved learner engagement and persistence. (Mikkonen et al., 2017; Vannasy & Sengsouliya, 2023). This ongoing feedback loop plays a crucial role in supporting learner development and promoting active participation in the learning process.

The role of reflection and self-directed learning is another key outcome associated with competency-based assessment. Through continuous evaluation and feedback, learners are encouraged to reflect on their performance and take responsibility for their own learning. Reflective practices enable learners to identify gaps in their competencies and develop strategies for improvement. Research indicates that competency-based learning environments foster self-regulated learning and encourage learners to become more independent and proactive in their learning journey. (Misbah et al., 2020; Vannasy & Sengsouliya, 2023). This is particularly important in vocational education, where continuous skill development is essential for career progression.

Furthermore, competency-based assessment supports lifelong learning and adaptability, both of which are critical in dynamic labour markets. As industries continue to evolve due to technological advancements, workers must continually update their skills and knowledge. Competency-based education fosters a learning culture in which learners are continually encouraged to improve their competencies and adapt to new challenges. Studies suggest that learners trained through competency-based systems are better equipped to engage in lifelong learning and remain competitive in changing work environments. (Allais, 2023).

In summary, the subthemes presented in the framework demonstrate that competency-based assessment has a significant impact on multiple dimensions of learner outcomes. By enhancing technical skills, employability competencies, workplace readiness, learner confidence, and self-directed learning, competency-based assessment provides a comprehensive approach to vocational education. When effectively implemented, these assessment practices contribute to the development of skilled, adaptable, and confident graduates who are well-prepared to meet the demands of modern labour markets. The integration of authentic assessment practices, continuous feedback, and industry collaboration, therefore, plays a critical role in strengthening the effectiveness of TVET systems.

5. CONCLUSION

This systematic review examined the implementation of competency-based assessment (CBA) in Technical and Vocational Education and Training (TVET), with particular focus on assessment models, quality assurance mechanisms, and learner outcomes. The findings indicate that competency-based assessment represents a significant shift from traditional knowledge-based evaluation toward performance-oriented assessment practices that emphasise the demonstration of practical competencies in authentic or simulated work environments. The review highlights that commonly used assessment approaches, including workplace-based, simulation-based, portfolio-based, and performance-based demonstrations, play a critical role in evaluating learners' readiness for employment.

The study further reveals that the effectiveness of competency-based assessment depends heavily on robust quality assurance mechanisms. Elements such as standardised competency frameworks, assessor competence, moderation processes, and industry engagement are essential in ensuring the reliability, validity, and credibility of assessment outcomes. Without these mechanisms, inconsistencies in assessment practices may undermine the integrity of competency-based certification systems.

In terms of learner outcomes, the review demonstrates that competency-based assessment contributes positively to the development of technical skills, employability competencies, workplace readiness, and learner confidence. The integration of authentic assessment practices, continuous feedback, and reflective learning processes supports the development of self-directed and adaptable learners. Overall, competency-based assessment emerges as a powerful approach for aligning TVET with labour market needs and enhancing the effectiveness of TVET systems in preparing graduates for the demands of the modern workforce.

6. IMPLICATIONS

The findings of this study have important implications for policymakers, educators, and TVET institutions. At the policy level, there is a need to strengthen national competency frameworks and ensure that assessment standards are clearly defined and aligned with industry requirements. Policymakers should prioritise developing comprehensive quality assurance systems to ensure consistency and transparency in competency-based assessment practices. This includes establishing clear guidelines for assessment design, moderation, and verification processes across institutions.

For TVET institutions, the findings highlight the importance of investing in assessor training and professional development. Assessors must possess not only technical expertise but also strong assessment literacy to ensure fair and accurate evaluation of learner competencies. Institutions should also enhance collaboration with industry stakeholders to ensure that assessment practices remain relevant to workplace demands. Strengthening partnerships with employers can facilitate workplace-based assessment opportunities and align training outcomes with labour market needs.

In addition, the integration of digital technologies and innovative assessment tools should be encouraged to enhance the effectiveness and efficiency of competency-based assessment. Simulation technologies, e-portfolios, and digital assessment platforms can provide flexible, scalable solutions for evaluating competencies across diverse learning environments. By adopting such innovations, TVET systems can improve access to quality assessment and support learner-centred approaches to skill development.

7. LIMITATIONS

Despite providing valuable insights into competency-based assessment in TVET, this study has several limitations that should be acknowledged. First, the review was limited to studies published in English, potentially excluding relevant research conducted in other languages. As a result, the findings may not fully represent global perspectives on competency-based assessment practices.

Second, the study focused on peer-reviewed journal articles published between 2016 and 2025. While this ensured the inclusion of recent research, it may have excluded earlier foundational studies that contributed to the development of competency-based education and assessment frameworks. Additionally, reliance on secondary data from published studies means the findings depend on the quality and scope of the included research.

Another limitation concerns the variability in contexts across the selected studies. TVET systems differ significantly across countries in terms of policy frameworks, institutional capacity, and industry involvement. These contextual differences may affect the generalizability of the findings. Therefore, the conclusions drawn from this review should be interpreted with consideration of these contextual variations.

8. RECOMMENDATIONS FOR FURTHER RESEARCH:

Future research should explore competency-based assessment practices in diverse geographical and institutional contexts, particularly in developing countries and small island states where TVET systems face unique challenges. Comparative studies examining different national approaches to competency-based assessment could provide deeper insights into best practices and contextual adaptations.

There is also a need for more empirical research examining the long-term impact of competency-based assessment on learner outcomes, particularly in terms of employment, career progression, and lifelong learning. Longitudinal studies could provide valuable evidence on how competency-based assessment influences learners' professional development over time.

In addition, future research should investigate the role of emerging technologies in enhancing competency-based assessment practices. The integration of digital tools, artificial intelligence, and virtual simulation environments offers new opportunities to improve assessment accuracy, efficiency, and accessibility. Exploring these innovations can help develop more effective and scalable assessment systems.

Finally, further research is needed to examine the effectiveness of quality assurance mechanisms in competency-based assessment. Studies focusing on assessor training, moderation practices, and industry collaboration can provide insights into how assessment systems can be strengthened to ensure reliability and validity. By addressing these areas, future research can contribute to the continuous improvement of competency-based assessment practices and support the advancement of TVET systems globally.

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