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Industry Micro-Credential Infusion in PQF Level 5 Technology Diploma Programs: Opportunities and Challenges

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ABSTRACT: This study examined the integration of industry micro-credentials into the Philippine Qualifications Framework (PQF) Level 5 Technology Diploma Programs implemented by the Technical Education and Skills Development Authority (TESDA) Region VII and selected accredited Technical-Vocational Institutions (TVIs) during Fiscal Year 2025. It specifically assessed the extent of industry micro-credential development based on curriculum integration, alignment with competency standards, industry collaboration, learning delivery systems, and institutional readiness. It also examined the characteristics of micro-credential integration in terms of technology utilization, competency-based learning, stackability and portability, digital credentialing, and quality assurance; identified implementation opportunities and challenges; evaluated effectiveness based on learner competency development, curriculum relevance, employability, industry responsiveness, and program sustainability; determined the relationship between the level of micro-credential integration and its effectiveness; and developed a Technology Infusion Framework for strengthening PQF Level 5 Technology Diploma Programs. The study employed a descriptive-correlational research design involving 200 respondents consisting of TESDA officials, TVET administrators, trainers, curriculum developers, industry partners, graduates, and current learners from TESDA Region VII and selected accredited TVIs. Data were gathered through a validated researcher-developed questionnaire and analyzed using frequency, percentage, weighted mean, standard deviation, and Pearson product-moment correlation. Findings indicated that the development and characteristics of industry micro-credential integration were rated at a high level, while its overall effectiveness was assessed as highly effective. Respondents identified substantial opportunities for curriculum innovation, stronger industry collaboration, workforce responsiveness, employability, and lifelong learning. Nevertheless, moderate implementation challenges were identified concerning policy implementation, faculty capability, technological infrastructure, institutional resources, and industry participation. The study also established a highly significant positive relationship between the level of industry micro-credential integration and its effectiveness, indicating that stronger integration was associated with more effective curriculum implementation and competency-based learning. Based on the findings, a Technology Infusion Framework was developed to guide curriculum enhancement, technology integration, competency-based instruction, digital credentialing, quality assurance, and collaboration among TESDA, accredited TVIs, and industry partners. The framework may support continuous curriculum innovation, improve graduate employability, and promote lifelong learning through responsive and industry-aligned technology diploma programs.

KEYWORDS: Technology Management, Industry Micro-Credentials, Technology Infusion, PQF Level 5, Technology Diploma Programs, Curriculum Enhancement, CTU-Main Campus, Cebu, Philippines

DEFINITION OF TERMS

For consistency and clarity, the following terms are operationally defined according to their use in the study:

Academe–Industry Micro-Credentials. These refer to short, competency-based, and potentially stackable certifications developed or validated collaboratively by educational institutions and industry partners to recognize specific skills aligned with TESDA standards and workforce requirements.

Competency. This refers to the demonstrated capability of a learner or graduate to perform specified tasks or occupational functions in accordance with established standards and performance criteria.

Competency-Based Education (CBE). This refers to an educational approach that emphasizes the attainment and demonstration of defined competencies, allowing learners to progress upon demonstrating the required learning outcomes.

Implementation Status. This approach refers to the extent to which academe–industry micro-credentials are incorporated and operationalized within PQF Level 5 Diploma Programs through curriculum, assessment, industry collaboration, and digital credentialing processes.

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Industry 4.0. Industry 4.0 refers to the fourth industrial revolution characterized by automation, digitalization, artificial intelligence, interconnected systems, and smart technologies requiring continuously updated workforce competencies.

Micro-Credentials. These refer to focused certifications that validate specific knowledge, skills, or competencies and may be combined or accumulated toward broader qualifications such as diplomas or degrees.

Perceptions. These refer to the views, attitudes, and judgments of stakeholders regarding the relevance, effectiveness, usefulness, and potential impact of academe–industry micro-credentials in TVET programs.

PQF Level 5 Diploma Program. This refers to a technical-vocational diploma qualification within the Philippine Qualifications Framework that develops advanced, specialized, and applied competencies and provides potential pathways toward employment and further education.

Stakeholders. These refer to individuals or groups involved in or affected by micro-credential implementation, including administrators, instructors, industry partners, TESDA personnel, learners, and graduates.

Acceptability. This refers to the extent to which stakeholders regard academe–industry micro-credentials as appropriate, useful, satisfactory, and relevant to institutional and industry requirements.

TESDA. This refers to the Technical Education and Skills Development Authority, the Philippine government agency mandated to develop, manage, and supervise technical-vocational education and skills development.

TVET. This refers to technical and vocational education and training, an educational and training system designed to develop practical competencies and occupational skills for employment and workforce development.

Digital Micro-Credential Management System (IDMCMS). This refers to a proposed technology-enabled platform designed to issue, manage, validate, store, monitor, and track micro-credentials digitally to support competency recognition and industry alignment.

Weighted Mean. This refers to a statistical measure used to determine the average response across Likert-scale indicators and to interpret the level of implementation, perceptions, effectiveness, or acceptability.

INTRODUCTION

The rapid transformation of industries through digitalization, automation, artificial intelligence, advanced manufacturing, the Internet of Things, and robotics has increased the demand for adaptable, technology-oriented, and future-ready competencies among TVET learners and workers (TESDA, 2018). In Cebu and neighboring provinces, Technical-Vocational Institutions (TVIs) offering Philippine Qualifications Framework (PQF) Level V Technology Diploma programmes play an important role in preparing learners for employment and further education through competency-based and industry-responsive training (TESDA, 2017; TESDA, 2020). PQF Level V programs may be strengthened through industry micro-credentials that validate specific and current competencies and complement diploma qualifications (OECD, 2023; TESDA, 2025). TESDA has promoted micro-credentialing as a flexible and modular approach that enables learners and workers to obtain recognition for specific skills without necessarily completing an entire qualification (TESDA, 2025).

This study, entitled “Industry Micro-Credential Infusion in PQF Level V Technology Diploma Programs: Opportunities, Challenges, and Implementation Prospects", examines the potential integration of industry-recognized micro-credentials into PQF Level V Technology Diploma programs offered by selected TVIs in Cebu and neighboring provinces. It focuses on their potential contribution to employability, competency recognition, career mobility, industry responsiveness, and readiness for local and international employment, while examining institutional, curricular, technological, financial, assessment, and industry-related challenges (OECD, 2023; OECD, 2024). Micro-credentials are viewed as focused and potentially stackable learning units that certify specific knowledge, skills, values, or competencies (OECD, 2023; CHED, 2025).

Although international and Philippine policies increasingly recognize micro-credentials as mechanisms for lifelong learning, employability, reskilling, and educational progression, empirical evidence concerning their systematic integration into PQF Level V Technology Diploma programmes remains limited (OECD, 2023; CHED, 2025). In particular, further investigation is needed regarding competency mapping, curriculum integration, assessment and certification, trainer qualifications, facilities, technology, costs, quality assurance, industry participation, employer recognition, and credential portability (Moodie & Wheelahan, 2021; OECD, 2024). The study therefore addresses this gap by examining a potential pathway linking PQF Level V diploma → industry micro-credentials → employment and work experience → bachelor's degree → graduate studies, subject to applicable admission, credit-transfer, and institutional policies (TESDA, 2017; TESDA, 2023).

The study may provide evidence for improving the industry responsiveness, employability, flexibility, career mobility, and lifelong-learning opportunities of PQF Level V Technology Diploma programmes. Its findings may assist learners, TVIs, industry partners, TESDA, CHED, and other stakeholders in strengthening curriculum development, competency recognition, industry collaboration, quality assurance, and articulation mechanisms. This direction is consistent with Philippine efforts towards future-ready skills, ladderised education, lifelong learning, and stronger education-to-employment pathways (TESDA, 2023; TESDA, 2025).

LITERATURE REVIEW

The study was anchored on theories and legal frameworks explaining competency development, learner motivation, technology adoption, experiential learning, and competency-based progression in technology-oriented education and training. These perspectives provided the foundation for examining how industry micro-credentials could complement PQF Level V Technology Diploma programs, strengthen employability, and support lifelong learning and educational progression.

Human capital theory explains that investments in education and training enhance productive capacity, employability, and economic value (Becker, 2016). Micro-credentials represent additional investments in specialized and verifiable competencies that respond to changing labor-market requirements (OECD, 2023). The skills investment perspective further emphasizes continuous upskilling and reskilling as

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technologies and occupational requirements evolve (OECD, 2021). Together, these perspectives support the integration of multiple industry-relevant micro-credentials into PQF Level V programs to strengthen employment readiness and career development.

Self-determination theory explains motivation through autonomy, competence, and relatedness, which influence learning engagement and persistence (Ryan & Deci, 2020). In micro-credential programs, learners may exercise autonomy in selecting competencies, develop competence through demonstrated performance, and establish relatedness through interaction with trainers, peers, and industry partners (Miao et al., 2023). The Technology Acceptance Model likewise explains technology adoption through perceived usefulness and ease of use (Davis, 1989; He & Li, 2023). This model is relevant to digital learning platforms, online assessment, electronic certification, and digital badges used in micro-credentialing.

Experiential learning theory emphasizes learning through concrete experience, reflection, conceptualization, and experimentation (Kolb & Kolb, 2017). This aligns with TVET's practical and competency-based orientation, where learners demonstrate skills through authentic workplace and laboratory activities. Competency-based education focuses on demonstrated outcomes rather than time spent in instruction and supports modular, stackable, industry-relevant credentials (Klein-Collins & Shafenberg, 2023; Lim et al., 2025).

The study was further supported by Republic Acts No. 10968, 10647, and 7796. RA 10968 institutionalized the PQF and promoted qualifications, pathways, and equivalencies. RA 10647 strengthened ladderized education and progression between TVET and higher education. RA 7796 established TESDA and emphasized relevant, accessible, quality, and industry-responsive technical education and skills development. Collectively, these frameworks support an education-to-employment-to-further-education pathway involving PQF Level V diplomas, industry micro-credentials, workplace experience, and subsequent degree progression.

OBJECTIVES

The study aimed to:

1. Identify the relevant and acceptable industry micro-credentials that could be integrated into the identified PQF Level V Technology Diploma Programs.
2. Determine the perceived potential of incorporating industry micro-credentials into PQF Level V Technology Diploma Programs.
3. Examine the challenges associated with the adoption and integration of industry micro-credentials into the identified programs.
4. Assess the readiness of Technical-Vocational Institutions (TVIs) to implement industry micro-credentials.
5. Determine whether significant differences existed in the respondents' assessments of the opportunities, challenges, implementation prospects, and institutional readiness concerning the integration of industry micro-credentials.

MATERIALS AND METHODS

Design

The study employed a descriptive-correlational research design to examine the opportunities, challenges, and implementation prospects of industry micro-credential infusion in PQF Level V Technology Diploma Programs. The descriptive component was used to determine and describe the profiles of the selected Technical-Vocational Institutions (TVIs), the relevant industry micro-credentials, their perceived potential for integration, the challenges encountered, and the institutions' readiness to implement micro-credentialing. The correlational component was used to determine whether significant relationships existed among the major variables examined in the study and to provide an empirical basis for the development of an implementation framework. The design was appropriate because the study sought to describe existing conditions and determine relationships among variables without manipulating the respondents or the educational environment. The study specifically examined curriculum integration, competency standards alignment, industry collaboration, learning delivery systems, institutional readiness, competency development, employability, industry responsiveness, and program sustainability as related dimensions of industry micro-credential infusion.

Environment

The study was conducted among selected Technical-Vocational Institutions (TVIs) offering PQF Level V Technology Diploma Programs in TESDA Region VII, particularly in Cebu and neighboring areas. The locale was selected because Region VII was identified as a relevant setting for examining micro-credentialing, technology-oriented TVET, and industry-responsive training. The participating institutions represented the context in which PQF Level V Technology Diploma Programs were implemented and where industry-related competencies and credentials could potentially be integrated into existing curricula. The study therefore considered the institutional, technological, curricular, and industry environments surrounding the delivery of technology diploma programs in the region. The manuscript identified TESDA Region VII and selected accredited TVIs as the principal institutional setting of the investigation.

Respondents

The respondents of the study were composed of 200 stakeholders representing different sectors involved in PQF Level V Technology Diploma Programs. They included academe and industry representatives, government representatives, TVET graduates, and current TVET learners. Their participation provided varied perspectives on the relevance, potential integration, opportunities, challenges, and implementation readiness associated with industry micro-credentials in technology diploma programs. The distribution of respondents is presented in the succeeding table.

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Table 1. Distribution of Respondents
N = 200

Stakeholder Group	Frequency (f)	Percentage (%)
Academe and Industry Representatives (TVET Administrators, Trainers/Instructors, Curriculum Developers, Industry Partners/Supervisors, Human Resource Managers)	40	20
Government Representatives (TESDA Officials/Personnel, Trainers, Assessors)	20	10
TVET Graduates, Current TVET Learners	140	70
Total	**200**	**100**

Sampling Procedure

The study employed a purposive sampling approach in identifying respondents who possessed relevant knowledge and experience concerning PQF Level V Technology Diploma Programs and industry-related competencies. The selection focused on individuals who could provide informed assessments of the study variables based on their institutional, instructional, industry, graduate, or learner experiences.

The sampling process began with the identification of selected accredited TVIs offering PQF Level V Technology Diploma Programs in TESDA Region VII. Eligible stakeholder groups were then identified within the participating institutions and industry organizations. Respondents were invited to participate based on their involvement with the programs, their familiarity with competency-based education and training, and their capacity to assess the potential integration of industry micro-credentials. A total of 200 respondents participated in the study.

Instrument

The validated researcher-made questionnaire had a significant impact on the study because it provided a systematic and comprehensive means of gathering quantitative evidence on the integration of industry micro-credentials into PQF Level V Technology Diploma Programs. By covering institutional profiles, the relevance and acceptability of micro-credentials, their potential contributions to competency development and employment, implementation challenges, and institutional readiness, the instrument enabled the researcher to obtain stakeholder-based information that could support evidence-informed analysis and decision-making. Its structured sections also ensured that the collected data were directly aligned with the research objectives, particularly in assessing industry responsiveness, competency standards alignment, technological relevance, employability, stackability, curriculum integration, assessment capability, industry collaboration, and administrative support. Consequently, the instrument served as an important basis for identifying implementation requirements and developing an appropriate framework for strengthening industry micro-credential integration in PQF Level V Technology Diploma Programs.

Data Gathering Procedure

The data-gathering process began with the preparation and validation of the researcher-made questionnaire. After the instrument had been finalized, the researcher coordinated with the concerned offices, institutions, and stakeholders to facilitate the administration of the survey. Permission to conduct the study was secured from the appropriate authorities of the participating institutions and organizations.

The respondents were informed of the purpose of the study and the nature of their participation. The researcher explained the instructions for completing the questionnaire and emphasized that the information provided would be used solely for research purposes. The questionnaires were distributed to the identified respondents through appropriate administration procedures. Completed questionnaires were collected, checked for completeness, organized, encoded, and prepared for statistical analysis.

Data collection focused on obtaining stakeholder assessments of the opportunities, challenges, implementation prospects, and institutional readiness associated with industry micro-credential integration. The collected data were subsequently tabulated and statistically analyzed in accordance with the objectives of the study.

Ethical Considerations

Ethical principles were observed throughout the conduct of the study. Participation of the respondents was voluntary, and respondents were informed about the purpose and general procedures of the research before answering the questionnaire. They were given the opportunity to participate freely and were not compelled to provide information against their preference.

RESULT AND DISCUSSIONS

The geographic mapping of key Technical-Vocational Institutions (TVIs) across Region VII—including urban industrial hubs like CITE, Inc. and TESDA Region VII in Cebu City, maritime and manufacturing centers like BEST, Inc. in Balamban, and rural-island institutions like North Coast Bohol Institute, Inc.—underscores the essential role of localized socio-economic context in implementing PQF Level V Technology Diploma Programs. Grounded in spatial and institutional readiness frameworks in technical education (Albright & Alvarez, 2021; TESDA, 2023), this distribution demonstrates that successful micro-credential integration depends heavily on geographic access to industrial clusters and regional labor markets. While urban and industrialized centers benefit from proximity to tech sectors and established public-private partnerships (e.g., CITE Technical Institute, Inc., 2026), island and rural providers face distinct infrastructural and connectivity challenges that require targeted policy intervention, flexible digital delivery, and decentralized resource allocation under Republic Act 7796. Consequently, regional TVET administrators and TESDA policymakers must craft equitable implementation strategies that account for geographic disparities, ensuring that micro-credential infusion delivers uniform quality assurance, stackable learning pathways, and accessible career progression across both urban hubs and geographically isolated island institutions in Central Visayas.

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The integration of industry micro-credentials into Philippine Qualifications Framework (PQF) Level V Technology Diploma Programs directly operationalizes foundational human capital and competency-based education theories (Becker, 2016; Klein-Collins & Shafenberg, 2023) alongside Philippine legislative mandates—specifically Republic Acts 10968 (PQF Act), 10647 (Ladderized Education Act), and 7796 (TESDA Act)—by establishing stackable, labor-market-responsive learning pathways that bridge technical-vocational education with higher education and dynamic industry demands. Guided by Self-Determination Theory and the Technology Acceptance Model (Davis, 1989; Ryan & Deci, 2020), this framework emphasizes that while micro-credentials enhance student motivation, digital adoption, and immediate employability, successful execution hinges on overcoming critical institutional barriers across Technical-Vocational Institutions (TVIs), including curriculum misalignment, resource deficits, and varying levels of organizational readiness. Consequently, educational administrators and TESDA policymakers must establish standardized qualification alignment matrixes, invest in digital platform infrastructure, and forge robust public-private industry partnerships to ensure that micro-credential infusion yields equitable, quality-assured career progression and lifelong learning pathways without overloading academic programs.

The distribution of respondents indicated that the study was predominantly represented by TVET graduates and current TVET learners, who comprised 140 respondents, or 70% of the total sample, while academe and industry representatives accounted for 40 respondents, or 20%, and government representatives accounted for 20 respondents, or 10%. This distribution implied that the findings were strongly informed by the experiences and perceptions of learners and graduates while still incorporating the perspectives of institutions, industry, and government stakeholders involved in technical-vocational education and training. The inclusion of trainers, curriculum developers, industry partners, supervisors, human resource managers, TESDA officials, assessors, graduates, and current learners provided a broader stakeholder perspective on the relevance and potential implementation of industry micro-credentials in PQF Level V Technology Diploma Programs. This stakeholder representation was consistent with the literature emphasizing that micro-credentials require alignment among learners, education and training providers, industry, and policy institutions to ensure relevance, quality, recognition, and employability. The OECD (2023) emphasized that micro-credentials can support lifelong learning, employability, and labor-market participation when they respond to learner and workforce needs, while TESDA (2025) highlighted industry collaboration and competency recognition in its micro-credentialing initiative. Similarly, the study's literature review emphasized that industry participation is important in ensuring that micro-credentials correspond to current and emerging labor-market requirements. Thus, the composition of respondents provided perspectives from the principal groups who could assess both the learner-level relevance and the institutional, industry, and policy requirements for integrating industry micro-credentials into PQF Level V Technology Diploma Programs.

The findings showed that the infusion of industry micro-credentials into PQF Level 5 Technology Diploma Programs was **highly developed,** with an overall mean of **4.12**, a percentage of **82.43%**, and a standard deviation of **0.91**. Among the dimensions, **competency-based learning** obtained the highest mean of **4.16**, followed by **competency standards alignment** at **4.16**, while the learning **delivery system** and **institutional readiness** obtained the lowest mean of **4.08**. All dimensions were interpreted as **highly developed,** indicating a consistently high level of micro-credential integration across curriculum, competency alignment, industry collaboration, learning delivery, institutional support, technology, credentialing, and quality assurance.

The findings in Table 3 revealed that the level of industry micro-credential infusion was highly developed, with an overall mean of 4.13, equivalent to 82.68%, and a standard deviation of 0.91. Among the indicators, quality assurance mechanisms that ensured the credibility and integrity of industry micro-credentials obtained the highest mean of 4.15 (83.00%), indicating that respondents strongly recognized the importance of reliable quality assurance systems in maintaining the validity of credentials. Competency assessment procedures complying with TESDA and industry quality standards followed with a mean of 4.14 (82.80%), while continuous monitoring and evaluation and institutional policies and quality management systems both obtained 4.13 (82.60%). Quality assurance practices supporting continuous curriculum enhancement received the lowest mean of 4.12 (82.40%), although it remained highly developed. The relatively low standard deviations ranging from 0.90 to 0.91 indicated consistent responses among the 200 respondents. The findings implied that selected TVIs had established a strong foundation for integrating industry micro-credentials, particularly in quality assurance, competency assessment, monitoring, curriculum improvement, and compliance with PQF and TESDA requirements. These results were consistent with the OECD (2023), which emphasized that credible micro-credential systems require clear quality assurance, assessment, recognition, and transparency mechanisms. Similarly, Moodie and Wheelahan (2021) stressed that quality standards and reliable credentialing processes were essential to ensure that micro-credentials were meaningful within education and employment systems. TESDA (2025) likewise emphasized industry alignment, competency recognition, and quality assurance in the development of micro-credentialing initiatives. The findings therefore suggested that sustained quality management and continuous program improvement were important conditions for ensuring that industry micro-credentials remained credible, relevant, and responsive to changing workforce requirements.

The findings implied that policy clarity, consistency, national support, and monitoring mechanisms remained areas requiring strengthening to ensure coherent micro-credential implementation. UNESCO (2022) emphasized the importance of clear recognition, quality assurance, and policy frameworks for flexible learning and micro-credentials.

The result implied a need for continuous faculty development, particularly in micro-credential design, digital learning, competency assessment, and industry collaboration. The ILO (2023) highlighted the importance of continuous skills development and instructor capacity in responding to changing occupational requirements.

The findings indicated that digital platforms, connectivity, learning management systems, ICT facilities, and technical support required further improvement. UNESCO (2022) noted that adequate digital infrastructure and interoperable systems are important for effective implementation and recognition of micro-credentials.

The result suggested that adequate funding, learning resources, facilities, administrative support, and sustainable budget allocation were necessary to support implementation. The World Bank (2023) emphasized that investments in institutional capacity, technology, and learning resources are essential for strengthening skills-development systems.

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The findings implied that stronger and more sustained industry participation was needed in curriculum development, competency assessment, workplace learning, and curriculum enhancement. The ILO (2023) emphasized the value of employer engagement and stronger links between education and the world of work in developing relevant skills.

Overall, the findings indicated that implementing industry micro-credential infusion remained challenging, particularly in policy implementation, faculty capability, technological infrastructure, institutional resources, and industry participation. The results implied the need for coordinated policy support, continuous faculty training, improved digital infrastructure, adequate institutional resources, and stronger industry partnerships. These requirements were consistent with UNESCO (2022) and ILO (2023), which emphasized quality assurance, flexible learning systems, digital capacity, lifelong learning, and meaningful employer engagement as important conditions for effective micro-credential and skills-development initiatives.

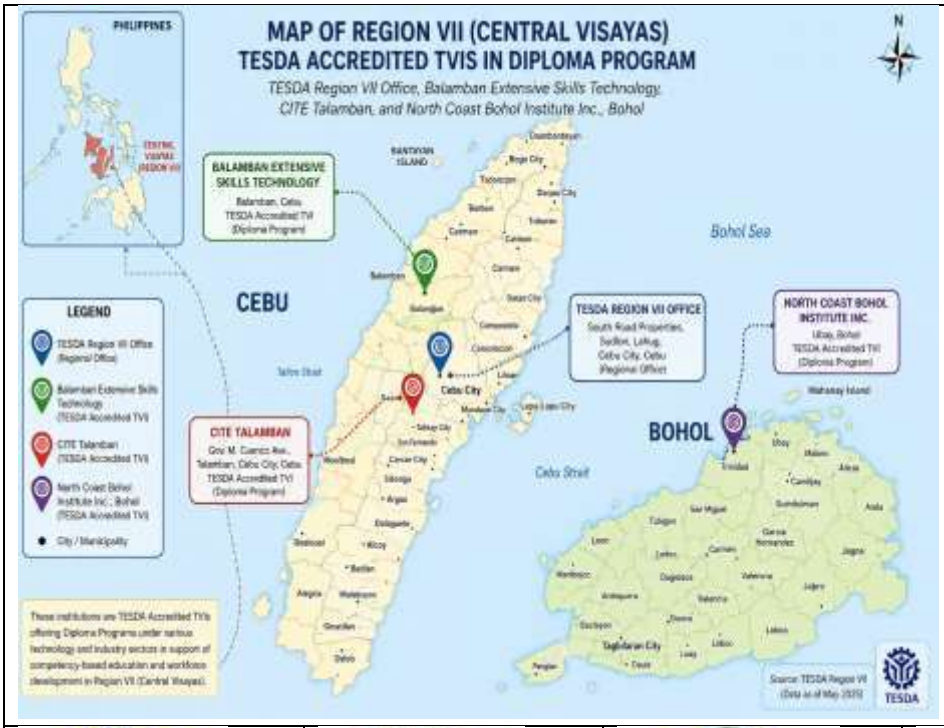
The findings indicated that the infusion of industry micro-credentials into PQF Level 5 Technology Diploma Programs was **highly effective,** with an overall mean of **4.14**, equivalent to **82.86%**, and a standard deviation of **0.90**. Learner competency development obtained the highest mean of **4.15**, suggesting that micro-credentials substantially supported the development of technical competencies, practical workplace skills, competency achievement, continuous learning, and confidence in performing industry-related tasks. Curriculum Relevance, Employability, Industry Responsiveness, and Program Sustainability also obtained consistently high means of **4.14**, indicating that micro-credentials contributed to aligning curriculum content with industry needs, strengthening employment-related competencies, responding to changing workplace requirements, and supporting the continuity and relevance of diploma programs. The relatively low standard deviation of **0.90** suggested that the respondents' assessments were generally consistent. These findings implied that integrating industry-recognized micro-credentials could provide a flexible mechanism for strengthening competency-based technical education and connecting learning outcomes with current labor-market expectations. This interpretation was consistent with the **UNESCO (2022)** emphasis on flexible and lifelong learning pathways, the **ILO (2023)** recognition of skills development and industry-relevant training as important mechanisms for improving employability, and the **World Economic Forum (2023)** observation that rapidly changing technologies require workers to continuously acquire and update skills. In the Philippine context, the findings were also aligned with the **Philippine Qualifications Framework (RA 10968)** and competency-based technical-vocational education principles, which emphasize clearly defined learning outcomes and qualifications that are relevant to industry and employment. Overall, the results suggested that industry micro-credential infusion could strengthen learner competencies, curriculum responsiveness, employability, industry alignment, and program sustainability when supported by appropriate institutional policies, industry collaboration, continuous evaluation, and quality assurance mechanisms.

The findings in Table 5 showed that the level of effectiveness of industry micro-credential infusion into PQF Level 5 Technology Diploma Programs was Highly Effective, with an overall mean of 4.14, equivalent to 82.86%, and a standard deviation of 0.90. Learner Competency Development obtained the highest mean of 4.15 (83.00%), indicating that micro-credential infusion effectively strengthened learners' acquisition and demonstration of relevant competencies. Curriculum Relevance, Employability, Industry Responsiveness, and Program Sustainability each obtained a mean of 4.14, with percentage ratings ranging from 82.80% to 82.88%, demonstrating consistently high perceived effectiveness across all dimensions. The uniform standard deviation of 0.90 suggested relatively consistent assessments among respondents. The findings implied that integrating industry micro-credentials could enhance the capacity of PQF Level 5 Technology Diploma Programs to develop job-relevant competencies, maintain curriculum alignment with industry needs, improve employment preparation, strengthen industry responsiveness, and support program sustainability. These findings were consistent with OECD (2023), which emphasized that micro-credentials can support targeted skills development, employability, and lifelong learning when appropriately designed and quality assured. OECD (2024) likewise highlighted the potential of micro-credentials to respond to changing labor-market requirements by providing flexible opportunities for upskilling and reskilling. Ahsan et al. (2023) further noted that micro-credentials can provide focused, verifiable learning outcomes that complement formal qualifications and strengthen learners' professional capabilities. Similarly, TESDA (2025) emphasized the role of micro-credentialing in providing flexible, modular, and industry-responsive skills development. Thus, the highly effective rating across all dimensions suggested that industry micro-credential infusion could serve as a practical mechanism for strengthening the relevance, competency orientation, employability focus, and sustainability of PQF Level 5 Technology Diploma Programs.

The findings indicated that the infusion of industry micro-credentials into PQF Level 5 Technology Diploma Programs was **Highly Effective**, with an overall mean of **4.14**, equivalent to **82.86%**, and a standard deviation of **0.90**. Learner Competency Development obtained the highest mean of **4.15**, suggesting that micro-credentials substantially supported the development of technical competencies, practical workplace skills, competency achievement, continuous learning, and confidence in performing industry-related tasks. Curriculum Relevance, Employability, Industry Responsiveness, and Program Sustainability also obtained consistently high means of **4.14**, indicating that micro-credentials contributed to aligning curriculum content with industry needs, strengthening employment-related competencies, responding to changing workplace requirements, and supporting the continuity and relevance of diploma programs. The relatively low standard deviation of **0.90** suggested that the respondents' assessments were generally consistent. These findings implied that integrating industry-recognized micro-credentials could provide a flexible mechanism for strengthening competency-based technical education and connecting learning outcomes with current labor-market expectations. This interpretation was consistent with the **UNESCO (2022)** emphasis on flexible and lifelong learning pathways, the **ILO (2023)** recognition of skills development and industry-relevant training as important mechanisms for improving employability, and the **World Economic Forum (2023)** observation that rapidly changing technologies require workers to continuously acquire and update skills. In the Philippine context, the findings were also aligned with the **Philippine Qualifications Framework (RA 10968)** and competency-based technical-vocational education principles, which emphasize clearly defined learning outcomes and qualifications that are relevant to industry and employment. Overall, the results suggested that industry micro-credential infusion could strengthen learner competencies, curriculum responsiveness, employability, industry alignment, and program sustainability when supported by appropriate institutional policies, industry collaboration, continuous evaluation, and quality assurance mechanisms.

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FIGURES AND TABLES



TESDA Reion VII **Cebu City**	**BEST, Inc** **Balamban, Cebu**	**CITE, Inc** **Cebu City**	**North Coast Bohol Institute Inc** **Island of Bohol**

Figure 1. Location Map of Research Environment

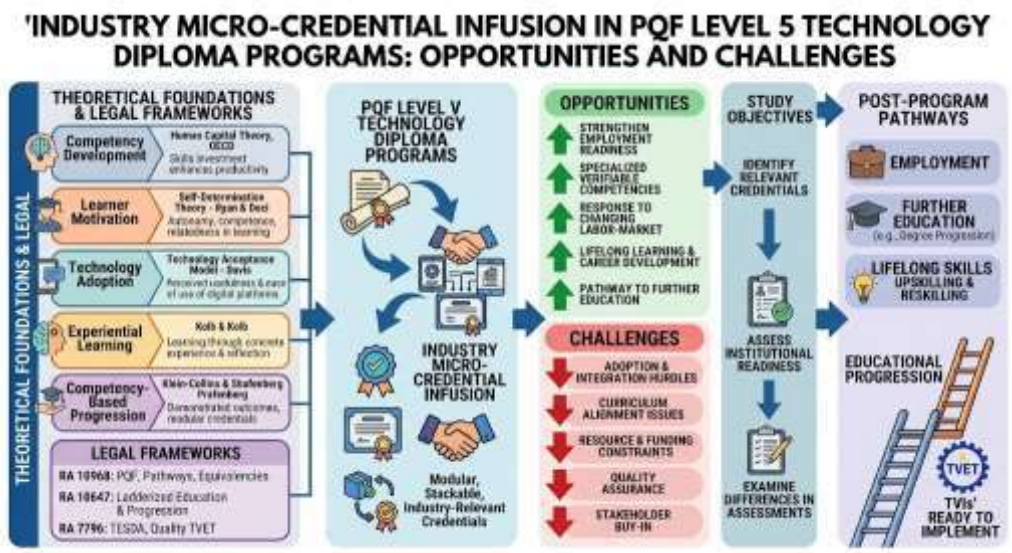


Figure 2. Conceptual Model

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Table 2. Level of Development of Industry Micro-Credential Infusion into PQF Level 5 Technology Diploma Programs
N=200

Dimension	Mean	Percentage (%)	SD	Interpretation
Curriculum Integration	4.15	83.08	0.90	Highly Developed
Competency Standards Alignment	4.16	83.12	0.90	Highly Developed
Industry Collaboration	4.10	82.00	0.92	Highly Developed
Learning Delivery System	4.08	81.52	0.93	Highly Developed
Institutional Readiness	4.08	81.60	0.93	Highly Developed
Technology Integration	4.13	82.52	0.91	Highly Developed
Competency-Based Learning	4.16	83.28	0.90	Highly Developed
Stackability and Portability	4.12	82.32	0.91	Highly Developed
Digital Credentialing	4.12	82.32	0.91	Highly Developed
Quality Assurance	4.13	82.52	0.91	Highly Developed
Overall Mean	**4.12**	**82.43**	**0.91**	**Highly Developed**

Table 3. Level Of Industry Micro-Credential Infusion
N = 200

Characteristics	5	4	3	2	1	Mean	Percentage (%)	SD	Interpretation
Quality assurance mechanisms ensure the credibility and integrity of industry micro-credentials.	88	69	30	10	3	4.15	83.00	0.90	Highly Developed
Competency assessment procedures comply with TESDA and industry quality standards.	87	70	30	10	3	4.14	82.80	0.90	Highly Developed
Continuous monitoring and evaluation improve the implementation of industry micro-credentials.	85	71	31	10	3	4.13	82.60	0.91	Highly Developed
Quality assurance practices support continuous curriculum enhancement and program improvement.	84	72	31	10	3	4.12	82.40	0.91	Highly Developed
Institutional policies and quality management systems ensure compliance with PQF and TESDA standards.	86	70	31	10	3	4.13	82.60	0.91	Highly Developed
Overall Mean						**4.13**	**82.68**	**0.91**	**Highly Developed**

Table 4. Challenges Encountered in Implementing Industry Micro-Credential Infusion
N=200

Challenge Dimensions	Overall Mean	Percentage (%)	SD	Interpretation
Policy Implementation	3.59	71.72	1.11	Challenging
Faculty Capability	3.59	71.88	1.10	Challenging
Technological Infrastructure	3.58	71.64	1.11	Challenging
Institutional Resources	3.59	71.72	1.11	Challenging
Industry Participation	3.59	71.88	1.10	Challenging
Overall	3.59	71.77	1.11	Challenging

Table 5. Level of Effectiveness of Industry Micro-Credential Infusion into PQF Level 5 Technology Diploma Programs

Dimensions	Overall Mean	Percentage (%)	SD	Interpretation
Learner Competency Development	4.15	83.00	0.90	Highly Effective
Curriculum Relevance	4.14	82.80	0.90	Highly Effective
Employability	4.14	82.88	0.90	Highly Effective
Industry Responsiveness	4.14	82.84	0.90	Highly Effective
Program Sustainability	4.14	82.80	0.90	Highly Effective
Overall	**4.14**	**82.86**	**0.90**	**Highly Effective**

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Table 6. Significant Relationship Between the Level of Industry Micro-Credential Infusion and the Effectiveness of Its Integration into PQF Level 5
Technology Diploma Programs
N = 200

Variables	Pearson Correlation Coefficient (r)	p-value	Decision	Interpretation
Development of Industry Micro-Credential Infusion × Effectiveness of Integration	0.812	0.000	Reject Ho	Significant Positive Relationship
Characteristics of Industry Micro-Credential Infusion × Effectiveness of Integration	0.845	0.000	Reject Ho	Significant Positive Relationship
Opportunities for Industry Micro-Credential Infusion × Effectiveness of Integration	0.791	0.000	Reject Ho	Significant Positive Relationship
Challenges Encountered × Effectiveness of Integration	-0.653	0.000	Reject Ho	Significant Negative Relationship
Overall Level of Industry Micro-Credential Infusion × Overall Effectiveness of Integration	0.864	0.000	Reject Ho	Highly Significant Positive Relationship

CONCLUSIONS

Based on the findings, the study concluded that the infusion of industry micro-credentials into PQF Level 5 Technology Diploma Programs was **Highly Developed and Highly Effective** in TESDA Region VII and selected accredited TVIs. The integration strengthened curriculum relevance, learner competency development, employability, industry responsiveness, and program sustainability. The findings further indicated that technology integration, competency-based learning, stackability and portability, digital credentialing, quality assurance, and institutional readiness contributed to effective micro-credential implementation. Although moderate challenges were identified in policy implementation, faculty capability, technological infrastructure, institutional resources, and industry participation, these areas could be addressed through continuous institutional improvement and stronger stakeholder collaboration. The significant positive relationship between the level of micro-credential infusion and its effectiveness confirmed that greater development of curriculum integration, competency alignment, technology utilization, quality assurance, and industry collaboration was associated with more effective implementation. Consequently, the developed Technology Infusion Framework provided a practical basis for strengthening the integration of industry micro-credentials and promoting responsive, competency-based, and industry-oriented PQF Level 5 Technology Diploma Programs.

RECOMMENDATIONS

1. **TESDA Region VII** should strengthen policies, guidelines, quality assurance mechanisms, competency standards, and digital credentialing systems supporting industry micro-credential implementation.
2. **Accredited TVIs** should continuously enhance PQF Level 5 curricula by systematically mapping relevant industry micro-credentials with program outcomes, competency standards, and industry requirements.
3. **TVI administrators** should provide adequate funding, facilities, digital infrastructure, learning resources, and institutional support to sustain micro-credential implementation.
4. **Industry partners** should actively participate in curriculum development, competency validation, workplace learning, assessment, certification, and periodic review of micro-credential offerings.
5. **Trainers and faculty members** should undertake continuous professional development, industry immersion, technology training, and competency-based assessment activities to maintain current industry competencies.
6. **Learners and graduates** should be encouraged to pursue relevant industry micro-credentials to complement their diploma qualifications, strengthen employability, and support continuing professional development.
7. **Future researchers** should validate and refine the Technology Infusion Framework through studies involving other TESDA regions, TVIs, higher education institutions, industries, and larger populations, while examining additional variables affecting micro-credential implementation and outcomes.

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