

A Meta-Analysis of Technical and Vocational Education and Training (TVET) Studies Across Continents

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Abstract

Technical and Vocational Education and Training (TVET) plays a critical role in enhancing employability and supporting economic development. However, global disparities exist in labor force participation, policy implementation, and system effectiveness, highlighting the need for cross-continental analysis. This study aimed to conduct a systematic meta-analysis of international TVET research to 1) evaluate labor force participation of TVET graduates, 2) identify innovative policies and systemic interventions that strengthen TVET outcomes, and 3) propose strategies suitable for enhancing the Philippine TVET system. A systematic review and meta-analysis were conducted on 60 studies published between 2016 and 2022. Data were sourced from four academic databases: ProQuest, EBSCO, JSTOR, and Elsevier. Inclusion criteria targeted studies focused on TVET programs or graduates reporting employment outcomes or systemic interventions. Qualitative data were analyzed using MAXQDA, while quantitative data were synthesized to determine labor force participation across continents. Labor force participation of TVET graduates varied by region, with Asia reporting the highest rate (27.27%) and Africa the lowest (10.54%). Effective policies identified include strong governance, public-private partnerships, competency-based training, recognition of prior learning, and ICT-supported monitoring. For the Philippines, adopting these strategies can improve alignment with labor market needs and enhance graduate employability. The study demonstrates that context-specific policies, systemic interventions, and strategic partnerships are essential for improving TVET outcomes globally and locally. Evidence-based strategies can strengthen the Philippine TVET system, ensure labor market relevance, and promote workforce readiness.

Keywords: Technical and vocational education and training (TVET), Labor force participation, Meta-analysis, Policy interventions, Philippines

Introduction

Technical and Vocational Education and Training (TVET) programs are implemented worldwide to equip learners with the knowledge, skills, and competencies required for specific trades or occupations. The content, structure, and delivery of TVET programs vary significantly across countries, reflecting differences in local economic demands, educational systems, and socio-cultural and political contexts (Nawi et al., 2020). By integrating practical, hands-on training with theoretical instruction, TVET seeks to prepare learners for productive employment across diverse sectors of the economy (UNESCO, 2001; Oviawe et al., 2017).

TVET has been established as a pivotal strategy for enhancing workforce employability, particularly for individuals who may not pursue traditional university education (Hassan et al., 2019). Beyond individual employment outcomes, TVET contributes to national development by supplying industries with skilled labor, fostering productivity, and supporting economic growth (Grosch, 2017). Comparative studies highlight that countries such as Germany and Switzerland have institutionalized strong TVET systems closely linked to labor markets, while in other contexts, including the United States, TVET continues to occupy a more peripheral role in education policy (Boateng, 2012).

Despite its recognized importance, TVET systems worldwide face persistent challenges. These include limited access for disadvantaged and marginalized populations, uneven program quality, weak alignment with labor market needs, low social prestige, and constrained funding mechanisms. Such challenges undermine the capacity of TVET programs to produce graduates who are fully prepared for contemporary workforce demands and sustainable economic participation (Hasim et al., 2016; Hussain et al., 2015).

Empirical evidence further suggests that the effectiveness of TVET interventions varies considerably across contexts. In the Philippine setting, impact evaluations conducted by Orbeta (2016) indicate that while TVET participation can improve employment prospects and earnings, outcomes are highly dependent on program relevance, training quality, and industry linkage. Recognizing these issues, the Technical Education and Skills Development Authority (TESDA) introduced the National Technical Education and Skills Development Framework 2021–2025, which emphasizes labor market responsiveness, quality assurance, public–private partnerships, and data-driven planning to strengthen the TVET system (TESDA, 2021).

While existing studies offer valuable insights into TVET performance, policies, and challenges at national or regional levels, there remains a clear gap in research that systematically synthesizes TVET outcomes across continents. Specifically, limited attention has been given to cross-continental comparisons of labor force participation, policy innovations, and system-level interventions. A comprehensive meta-analysis of international TVET studies can address this gap by identifying global trends, effective practices, and transferable policy approaches. Such synthesis provides a robust evidence base for informing context-sensitive reforms and strengthening national TVET systems, including those in the Philippines.

Objectives:

This study aimed to conduct a systematic meta-analysis of international TVET research to evaluate global trends and inform localized policy development.

Specific Objectives:

1. To analyze labor force participation rates of TVET graduates across continents based on studies published from 2016–2022.
2. To synthesize innovative policies and systemic interventions that have strengthened TVET outcomes globally.
3. To propose evidence-based strategies for enhancing the Philippine TVET system, grounded in best practices and aligned with labor market requirements.

Methodology

This study employed a systematic review and meta-analysis approach to synthesize global research on TVET programs, labor force participation, and policy interventions, combining quantitative and qualitative analyses to identify trends, effective practices, and strategies for system improvement.

Research Design

This study employed a systematic meta-analysis to evaluate Technical and Vocational Education and Training (TVET) programs worldwide and provide evidence-based strategies for the Philippine context. The design combined quantitative aggregation of labor market outcomes with qualitative thematic analysis of policies and systemic interventions, ensuring alignment with the study objectives: assessing labor force participation, synthesizing effective global policies, and proposing localized improvements for the Philippine TVET system.

Data Sources and Search Strategy

A comprehensive search was conducted across four academic databases: ProQuest, EBSCO, JSTOR, and Elsevier, covering publications from 2016 to 2022. Keywords included “*Technical Vocational Education and Training*”, “*TVET*”, “*Vocational Education*”, “*employment outcomes*”, “*policy interventions*.” Peer-reviewed journal articles, government reports, and policy briefs in English were included.

Criteria

Studies were included if they (1) focused on TVET programs or graduates, (2) reported employment outcomes or systemic interventions, and (3) were published in English between 2016 and 2022. Studies were excluded if they (1) addressed general higher education without a TVET focus, (2) were opinion pieces or commentaries lacking empirical evidence, (3) were duplicate publications, or (4) did not have full-text availability. After applying these criteria, a total of 60 studies from 10 countries per continent (excluding Antarctica) were selected, encompassing quantitative, qualitative, and mixed-method designs.

Data Extraction and Analysis

Data were extracted using a structured template capturing study characteristics, TVET program type, labor market outcomes, and systemic interventions. Quantitative data were managed with Excel, while qualitative data were coded and analyzed using MAXQDA to identify recurring themes and best practices.

Quality Assessment

Each study was appraised for methodological quality using a modified AMSTAR 2 checklist, considering study design, sample size, validity of measures, and appropriateness of analysis. High-risk studies were excluded from quantitative aggregation but retained for qualitative synthesis to inform policy recommendations.

Data Synthesis

Quantitative synthesis involved calculating labor force participation rates by continent, including averages, ranges, and standard deviations. Qualitative synthesis identified themes in governance, industry partnerships, curriculum modernization, quality assurance, and lifelong learning. Philippine-specific strategies were derived by mapping global best practices to local labor market and educational contexts. The PRISMA flow diagram documented study selection, screening, eligibility, and inclusion, ensuring transparency and replicability.

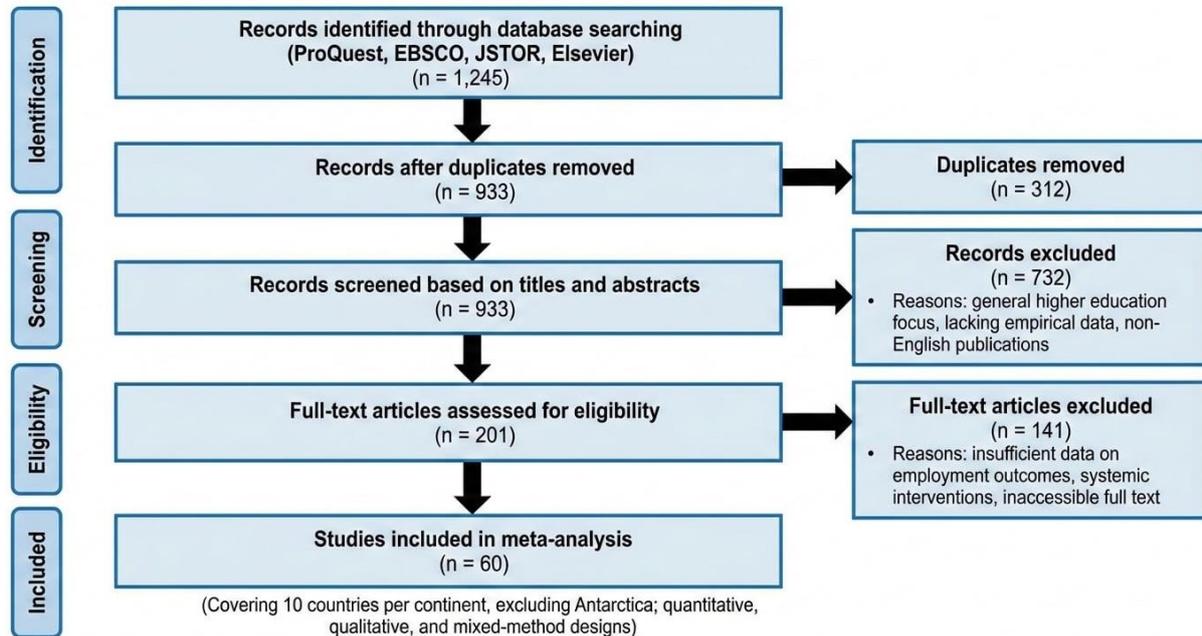


Figure 1 Flow diagram of study selection process (Source: Research, 2025)

The study followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparent reporting of study selection. An initial search across ProQuest, EBSCO, JSTOR, and Elsevier yielded 1,245 records. After removing 312 duplicates, 933 unique records were screened based on titles and abstracts. Of these, 732 records were excluded for not meeting the inclusion criteria, such as focusing on general higher education, lacking empirical data, or being non-English publications. The remaining 201 full-text articles were assessed for eligibility, resulting in 141 exclusions due to insufficient data on employment outcomes, systemic interventions, or inaccessible full text. Finally, 60 studies were included in the meta-analysis, covering 10 countries per continent (excluding Antarctica) with quantitative, qualitative, and mixed-method designs.

Results

This meta-analysis synthesizes global evidence on Technical and Vocational Education and Training (TVET) outcomes from 2016–2025. Findings are organized into three major areas: 1) labor force participation rates of TVET graduates, 2) innovative policies strengthening TVET systems, and (3) suitable approaches to enhance the Philippine TVET system. Across the 60 contributing studies, results highlight differential employment outcomes, policy effectiveness, and contextual challenges across continents.

1. Labor Force Participation Rate of TVET Graduates

TVET programs serve as a direct link between education and employment by equipping graduates with practical and occupational skills aligned with labor market needs (UNESCO, 2022). Evidence from systematic reviews indicates that participation in TVET is positively associated with employment outcomes in low- and middle-income countries, with small but statistically significant effects on paid employment and formal employment outcomes when compared to non-TVET counterparts (Leidholm & Manda, 2013).

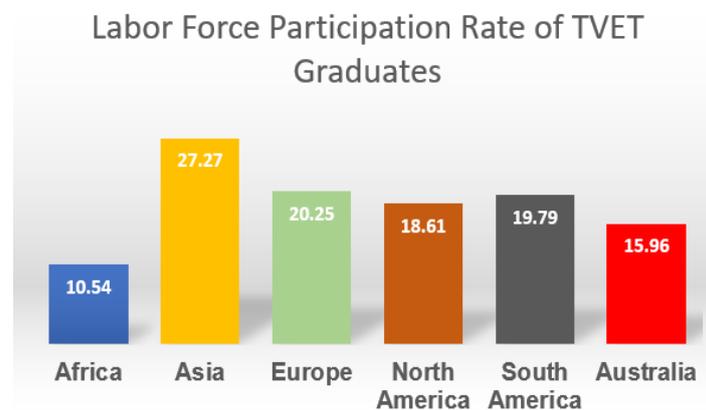


Figure 2 Labor force participation rate of TVET across continents

Note: Data extracted from 10 representative countries per continent; total contributing studies = 60 (Source: Research, 2025)

Figure 2 shows average labor force participation rates of TVET graduates across continents based on employment data aggregated from 60 studies. Asia reported the highest participation rate (27.27%), followed by Europe (20.25%), South America (19.79%), North America (18.61%), and Australia (15.96%), while Africa registered the lowest (10.54%). These figures represent the proportion of TVET graduates employed in industrial sectors relative to total graduates per region.

Asia's strong participation reflects effective alignment of TVET training and labor market demands, particularly in manufacturing and technology industries — trends supported by UNESCO-UNEVOC data on emerging skills and competencies integration across Asia-Pacific countries.

Europe has well-developed dual training and lifelong learning systems, which facilitate transitions from training to employment (OECD, 2018).

Africa's lower rates are linked to structural challenges in formalizing employment and aligning TVET offerings with employer needs, as highlighted in African TVET transformation

programs and research on digital and green skills integration.

North and South America show moderate performance, where evidence indicates mixed results influenced by policy variation and employer perceptions of TVET credentials.

2. Innovative Policies to Strengthen TVET Systems

Despite the potential of TVET to address skills mismatches and support decent work, global reports reveal persistent gaps in access, relevance, and quality, especially in low- and middle-income contexts (UNESCO, World Bank & ILO, 2023). TVET systems are often criticized for limited adaptability to industry needs due to outdated curricula and insufficient teacher preparation.

Across the included studies, several policy innovations and systemic reforms were consistently associated with improved TVET outcomes:

- Strengthening governance and institutional coordination — policy frameworks that involve government, employers, and TVET institutions enhance relevance and implementation effectiveness (UNESCO, 2022).
- Industry partnerships & work-based learning — collaborations between training providers and employers support labor market entry and competency alignment (OECD, 2018).
- Curriculum modernization & skills anticipation — integrating digital, green, and soft skills into training enhances employability in emerging sectors.
- Quality assurance & lifelong learning strategies — monitoring systems and pathways for continued upskilling improve long-term career adaptability.
- Targeted access programs for women and marginalized groups — inclusion efforts expand participation and address equity concerns.
- These strategies reflect a combination of systemic reforms, stakeholder engagement, and curricula modernization that support TVET systems in adapting to evolving labor market demands.

3. Suitable Approaches to Strengthen TVET System Development that benefit present Philippine Education

To enhance the effectiveness of TVET in the Philippines, it is essential to adapt global best practices to the local context while addressing systemic challenges such as quality assurance, industry alignment, and access for marginalized groups. Evidence from international and local studies suggests that integrating certification frameworks, recognition of prior learning, and public-private partnerships can improve the performance of vocational training centers and ensure that graduates are better prepared for labor market demands (Schröder, 2019; UNESCO, 2022). The following table and discussion present strategies, tools, and mechanisms designed to strengthen the Philippine TVET system and support the successful transition of learners into sustainable employment.

Table 1 Suitable Approaches to Strengthen TVET System Development

Certification Mechanism	Strategies & Tools for Vocational Training Center Performance
National Qualifications Framework and Regulated Qualifications Framework	<ul style="list-style-type: none"> • Build enabling conditions (robust TVET policies, institutional anchorage, partnership frameworks, and NQF mechanisms) for valuable qualifications. • Determine certification processes based on identified skills needs. • Develop business plans and performance contracts for Vocational Training Centers (VTCs) to enhance strategic, pedagogical, administrative, and financial management autonomy. • Promote public-private partnerships (PPPs) to improve the training-to-work transition. • Define skill sets, Competency-Based Training (CBT) courses, and supervisor/mentor standards for apprenticeships, dual training, and internships. • Reinvest professional taxes in ongoing training and apprenticeships via a national vocational training fund (UNESCO, 2022; Schröder, 2019).
Recognition of Prior Learning (RPL)	<ul style="list-style-type: none"> • Adapt and decentralize the RPL process to give access to informal and non-formal sector candidates. • Develop RPL guidelines aligned with NQF, offering flexible and modular approaches, and credible assessment tools for employers. • Provide career guidance services through dedicated units. • Support entrepreneurship through demand-driven skills targeting and microfinance modules. Use employment rates, corporate growth, and trainee/employer satisfaction as Key Performance Indicators (Mariano & Tantoco, 2023).
Public-Private Partnership in Certification	<ul style="list-style-type: none"> • Engage the private sector in every step of certification, including labor needs identification and occupational standards. • Delegate certification steps to autonomous private bodies for competency-based qualifications. Build monitoring systems to track TVET graduates' labor market outcomes by sector and region. • Harness ICT for effective monitoring and evaluation (M&E), adjust training content based on labor market research, and communicate results to stakeholders and learners (Othman, 2019; Pambudi & Harjanto, 2020).

Most TVET reforms globally focus on quality training management. However, vocational training actors often report that quality assurance systems remain insufficiently effective. To achieve successful outcomes, the quality of training and leadership in training centers must be validated through the sustainable transition of learners from TVET to the labor market (Schröder, 2019; Othman, 2019; Pambudi & Harjanto, 2020).

Discussions

This meta-analysis of 60 studies from ten countries per continent (excluding Antarctica) provides a comprehensive view of the current state and effectiveness of Technical and Vocational Education and Training (TVET) globally. The findings reveal substantial regional differences in labor force participation, policy implementation, and systemic development, reflecting the diverse socioeconomic, cultural, and policy environments in which TVET operates.

1. The study found that Asia leads with a labor force participation rate of 27.27%, followed by Europe (20.25%), South America (19.79%), North America (18.61%), Australia (15.96%), and Africa (10.54%). The lower participation in Africa aligns with earlier research (Boateng, 2017; Oketch, 2017) and may be explained by limited funding, fragmented policies, insufficient infrastructure, and societal undervaluing of vocational education. In contrast, higher participation in Asia reflects strong alignment between TVET curricula, apprenticeship programs, and labor market needs (Kirior, 2017; UNESCO, 2024). This finding supports Human Capital Theory (Becker, 1993), suggesting that investments in skills and structured training enhance employability and productivity.

2. Global evidence shows that effective TVET systems rely on multifaceted policy interventions, including robust governance, private-sector partnerships, curriculum modernization, ICT integration, and quality assurance mechanisms (Schröder, 2019; Hanni, 2019; Smith, 2022). These interventions facilitate skill development beyond technical expertise, promoting critical thinking, entrepreneurship, and lifelong learning (Hasim et al., 2016). The study also confirms prior literature indicating that inadequate policy alignment and low societal recognition of TVET programs can hinder the successful integration of graduates into the workforce (Grosch, 2017; Oketch, 2017).

3. Adapting global best practices, the Philippine TVET system can strengthen its relevance and effectiveness by implementing National Qualifications Frameworks (NQF), Recognition of Prior Learning (RPL), competency-based training, apprenticeships, internships, and ICT-enabled monitoring. These strategies ensure that training aligns with labor market demands and supports employability outcomes. Furthermore, public-private partnerships and sector-specific career guidance can enhance the transition of graduates into employment, addressing gaps in both formal and informal labor sectors (Schröder, 2019; Othman, 2019; Pambudi & Harjanto, 2020).

Limitations of the study include uneven study distribution across continents, variations in study quality, and exclusion of non-English publications, but the findings provide a robust foundation for evidence-based policy and system improvements.

Conclusion and suggestions

This meta-analysis highlights the critical role of TVET in enhancing employability and supporting economic development. Labor force participation varies widely across continents, with Asia and Europe showing higher alignment between TVET programs and labor market needs, while Africa faces challenges due to limited funding, policy gaps, and societal perceptions of vocational education (Boateng, 2012; Oketch, 2017; UNESCO, 2022). Effective TVET systems are characterized by strong governance, public-private partnerships, curriculum modernization, ICT integration, and quality assurance, which together improve both technical and employable skills (Schröder, 2019; Hanni, 2019; Maireva et al., 2021).

For the Philippine TVET system, adopting evidence-based strategies can enhance program effectiveness and graduate employability. Key recommendations include:

1. Strengthen management and policy frameworks to ensure TVET programs respond to national and local labor market demands.
2. Expand the National Qualifications Framework (NQF) and Recognition of Prior Learning (RPL) to validate formal and informal skills and improve accessibility for marginalized groups.
3. Involve private-sector partners in curriculum design, apprenticeships, and internships to enhance program relevance.
4. Utilize ICT systems to track graduate outcomes, monitor program quality, and identify skills gaps in real time.
5. Support professional development for instructors and encourage graduates to develop entrepreneurial and lifelong learning skills.
6. Conduct regular program evaluations and longitudinal studies to identify effective strategies and inform continuous improvement.

These measures collectively aim to strengthen the Philippine TVET system, improve labor market integration, and maximize the socioeconomic benefits of vocational education.

New knowledge and the effects on society and communities

Technical and Vocational Education and Training (TVET) plays a critical role in enhancing employability and supporting economic development. However, global disparities exist in labor force participation, policy implementation, and system effectiveness, highlighting the need for cross-continental analysis. Effective policies identified include strong governance, public-private partnerships, competency-based training, recognition of prior learning, and ICT-supported monitoring. For the Philippines, adopting these strategies can improve alignment with labor market needs and enhance graduate employability. The study demonstrates that context-specific policies, systemic interventions, and strategic partnerships are essential for improving TVET outcomes globally and locally. Evidence-based strategies can strengthen the Philippine TVET system, ensure labor market relevance, and promote workforce readiness.

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