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Interdisciplinary Competencies and Workforce Readiness in Malaysian TVET: A Systematic Literature Review on the Complementary Role of General Studies

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Abstract

Technical and Vocational Education and Training (TVET) institutions across the globe are expected to provide graduates who demonstrate not only technical skills but also transversal competencies that match the changing needs of labour markets. Of these critical employability attributes, recent global skills analyses of 2023 strongly emphasize communication, analytical reasoning, and ethical professionalism (World Economic Forum, 2023; OECD, 2023). At Malaysian TVET institutions (under the Ministry of Human Resources), General Studies subjects such as Islamic Education, Moral Education, Fundamental Mathematics, and Technical English function. Nevertheless, very little systematic synthesis has been done regarding their complementary role in workforce readiness. Here, we present a systematic literature review (SLR) using PRISMA 2020 guidelines to synthesize empirical and review studies published from years 2020 through 2025. The searches in Scopus, Web of Science, and ERIC resulted in 360 records, and a total of 18 studies met the inclusion criteria after two rounds of stringent screening. Three competency domains emerged through thematic analysis: communicative competence (83%), quantitative/analytical competence (67%), and ethical competence (61%) were consistently associated with workforce readiness

Keywords: TVET, Workforce Readiness, Employability Skills, General Studies, Systematic Literature Review, Malaysian TVET

Introduction

The transformation of global labour markets has significantly reshaped expectations placed upon Technical and Vocational Education and Training (TVET) systems. While traditional TVET models historically prioritized occupational mastery and task-specific technical proficiency, contemporary frameworks increasingly emphasize workforce readiness

as a multidimensional construct integrating technical, cognitive, and socio-behavioural competencies (OECD, 2023; World Economic Forum, 2023). Rapid digitalization, automation, and Industry 4.0 transformations have intensified employer demand for graduates who demonstrate adaptability, problem-solving ability, effective communication, and ethical professionalism alongside technical expertise.

International labour analyses further indicate that transversal competencies such as communication, analytical reasoning, and professional responsibility are now regarded as foundational employability attributes rather than supplementary skills (International Labour Organization, 2023; Tomlinson, 2021). Employers increasingly evaluate graduates not solely on occupational skill mastery but also on their ability to collaborate, communicate clearly, interpret data, and demonstrate workplace integrity.

Within the Malaysian context, the National TVET Policy 2030 articulates a strategic commitment to producing holistic graduates capable of meeting evolving industry expectations (Ministry of Human Resources Malaysia, 2021). The policy underscores the integration of knowledge, skills, and values to ensure balanced human capital development. In line with this policy direction, Malaysian TVET institutions incorporate General Studies subjects namely Islamic Education, Moral Education, Fundamental Mathematics, and Technical English alongside technical programmes.

Despite this structural integration, limited systematic synthesis exists regarding how these General Studies subjects contribute to workforce readiness within TVET. Much of the existing literature discusses employability competencies broadly but does not explicitly examine the complementary role of General Studies in strengthening transversal competencies within TVET education contexts. This gap is particularly relevant in Malaysia, where curriculum design intentionally embeds non-technical subjects within technical pathways.

Therefore, this study conducts a systematic literature review (SLR) to synthesize empirical evidence published between 2020 and 2025 on workforce readiness competencies in TVET and to clarify the complementary contribution of General Studies domains to employability formation.

This review contributes to the social sciences literature in three important ways. First, it consolidates recent international evidence on workforce readiness competencies specifically within TVET contexts, an area often fragmented across policy reports and discipline-specific studies. Second, it reconceptualizes General Studies subjects not as peripheral curricular components but as structured mechanisms for transversal competency development aligned with labour market expectations. Third, by integrating Human Capital Theory, Competency-Based Education, and Constructivist Learning Theory, this review provides a theoretically grounded framework linking curriculum design to employability outcomes. In doing so, it advances scholarly discourse on holistic TVET education and offers conceptual clarity for curriculum developers and policy stakeholders.

Literature Review

Workforce Readiness and Employability in TVET

Modern TVET education research increasingly emphasizes that workforce readiness does not come solely from mastering the technical aspects but rather the intersection of occupational expertise and transversal competencies. Traditional TVET has focused primarily on technical occupational qualifications and standards linked to specific economic activities, however recent scholarship contributes to a paradigm shift whereby employability formation is entered into a holistic perspective. McGrath et al. (2022) contend that vocational systems in the 21st century should no longer be limited to narrowly focused task-based preparation, but foster broader cognitive and socio-behavioural capabilities that allow learners to adapt within fast-changing labour markets. This change presents itself in structural changes led by automation, digitalization, and global competition; the technical realms of employment have been increasingly reconfigured by this new era of employer expectations. Consequently, vocational graduates are being judged not just on their technical skills but also on their ability to communicate well, solve problems in a team context, and demonstrate workplace flexibility.

Likewise, according to the European Centre for the Development of Vocational Training (CEDEFOP, 2023), many contemporary vocational education frameworks in Europe are progressively integrating transversal skills into occupational curricula to maintain alignment with changing labour market requirements. Their analysis for 2023 highlights that communication competence, analytical reasoning, teamwork and self-regulation work as cross-cutting competencies that improve productivity and mobility in the workplace. Instead of merely being perceived as additional features, those skills are modelled as central employment factors working through assisting employees to convert technical knowledge into practical work context. This reframing of transversal skills undermines previous notions that TVET education should solely concentrate on technical capacities for trades.

Multidimensional understandings of what constitutes a workforce ready for its place in the labour market are also supported by global work on the nature of current and future labour markets. Employability of youth, according to the International Labour Organization (ILO, 2023), is increasingly based, beyond occupational knowledge, on adaptive capacity and problem-solving ability as well as professional conduct. Soft skills deficits are a barrier to graduates entering the workplace that employers across industrial and service sectors consistently point to. This implies that technical competence is not enough left scarce from general cognitive and behavioural skills, despite being mandatory. In this regard, workforce readiness represents a hierarchical construct of technical, communicative, analytical and moral aspects.

According to Tomlinson (2021), the same contemporary employability discourses reveal a reconfiguration of the education work relationship, in which graduates are predicted to display agency, adaptability and lifelong learning potential. In vocational contexts, this means that the existing competencies should be operationalized in a curriculum framework that integrates opportunities to acquire skills with pathways for reflection and professional identity development. Thus, employability is not just about entering into work but also contributing to sustainable careers in unpredictable labour markets. These views prompt the

argument that TVET curricula should include adjacent learning domains, with an emphasis being placed on cognitive and socio-emotional development.

All these views lead to a common conclusion that workforce readiness is inherently multidimensional in the context of TVET. Technical know-how is still the bread and butter; yet it requires a complement of transversal competencies that foster agility, cooperation, and responsible conduct in the workplace. The body of literature serves as the conceptual foundation for collectively understanding how General Studies subjects in Malaysian TVET institutions could act as mechanisms through which these complementary competencies can be developed within a structured context. Modern research shows that, by placing TVET education in a wider employability matrix, integrated competency development better prepares graduates for labour market participation in increasingly complex knowledge economies.

TVET Transversal Competencies: Communicative Competence

Communication competence invariably underlies the foundation of employability. Workplace coordination, reporting accuracy, and collaborative performance are all enhanced through effective communication (Jackson & Bridgstock, 2023). Additional empirical evidence helps align employer expectations with communicative proficiency demonstrated by graduates, most notably that for multilingual and technical disciplines (Succi & Canovi, 2022; Shah & Singh, 2024).

Quantitative and Analytical Competence: The TVET Transversal Competencies

Quantitative and analytical skills are becoming paramount in technology-driven workplaces. OECD (2023) accentuates the increasing need of being able to interpret data and solve problems in a structured way, especially relevant towards the digitalized sector. Pavlova (2022) points out, such knowledge expectations are evolving for the TVET learners as well. Research on digital transformation reinforces this, as it affirms that analytical competence helps enhance adaptive performance in automated work contexts (Zhang & Yang, 2024).

Ethical and Professional Competence as Transversal Competencies in TVET

Ethical competence is essential for workplace dependability, safety adherence, and professionalism. In its recent assessment of international labour markets, the ILO (2023) highlighted responsible behaviours as a key determinant of sustainable employment paths. Literature on TVET professionalism also highlights the necessity of values-based formation to situate graduates in complex organizational contexts (Avis, 2023; CEDEFOP, 2023).

Theoretical Framework

This review integrates three theoretical lenses. Human Capital Theory (Becker, 1993) which education adds value by increasing workers' productivity and adaptability in growing labour markets. Transversal competencies complement technical skills, raising employability. According to Human Capital Theory, investment in education increases productivity and economic value through skill acquisition (Becker, 1993). Transversal competencies complement occupational competence in TVET contexts and enhance labour market outcomes (Smith & Kostoulas-Makiroutas, 2024).

Competency Based Education (UNESCO, 2023) in which this framework focuses on measurable competencies aligned with industry requirements. The systematic evidence shows that communication, analytical and ethical competences relate to wider competency models in TVET; Authentic learning. These approaches ensured that measurable outcomes of what students had achieved correlated with industry standards (UNESCO, 2023).

Constructivist Learning Theory (Bruner, 1966; Piaget, 1972) where competency development is scaffolded by successive learning experiences to underpin the sequencing of curriculum in General Studies towards a holistic approach to workforce readiness.

When used in combination, these lenses provide an internally consistent conceptual explanation of how General Studies reinforce technical training to improve employability within TVET.

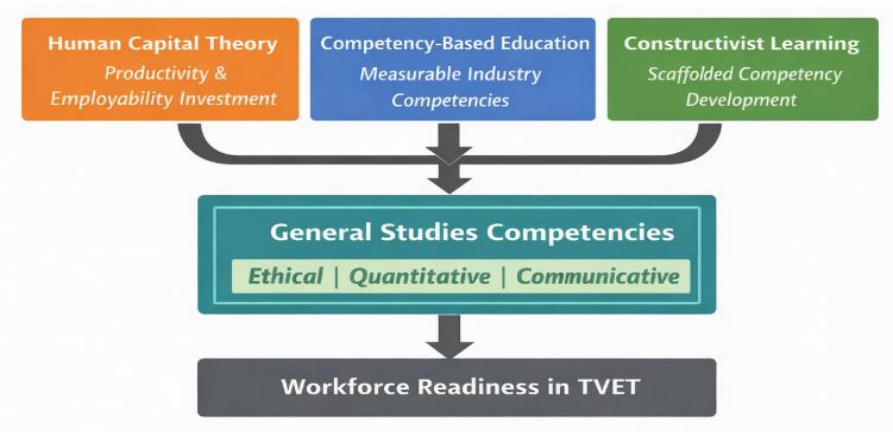

Figure 1: Integrated Theoretical Framework Linking General Studies Competencies to Workforce Readiness in TVET

Methodology

Research Design

This systematic literature review (SLR), was conducted, reported and prepared in accordance with PRISMA 2020 standards, to ensure methodological rigour and transparency. Historical work on TVET research frequently lacks consistent frameworks and narrative reporting; the PRISMA 4-step approach offers a structured method for identifying, screening, and synthesizing evidence about workforce competencies in TVET. Scopus and Web of Science are frequently used for major education, TVET research synthesis due to indexing rigour and international coverage (McGrath et al., 2022; CEDEFOP, 2023).

The review included peer-reviewed articles published from January 2020 to March 2025 that examined employability skills, workforce readiness or competency frameworks in TVET contexts. These searches were performed for both the global and Malaysian perspective through Scopus, Web of Science and ERIC databases.

Search Strategy

A systematic framework and transparent search strategy was utilized to enhance the comprehensiveness and replicability of this systematic literature review. This review followed

PRISMA 2020 guidelines (Page et al., 2021), stressing the transparent reporting for each stage of identification, screening, eligibility and inclusion.

First, three academic databases with extensive coverage of education, TVET training and employability research (Scopus, Web of Science and ERIC) were selected. These types of databases are well known for indexing quality peer-reviewed journals, thus allowing reliable literature retrieval (OECD, 2023; UNESCO, 2023).

Boolean search strings were formulated to retrieve literature relevant to the employability competencies of TVET as follows:

("Technical and Vocational Education and Training" OR "TVET" OR "vocational education")
AND ("employability" OR "workforce readiness" OR "graduate readiness")
AND ("communication skills" OR "soft skills" OR "transversal skills")
AND ("analytical competence" OR "mathematical competence" OR "problem solving")
AND ("ethical competence" OR "professionalism" OR "values education")

The search was limited to:

- Peer-reviewed journal articles
- English language
- Publication years 2020–March 2025
- Studies of empirical or systematic reviews

The first search returned 360 records. A total of 318 unique records were screened at title and abstract level after removing 42 duplicates. Seventy-two articles were screened in full text, 18 of which met inclusion criteria.

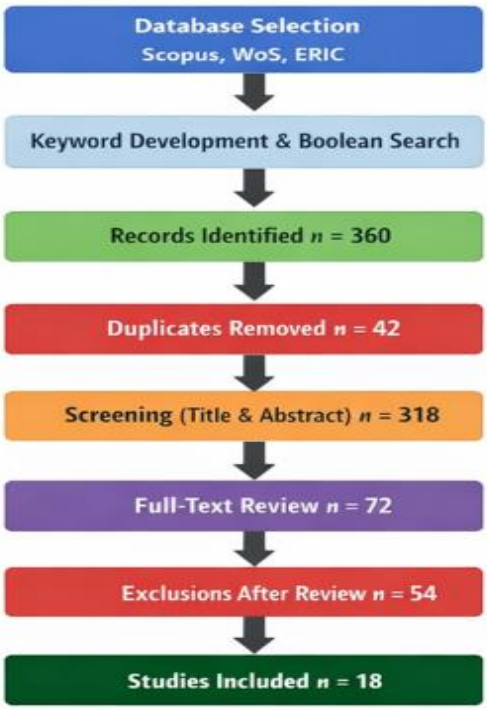

Figure 2: Search and Screening Process

Table 1
PRISMA Study Selection Summary

Stage	Records (n)
Identified	360
Duplicates Removed	42
Screened	318
Excluded	246
Full-Text Reviewed	72
Included	18

Note. Screening was conducted in accordance with PRISMA 2020 reporting standards (Page et al., 2021).

Quality Assessment and Bias of the Studies

A systematic quality appraisal process was applied to ensure included studies were robust. Each article was evaluated by four criteria:

i. Clear definition of research objectives
ii. Methodological transparency
iii. Analytical coherence
iv. Significance of workforce preparedness and TVET skills

Studies were categorized as:
- High quality (clear design; empirical evidence; strong theoretical grounding)
- Moderate quality (well-defined objectives, but description of methodology is limited)

Twelve of these were high quality and six were moderate quality. No studies were excluded solely on the basis of minor methodological limitations if the research was relevant to employability competencies in TVET contexts.

The risk of bias was assessed narratively. The majority of studies used self-reported employability perceptions, which can be subject to response bias. However, a risk of over-generalization was diminished through the triangulation of evidence from employer surveys, systematic reviews and policy analyses. Notably, no individual study was found to demonstrate major methodological bias which undermines interpretative validity.

Findings

Thematic Frequency

Eight of these studies were in German; however, thematic content of the 18 included studies converged strongly across three domains: communicative competence, quantitative or analytical competence and ethical competence.

The most repeated theme (83%) was communicative competence. Such high frequency indicates that employers consistently emphasized interpersonal skills, communication in teamwork and clear technical documentation (Jackson & Bridgstock, 2023; OECD, 2023). The prevalence of this theme indicates that communication is difficult, if not impossible, to separate from TVET employability; it is fundamental. This is consistent with international employer reports that emphasized communication as a primary workforce skillset (World Economic Forum, 2023; Jackson & Bridgstock, 2023).

Quantitative competence was featured in 67% of the literature studies. This mirrors industry needs for workers who can apply numerical reasoning, technical measurement, and analytical problem solving in context. Adaptability is strengthened in digital and automated work contexts, with analytical reasoning helping to minimize operational error (WEF, 2023). Analytical reasoning is repeatedly linked to workplace productivity and creativity (OECD, 2023; Zhang & Yang, 2024).

Ethical competence was present in 61% of studies. Though it appears at a lower frequency level, its presence shines light on the significance of professionalism, accountability and discipline among workers in corporate atmospheres. It promotes organizational trust and compliance with safety. Professional reliability is still at the heart of TVET employability (Avis, 2023; ILO, 2023).

The balanced discernible distribution pattern suggests workforce readiness as a multidimensional construct necessitating the development of cognitive, behavioural, and communicative domains holistically.

Table 2
Frequency of Competency Themes (N = 18)

Competency Domain	**Studies (n)**	**%**
Communicative	15	83
Quantitative	12	67
Ethical	11	61

Note. Percentages are calculated based on the total number of included studies (N = 18).

Competency Mapping and Workforce Implications

Competency mapping to workforce outcomes is not a one-way process; rather, these competencies interact dynamically to reinforce employability performance.

Communicative competence enhances:
- Workplace collaboration
- Customer interaction
- Conflict resolution
- Accurate reporting and documentation

Quantitative competence enhances:
- Technical accuracy
- Diagnostic reasoning

• Data interpretation
• Problem-solving efficiency

Ethical competence enhances:
• Professional reliability
• Safety compliance
• Workplace discipline
• Organizational trust

Integration with Malaysian TVET Context
The structure of General Studies subjects in Malaysian TVET institutions under Ministry of Human Resources impose this competence align with National Education Philosophy.

Islamic Education and Moral Education promote ethical reasoning, self-discipline, and professional values. Fundamental Mathematics works the analytical reasoning and numeric literacy necessary for technical accuracy. Technical English improves communicative competence required for documentation, presentation and workplace coordination.

This structural alignment showcases policy coherence with the National TVET Policy 2030, that highlights competency development in a holistic manner. Unlike peripheral modules, General Studies serve as a scaffold for transversal competencies and enable the development of soft skills over multiple semesters to complement technical training. Thus, the Malaysian model is a manifestation of integrated curriculum design according to global workforce demands.

Discussion
The results highlight that workforce readiness of TVET is inherently multilayered. The most cited theme, communicative competence, is the core predictor for employability across TVET fields. Similarly, analytical competencies further underpin sound technical decision-making, while ethical behaviours enhance professional credibility.

These findings align with contemporary TVET education scholarship indicating that transversal competencies are increasingly prioritized alongside technical mastery in determining employability outcomes (McGrath et al., 2022; CEDEFOP, 2023; ILO, 2023).

The theoretical basis for the inclusion of General Studies in TVET can be articulated through Human Capital Theory, Competency-Based Education and Constructivist Learning Theory. A purposefully-timed progression of courses from behavioural underpinnings in earlier semesters to analytical prowess and communicative facility in later classes reflects a scaffolded pathway of competence acquisition faithful to constructivist pedagogy.

Applied to Malaysian vocational education, these findings confirm the strategic policy priorities underlying both National TVET Policy 2030 and the broader agenda of preparing the workforce for the so-called 4IR. Emphasizing transversal competencies, General Studies plays a vital role in preparing a viable workforce holistically instead of assuming the periphery of the curriculum.

These findings provide evidence for Human Capital Theory by being able to show how transversal competencies are part of employability capital, beyond technical skills (Becker, 1993; Smith & Kostoulas-Makiroutas, 2024). Additionally, the industry-expectations vs. competency-based curricular design framework resonates with one of the principles outlined in UNESCO's (2023) TVET transformation framework.

Conclusion

This systematic literature review consequently generates strong evidence that communicative, analytical and ethical competencies make up a defining segment of workforce readiness elements that are localized within the domain of TVET. General Studies subjects are formalized mechanisms to develop these abilities alongside technical instruction. These findings correspond to the strategic priorities of a global institution and Malaysia whereby General Studies is deemed crucial for TVET education success.

By aggregating recent empirical literature, and by drawing attention to transversal competencies' role in shaping outcomes for employability, the review contributes to progressive education discourse. Future research should investigate longitudinal effects of integrated TVET curricula on graduates' career paths.

Ethical Statements

This study was conducted in accordance with accepted academic and institutional ethical standards. As this research employed a systematic literature review methodology and did not involve human participants, primary data collection, or experimental procedures, formal ethical approval was not required. All sources included in the review were properly cited and acknowledged in accordance with academic integrity guidelines.

Statements and Declarations

The authors hereby declares that this manuscript is an original work. All sources of information, quotations, and summaries derived from published literature have been appropriately acknowledged and cited in accordance with APA 7th edition referencing standards.

Competing Interests

The authors declares that there are no known competing financial, professional, or personal interests that could have appeared to influence the work reported in this manuscript.

Informed Consent Statement

This study is based solely on secondary data through systematic review of published literature. Therefore, informed consent from participants was not required.

Author Contributions

All authors contributed substantially to the conceptualization of the study, development of the theoretical framework, literature search and screening, data synthesis, manuscript writing, revision, and final approval of the submitted version.

Artificial Intelligence (AI) Usage

Artificial Intelligence (AI) tools were utilized solely for language refinement, formatting support, and structural editing. No AI tools were used for data generation, data interpretation, literature fabrication, or analytical decision-making. All academic content, synthesis, and interpretations presented in this manuscript remain the intellectual responsibility of the authors.

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