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A Conceptual Framework for Evaluating On-the-Job Training Components and Competency Constructs in Construction Technology Education within Malaysian Vocational Colleges

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ABSTRACT

The increasing demand for skilled labor in the construction industry necessitates a robust evaluation mechanism for on-the-job training (OJT) programs within vocational education systems. In Malaysia, vocational colleges play a pivotal role in equipping construction technology students with industry-relevant competencies. However, the absence of a standardized and analytically grounded framework for assessing OJT components and competency constructs limits the effectiveness of training outcomes. This study develops a conceptual framework integrating competency-based education principles, Rasch measurement theory, and Bloom's taxonomy to systematically evaluate OJT structures in Malaysian vocational colleges. The research adopts a qualitative analytical methodology grounded in existing literature and policy documents to identify core constructs, elements, and performance indicators. The proposed framework emphasizes alignment between industrial expectations, curriculum standards, and assessment practices. Findings reveal critical gaps in current evaluation systems, particularly in competency validation, assessment reliability, and integration of generic skills. The study contributes a structured, scalable model for enhancing OJT effectiveness and provides implications for curriculum designers, policymakers, and educators in vocational training systems.

1. INTRODUCTION

The transformation of vocational education systems globally reflects an increasing emphasis on competency-based training aligned with industry demands. In Malaysia, vocational colleges have undergone significant restructuring to enhance the employability and technical proficiency of graduates, particularly in construction technology programs (Buletin Anjakan, 2015). On-the-job training (OJT) is a critical component of this transformation, offering students experiential learning opportunities within real industrial environments. Despite its importance, the evaluation of OJT remains fragmented, lacking a unified framework that systematically measures competency development and training effectiveness.

The construction industry, characterized by complex project environments and dynamic skill requirements, demands both technical and generic competencies. Studies highlight the importance of integrating structured assessment systems to evaluate these competencies effectively (Ab Rahman et al., 2014). However, existing practices in Malaysian vocational colleges often rely on inconsistent evaluation criteria, limiting the reliability and validity of assessment outcomes.

The problem addressed in this study is the absence of a comprehensive conceptual framework that integrates training components, competency constructs, and standardized assessment mechanisms for OJT in construction technology education. This gap affects the alignment between training outcomes and industry expectations, thereby impacting graduate employability.

The primary objective of this research is to develop a conceptual framework that systematically evaluates OJT components and competency constructs. The study aims to identify key elements of effective training, establish measurable competency indicators, and propose an analytical model for assessment.

The scope of this study is limited to construction technology programs in Malaysian vocational colleges, focusing on OJT implementation and evaluation mechanisms. The significance lies in providing a structured approach to improving training quality, ensuring consistency in assessment, and enhancing workforce readiness.

2. LITERATURE REVIEW

The concept of competency-based education (CBE) has been widely adopted in vocational training systems to align educational outcomes with industry requirements. Ab Rahman et al. (2014) emphasize that assessment practices in Malaysian vocational colleges must reflect real-world competencies rather than theoretical knowledge alone. This aligns with the National Occupational Skills Standard (NOSS), which provides structured guidelines for competency development (Department of Skills Development, 2016).

The theoretical foundation of competency assessment is further supported by Rasch measurement theory, which ensures the reliability and validity of assessment instruments (Aziz, 2011). The Rasch model enables the transformation of qualitative performance indicators into quantitative measures, allowing for objective evaluation of student competencies (Green & Frantom, 2002). This approach addresses inconsistencies in traditional assessment methods and enhances measurement precision.

Bloom's Taxonomy plays a crucial role in structuring learning outcomes and assessment criteria. The taxonomy categorizes cognitive processes into hierarchical levels, enabling educators to design assessments that capture varying degrees of skill complexity (IACBE, 2014). The integration of Bloom's Taxonomy into OJT evaluation ensures that both lower-order and higher-order cognitive skills are assessed systematically (IACBE, 2014).

Research on industrial attachment programs highlights several challenges, including inadequate supervision, lack of standardized evaluation criteria, and misalignment between academic and industrial expectations (Chinyemba et al., 2012). These challenges underscore the need for a structured framework that integrates multiple dimensions of competency assessment.

Generic skills, such as communication, teamwork, and problem-solving, are increasingly recognized as essential components of vocational education (Curriculum Development Centre, 2001). Studies indicate that these skills significantly influence job performance and career progression (Hassan et al., 2007). However, their assessment within OJT programs remains inconsistent and often subjective.

The literature also highlights the importance of rubric-based assessment systems for evaluating performance outcomes. De Luca and Bolden (2014) demonstrate that well-designed rubrics enhance assessment reliability and provide clear performance expectations. Similarly, Reddy (2011) emphasizes the role of rubrics in improving assessment transparency and consistency.

Despite these advancements, gaps remain in integrating theoretical models with practical training evaluation. Existing frameworks often lack comprehensive coverage of training components, competency constructs, and assessment mechanisms. This study addresses these gaps by proposing a unified conceptual framework.

3. METHODOLOGY

This study adopts a qualitative conceptual research design aimed at developing a comprehensive framework for evaluating OJT in construction technology education. The methodology is structured into three primary phases: construct identification, framework development, and validation through theoretical synthesis.

3.1 Identification of OJT Components

The first phase involves identifying key components of OJT programs based on existing literature and policy documents. Core components include training objectives, workplace environment, supervision quality, task complexity, and duration of training. These components are derived from vocational curriculum standards and industry practices (Department of Technical Education and Vocational, 2017).

Each component is analyzed in terms of its functional role in competency development. For example, supervision quality directly influences skill acquisition, while task complexity determines the depth of learning.

3.2 Development of Competency Constructs

Competency constructs are categorized into technical skills, generic skills, and cognitive abilities. Technical skills relate to construction-specific tasks such as site management and material handling. Generic skills include communication, teamwork, and adaptability, as highlighted in vocational education frameworks (Curriculum Development Centre, 2001).

Cognitive abilities are structured using Bloom's Taxonomy, ensuring a hierarchical evaluation of learning outcomes (IACBE, 2014). This integration allows for the assessment of knowledge application, analysis, and problem-solving capabilities.

3.3 Integration of Rasch Measurement Model

The Rasch model is employed to develop a measurement system that quantifies competency levels. This involves constructing assessment instruments with calibrated difficulty levels and performance indicators (Aziz, 2011). The model ensures that assessment outcomes are reliable and comparable across different training contexts.

3.4 Framework Design

The conceptual framework integrates OJT components, competency constructs, and assessment mechanisms into a unified model. The framework consists of three layers:

- Input Layer: Training components and environmental factors
- Process Layer: Competency development and learning activities
- Output Layer: Measurable performance outcomes

Each layer is interconnected, ensuring a holistic evaluation process.

3.5 Hypothetical Application Example

To illustrate the framework, consider a construction student assigned to a site supervision role. The input layer includes training objectives and supervision quality. The process layer evaluates task execution and problem-solving. The output layer measures competency using Rasch-based assessment and Bloom's taxonomy levels (IACBE, 2014).

4. RESULTS

The analysis reveals that current OJT evaluation practices lack integration between training components and competency assessment. The proposed framework addresses this gap by providing a structured model that links input factors with measurable outcomes.

Findings indicate that incorporating Rasch measurement enhances assessment reliability, while Bloom's taxonomy ensures comprehensive evaluation of cognitive skills. The integration of generic skills into competency constructs improves alignment with industry requirements.

The framework demonstrates scalability and adaptability across different vocational programs. It enables consistent evaluation standards and facilitates data-driven decision-making in training design.

5. DISCUSSION

The findings highlight the importance of a multidimensional approach to OJT evaluation. The proposed framework aligns with competency-based education principles and addresses limitations identified in previous studies (Ab Rahman et al., 2014). By integrating Rasch measurement and Bloom's taxonomy, the framework enhances both reliability and depth of assessment.

The inclusion of generic skills reflects evolving industry demands, emphasizing the need for holistic competency development (Hassan et al., 2007). However, implementing the framework requires institutional support, training for educators, and alignment with national standards.

A key limitation is the conceptual nature of the study, which requires empirical validation. Future research should focus on testing the framework in real-world settings to assess its effectiveness.

6. CONCLUSION

This study develops a comprehensive conceptual framework for evaluating OJT components and competency constructs in construction technology education within Malaysian vocational colleges. The framework integrates theoretical models and practical considerations, providing a structured approach to assessment.

The research contributes to the advancement of vocational education by addressing gaps in training evaluation and offering a scalable model for competency assessment. Future studies should focus on empirical validation and refinement of the framework to enhance its applicability.

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