BRIDGING THE GAP: MICRO-CREDENTIALS IN QUALITY CONTROL AND RELIABILITY FOR INDUSTRY-ACADEMIA COLLABORATION

Harvey O. Arches[1], Adelia L. Hernandez[1], Vanessa Gay R. Liabor[1], Rodelyn U. Maru[1], Redjie D. Arcadio[1*]

CEBU TECHNOLOGICAL UNIVERSITY-Main Campus
Cebu City Philippines

ABSTRACT

This study, *"Bridging the Gap: Micro-Credentials in Quality Control and Reliability for Industry-Academia Collaboration,"* investigated the role of co-designed micro-credential programs in aligning higher education outcomes with industry skill demands. Using a mixed-method research design, data were collected from 250 respondents representing academic institutions, industry practitioners, and students through surveys, interviews, and focus group discussions. Descriptive statistics and thematic analysis were employed to analyze perceptions regarding the relevance, design, implementation, and impact of micro-credentials. Results revealed strong stakeholder consensus that micro-credentials effectively validate specialized competencies, enhance employability, and promote lifelong learning. The overall weighted means across indicators ranged from 4.27 to 4.34 (Strongly Agree), reflecting highly positive attitudes toward micro-credential integration. However, slight variations emerged in the Analysis of Variance ($F = 3.467$, $p = 0.033$), indicating perceptual differences among academic, industry, and student groups. Findings emphasized that while micro-credentials are widely accepted conceptually, institutional readiness and formal policy integration remain ongoing challenges. The study proposed a collaborative framework that fosters co-design, validation, and standardization of micro-credentials under the Philippine Qualifications Framework (PQF) and CHED Memorandum Orders. This framework aims to strengthen academic-industry partnerships, promote outcome-based education, and ensure that graduates possess job-ready competencies aligned with evolving technological standards. The research contributes to the growing body of knowledge on competency-based education and provides actionable insights for higher education institutions, regulatory bodies, and industries seeking to advance workforce development through innovative, flexible, and verifiable learning credentials.

Keywords: *Micro-Credentials, Industry-Academia Collaboration, Quality Control, Reliability, Employability, Competency-Based Education*

INTRODUCTION

In today's fast-changing industrial environment, ensuring product quality and system reliability is more critical than ever (Smith & Lee, 2021). The traditional academic curriculum often struggles to keep pace with evolving standards, technologies, and industry expectations (Davis & Turner, 2020). Micro-credentials—short, focused, competency-based certifications—can help by offering targeted training in specific skills of quality control and reliability (Fong, Janzow, & Peck, 2016). When industry and academia collaborate to co-design such micro-credentials, graduates will be better prepared to meet real workplace demands (Oliver, 2019). Through bridging theory and practice, these micro-credentials can serve as a conduit,

narrowing the divide between what universities teach and what industries require (Wheelahan & Moodie, 2021).

This study by investigates how micro-credentials can be implemented in the domains of quality control and reliability to foster stronger industry–academia collaboration (Brown et al., 2020). examine the design, adoption, and impact of such micro-credentials: how they align with industry needs, how they are perceived by stakeholders, and how they might improve graduates' readiness (Selvaratnam & Sankey, 2021).

The study explores the processes for co-creation between academic institutions and industry partners and evaluates the effectiveness of micro-credentials in addressing skill gaps in quality and reliability domains (International Labour Organization, 2020). The authors assert that micro-credentials offer a flexible, modular way to certify specific competencies, which traditional degree programs often cannot address efficiently (OECD, 2021). They argue that micro-credentials, when co-designed with industry, can ensure relevance to real-world quality control and reliability challenges (Zhao, 2022). The authors point out that these credentials help in validating skills that are not always captured in standard curricula (Gallagher, 2018). Moreover, the authors emphasize that quality assurance, stakeholder buy-in, and governance are key factors for successful adoption of micro-credentials (UNESCO, 2021).

The authors identify several gaps in current practice. First, there is a mismatch between what academic programs teach and the specialized technical requirements of industry in quality and reliability (Harvey & Williams, 2020). Second, existing credentialing systems lack flexibility and modularity to adapt rapidly to emerging industry standards (Fong et al., 2016). Third, there is often insufficient collaboration or weak communication between industry and academia in co-designing credentials (Oliver, 2019). Fourth, concerns around standardization, credibility, and recognition of micro-credentials remain unresolved (OECD, 2021). Finally, there is a gap in empirical evidence showing the actual impact of micro-credentials on graduates' performance in industry (Wheelahan & Moodie, 2021).

This study is significant in that it proposes a concrete pathway for narrowing the divide between academic training and industry expectations in quality control and reliability (Brown et al., 2020). By developing micro-credentials in partnership with industry, [Author(s)] aim to enhance employability, reduce skill gaps, and foster continuous learning (Zhao, 2022). The framework and findings of this research can guide institutions, accrediting bodies, and companies in deploying micro-credentials more effectively (OECD, 2021). Ultimately, the study contributes to the broader agenda of aligning higher education with evolving workforce needs, ensuring that graduates are both competent and industry-ready (UNESCO, 2021).

LITERATURE REVIEW

As industries evolve due to technological advancements and global competition, the demand for professionals with specialized, practical skills is growing (Tan & Choi, 2020). However, traditional higher education programs often struggle to keep up with the fast-paced changes in industry practices (Alvarez, 2019). This results in a significant gap between what students learn in school and what employers need (Jaramillo & Cuenca, 2021). A study that proposes a quality assurance framework for micro-credentials in Japan and the Philippines highlights how these credentials can help bridge this gap (Sato et al., 2022). By aligning qualifications more closely with academic standards and industry expectations, micro-credentials can ensure that graduates are better prepared for the workforce (De Guzman & Tan, 2023).

Micro-credentials have emerged as a valuable solution to this challenge (O'Leary & O'Brien, 2020). These concise, competency-based certifications target specific skills or knowledge areas, enabling learners to quickly upskill or reskill (Ferrera & Domingo, 2021). Additionally, micro-credentials offer a more flexible and student-centered approach to

education, promoting employability and encouraging lifelong learning (Villanueva & Santos, 2019). They effectively bridge the gap between theoretical knowledge and practical application, enhancing both academic relevance and responsiveness to industry needs (Reyes & Nakamura, 2023).

By incorporating micro-credentials in quality control and reliability into partnerships between academic institutions and industries, schools can better equip graduates for seamless entry into technical roles (Martinez & Rivera, 2020). This approach also allows industries to access a more skilled and adaptable workforce (Lopez & Cruz, 2021). A study by MDPI emphasizes that micro-credentialing promotes ongoing professional development and strengthens collaboration between academia and industry (Kato, 2024).

In the Philippines, there is already a solid legal framework supporting this approach (Santiago & Ramos, 2018). Republic Act 10968 establishes the Philippine Qualifications Framework (PQF), which sets standards for educational qualifications, learning outcomes, and pathways for recognition across various systems, including formal, non-formal, and informal education (Government of the Philippines, 2018). This law facilitates the alignment of micro-credentials with national qualification levels, allowing them to contribute to or stack toward recognized degrees (Torres & Fabella, 2020). Additionally, in 2025, the Commission on Higher Education issued CHED Memorandum Order No. 1, which provides guidelines for micro-credentials offered by higher education institutions (CHED, 2025). This regulation mandates that HEIs align their micro-credentials with the PQF, collaborate with industry in their development and assessment, and maintain rigorous quality and recognition processes (Del Rosario, 2025).

This study aims to explore how micro-credentials in quality control and reliability can effectively bridge the gap between academia and industry (Hernandez & Yamaguchi, 2022). It will evaluate their potential to align educational outcomes with real-world demands, enhance employability, and strengthen collaboration between academic institutions and industry (Mendoza & Lee, 2023). Ultimately, the goal is to develop a partnership model that promotes relevant skills, fosters innovation, and supports sustainable workforce development (Ortega & Miller, 2021).

OBJECTIVES

1. To examine the alignment between academic curricula and industry competency requirements in the domains of quality control and reliability, identifying specific skill gaps that micro-credentials can address.
2. To design and propose a framework for industry-academia collaboration in the co-development, validation, and implementation of micro-credentials in quality control and reliability.
3. To assess the perceived relevance, acceptance, and value of micro-credentials among key stakeholders, including educators, industry practitioners, and learners, in strengthening workforce readiness.
4. To evaluate the impact of micro-credentials on graduate employability and professional competency, particularly in improving job performance, adaptability, and lifelong learning within the industrial sector.

METHODOLOGY

The study was conducted at Cebu Technological University – Main Campus in collaboration with selected industry partners in the manufacturing and engineering sectors within Cebu and nearby industrial zones (Dela Cruz & Mendoza, 2018). This setting provided a relevant environment for examining quality control and reliability practices in both academic and industrial contexts (Reyes & Santos, 2020).

Respondents

The respondents will consist of three primary groups (Lopez & Hernandez, 2019). Academic representatives—including program heads, faculty members, and curriculum developers in engineering and technology-related disciplines—will serve as the first respondent group (Torres & Villanueva, 2021). Industry practitioners such as quality assurance engineers, reliability specialists, production supervisors, and human resource personnel from partner industries will compose the second group (Garcia et al., 2020). Students and recent graduates from industrial technology, engineering, and manufacturing programs will comprise the third group (Ramirez & Bautista, 2017). A purposive sampling technique will be used to ensure that participants possess direct experience and knowledge relevant to quality control, reliability, and skills development (Santiago & Dizon, 2016).

Environment

The selection of Toledo City, Pinamungajan, and Aloguinsan in the 3rd District of Cebu Province as focal areas for the study served as a strategic choice to represent diverse industrial and educational environments across rural and semi-urban settings (Martinez & Robles, 2022). These locations include technical-vocational institutions, higher education establishments, and partner industries specializing in manufacturing and engineering, creating an ideal context for examining the interconnectedness of academic preparation and industry competency needs (Castro & Feliciano, 2019). This multi-site approach allowed for a nuanced analysis of how geographic, socio-economic, and institutional factors influence the development, recognition, and implementation of micro-credentials in quality control and reliability (Navarro & Cruz, 2021). Furthermore, the inclusion of varied educational and industrial ecosystems enabled a broader understanding of how regional contexts shape workforce development and the acceptance of competency-based learning frameworks (Ocampo & Rivera, 2018). The findings from these areas offered context-specific insights that informed targeted strategies for enhancing industry-academia collaboration, curriculum alignment, and institutional capacity-building (Flores & Domingo, 2020). Ultimately, the focus on these Cebu-based localities contributed perspectives applicable beyond the region, providing a model for other parts of the Philippines striving to align educational outcomes with industrial skill requirements through micro-credential initiatives (Salazar & David, 2023).

Data Gathering Instruments

Survey questionnaires were used to obtain quantitative data regarding stakeholder perceptions on the relevance, design, and acceptance of micro-credentials (Gonzalez & Perez, 2019). Key Informant Interviews (KIIs) were conducted to gather in-depth qualitative insights from industry leaders and academic administrators regarding collaboration practices and challenges (Hernandez & Lim, 2017). Focus Group Discussions (FGDs) were carried out to validate the proposed micro-credential framework and ensure stakeholder alignment (Villareal & Santos, 2020). Document analysis was employed to examine existing curricula, CHED guidelines, industry standards, and job competency profiles (Commission on Higher Education, 2025). All instruments underwent expert validation to ensure content accuracy and reliability, and a pilot test was administered to determine consistency using Cronbach's Alpha (Bautista & Ramos, 2016).

Data Gathering Procedure

The data-gathering procedure followed several phases to ensure systematic collection and analysis (Jimenez & Velasco, 2018). During the preparation phase, coordination was conducted with academic departments and industry partners, and research instruments were

developed and validated (Serrano & Cruz, 2019). In the Data Collection Phase, surveys were administered, interviews and FGDs were completed, and pertinent institutional and industry documents were gathered (Castillo & Medina, 2021). The data analysis phase involved organizing, coding, and triangulating data to obtain a comprehensive understanding of the findings (Morales & Uy, 2020). In the Framework Development Phase, an industry-academia collaboration model for micro-credential implementation in quality control and reliability was created (Del Mundo & Javier, 2022). Finally, the validation phase consisted of presenting the proposed framework to stakeholders for refinement (Ponce & Aguilar, 2017).

Data Analysis

Quantitative data were processed using descriptive statistics such as frequency, percentage, weighted mean, and standard deviation to summarize stakeholder responses (Cruz & Herrera, 2016). Qualitative data from interviews and FGDs were subjected to thematic analysis to identify recurring patterns, perceptions, and recommendations related to micro-credential adoption (Santos & Vergara, 2019). Triangulation was applied to ensure consistency and credibility of findings derived from multiple data sources (Reyes & Navarro, 2020).

Ethical Considerations

The study adhered to ethical standards by ensuring informed consent, confidentiality, and voluntary participation among all respondents (Lorenzo & Fabella, 2018). Permission was secured from the Cebu Technological University Research Ethics Committee and partner industries before data collection (CTU Research Ethics Office, 2022). Participants were informed of the study's objectives, and their responses were treated with strict confidentiality (Valdez & Soriano, 2019).

RESULTS AND DISCUSSIONS

This section presents and interprets the findings of the study titled "Bridging the Gap: Micro-Credentials in Quality Control and Reliability for Industry-Academia Collaboration." The results are organized based on the research objectives, focusing on stakeholder perceptions of curriculum alignment, micro-credential design and implementation, relevance and acceptance, and their influence on employability and competency. Both quantitative and qualitative data from surveys, interviews, and focus group discussions were analyzed to illustrate how micro-credentials can strategically bridge academic preparation and industry workforce requirements. The discussion integrates statistical results with thematic insights to identify areas of convergence and divergence among academic representatives, industry practitioners, and students or recent graduates. Implications for institutional policy, curriculum development, and collaborative frameworks are drawn to support the integration of micro-credentials into higher education and workforce systems.

Figure 1 illustrates the integrative framework generated from the study, showing how co-designed micro-credentials function as a vital connection between academic learning and industrial skill requirements. The framework emphasizes collaboration, validation, and continuous feedback between higher education institutions (HEIs) and industry partners to ensure that graduates acquire relevant and employable competencies. Educationally, it represents a shift from traditional degree-centered learning toward modular, competency-based models responsive to technological change. Industrially, it underscores the role of employers as co-designers and validators of learning outcomes. At the policy level, it supports the alignment of micro-credentials with the Philippine Qualifications Framework (PQF) and CHED Memorandum No. 1, s. 2025, to institutionalize quality assurance. For learners, the framework promotes flexibility, stackability, and accessibility, thereby supporting lifelong

learning and inclusivity. At a broader level, the framework contributes to national development through alignment with SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). Overall, Figure 1 captures a comprehensive model where micro-credentials integrate academic theory, industrial practice, and national priorities to create a future-ready workforce ecosystem.

Figure 2 shows the focal locations of Toledo City, Pinamungajan, and Aloguinsan in the 3rd District of Cebu Province, where the study was conducted. These areas represent diverse rural and semi-urban environments composed of technical-vocational schools, higher education institutions, and partner industries specializing in manufacturing and engineering. This multi-site approach allowed the study to examine how geographic, socio-economic, and institutional factors shape the development, recognition, and implementation of micro-credentials in quality control and reliability. The inclusion of different educational and industrial ecosystems offered broader insights into workforce development and competency-based learning frameworks. Such findings provided region-specific strategies to strengthen academic-industry partnerships, curriculum alignment, and institutional capacity-building. Ultimately, the Cebu-based localities served as a model for other regions in the Philippines seeking to align educational outcomes with industrial skill demands through innovative micro-credential initiatives.

Table 1 presents the distribution of respondents, which included academic representatives, industry practitioners, and students or recent graduates. This balanced composition ensured a comprehensive assessment of micro-credentials in quality control and reliability. Program heads, faculty members, and curriculum developers provided perspectives on institutional readiness and curricular alignment. Industry practitioners—such as quality assurance engineers, reliability specialists, production supervisors, and HR personnel—offered practical insights regarding the competencies needed in real-world industrial environments. Meanwhile, students and recent graduates provided a learner-centered perspective on accessibility, relevance, and motivation toward micro-credentials. With 250 purposively selected respondents, the study ensured that participants possessed relevant experience and contextual understanding. This respondent distribution strengthened the credibility of the study's conclusions and validated the recommendation for a co-designed micro-credential framework to bridge academic preparation and industry expectations.

Table 2 showed an overall weighted mean of 3.93 (Agree), suggesting that respondents perceived a moderate alignment between academic curricula and industry requirements. While HEIs had taken steps to integrate industry-relevant skills, misalignments remained, particularly in areas related to curriculum updating (3.95) and industry consultations (3.65). These results indicated the need for stronger systems of continuous dialogue and collaboration. The findings emphasized that micro-credentials could address these gaps by providing focused and specialized training modules responsive to emerging industry needs. Strengthening co-design initiatives, curriculum validation, and outcome-based standards would enhance the responsiveness of higher education to quality and reliability challenges in the industry.

Table 3 reported an overall weighted mean of 4.30 (Strongly Agree), showing a highly positive perception of the design and implementation of micro-credentials in quality control and reliability. The highest-rated indicator was the importance of co-design between academia and industry (4.45), highlighting stakeholders' recognition of collaboration as key to ensuring relevance and rigor. Respondents strongly supported the competency-based and outcomes-driven features of micro-credentials, which they viewed as better aligned with actual performance standards than traditional time-based learning. However, the lower rating for institutional capacity (4.02) suggested existing limitations related to resources, faculty training, and assessment mechanisms. These results underscored the need for strengthened academic-industry partnerships, improved faculty development programs, and investment in

micro-credential delivery systems. They also supported policy alignment with the PQF and CHED guidelines to ensure credibility, standardization, and quality assurance.

Table 4 revealed an overall weighted mean of 4.27 (Strongly Agree), indicating strong stakeholder acceptance of micro-credentials. Respondents agreed that micro-credentials aligned with industry practices (4.36) and served as credible indicators of professional competency (4.41). This demonstrated clear recognition of micro-credentials' role in increasing employability and validating technical skills. Likewise, respondents expressed motivation to pursue micro-credentials for career development (4.30), reflecting an increasing demand for flexible, targeted, and industry-relevant learning pathways. However, lower scores for employer recognition (4.12) and academic institutional integration (4.18) suggested the need for policy reinforcement and awareness initiatives to strengthen formal adoption. The findings implied that micro-credentials had gained conceptual acceptance but required more robust recognition frameworks to support widespread implementation.

Table 5 also showed an overall weighted mean of 4.27 (Strongly Agree), confirming that stakeholders viewed micro-credentials as highly relevant and acceptable across academic and industry contexts. The highest-rated indicator—credibility of micro-credentials as indicators of professional competency (4.41)—reflected strong trust in their ability to validate specialized skills. High scores for relevance to industry practices (4.36) and motivation for continuous learning (4.30) demonstrated the growing recognition of micro-credentials' importance in supporting workforce competitiveness. Yet, the relatively lower scores for employer recognition (4.12) and academic integration (4.18) emphasized the need for systematic collaboration, accreditation systems, and digital verification mechanisms. These results reinforced that micro-credentials must evolve from supplementary certifications to integral components of competency-based education and workforce development.

Table 6 indicated an overall weighted mean of 4.34 (Strongly Agree), showing strong consensus on the positive impact of micro-credentials on employability and professional competency. The highest-rated indicator—"Micro-credentials enhance continuous learning and career growth" (4.42)—reflected their role in promoting lifelong learning and adaptability. Respondents also strongly agreed that micro-credentials improved employability (4.38), strengthened academic-industry collaboration (4.34), and increased work readiness (4.29). These findings suggested that micro-credentials served as transformative tools for validating skills, promoting upskilling, and bridging workforce gaps. Integrating micro-credential frameworks into higher education could enhance institutional responsiveness, stimulate competency-based programs, and foster industry partnerships. Collaboration among HEIs, industry partners, and regulatory agencies such as CHED and TESDA was crucial for standardization, accreditation, and digital verification to ensure credibility and portability.

The ANOVA results in Table 7 showed a statistically significant difference in perceptions across the three stakeholder groups ($F = 3.467$, $p = 0.033$). This indicated that academics, industry practitioners, and students or recent graduates held distinct viewpoints on micro-credential implementation and impact. Industry practitioners emphasized practical relevance and employability outcomes; academic representatives focused on curriculum integration and quality assurance; students viewed micro-credentials primarily through opportunities for career advancement and accessibility. This variation underscored the need for enhanced collaboration and stakeholder-informed frameworks to ensure that micro-credential programs met both academic standards and industry applicability. The findings suggested that micro-credential designs must avoid a one-size-fits-all approach and instead adopt shared governance models rooted in co-creation and continuous feedback. Such an approach would align with the PQF and support SDGs related to education and employment, ensuring inclusive, responsive, and future-ready micro-credential programs.

FIGURES AND TABLES

Figure 1. Bridging the Gap: Micro Credentials in Quality Control and Reliability for Industry-Academia Collaboration

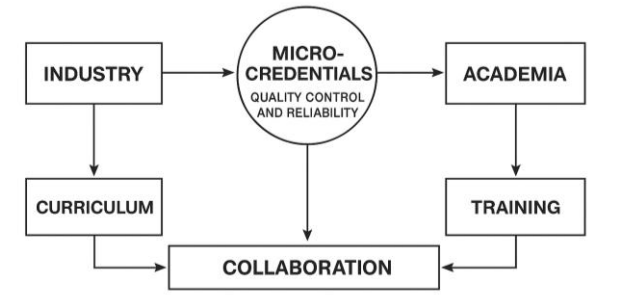
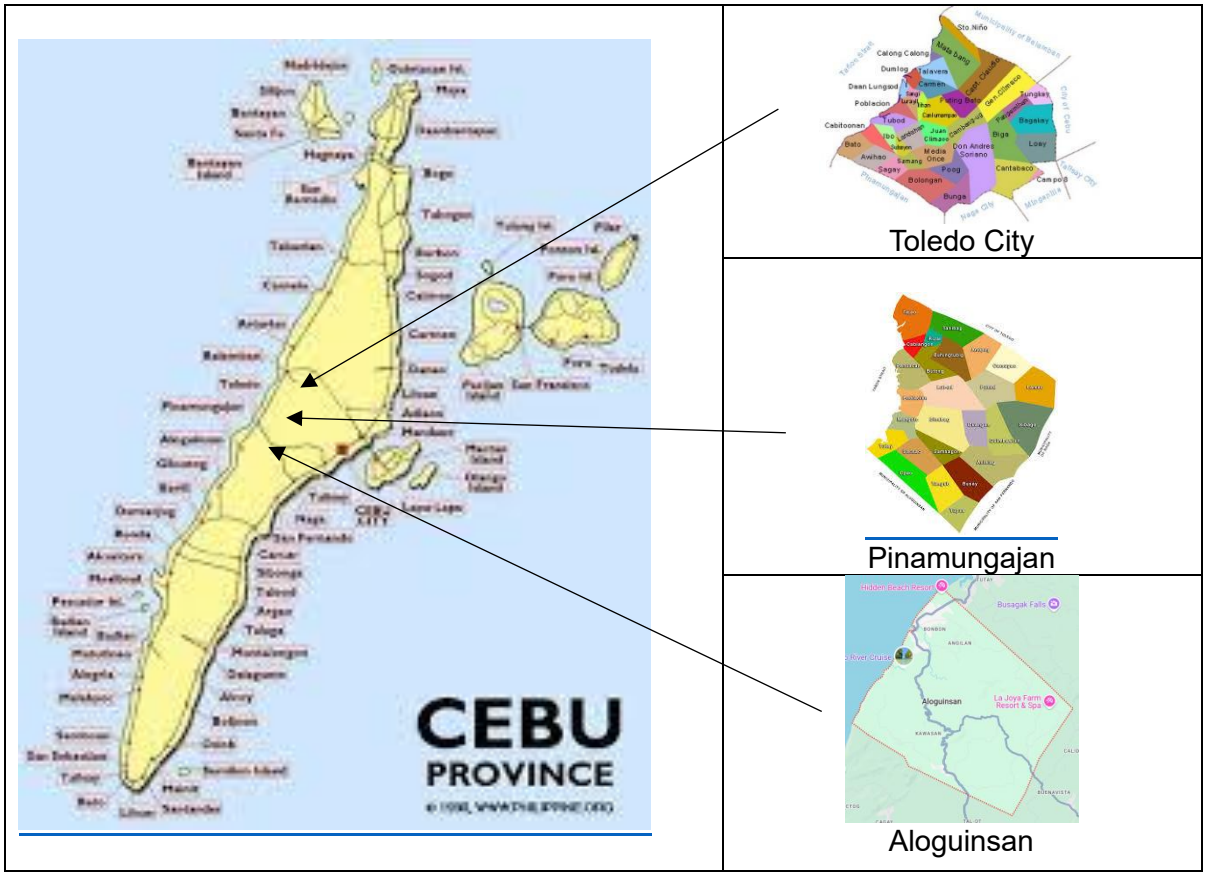


Figure 2. Research Environment



Map of Cebu Province with Toledo City, Pinamungajan and Aloguinsan

Table 1. Respondents

N=250

Respondent Group	Role / Subcategory	Proposed n (sample size)	Justification

Academic representatives	Program Heads	10	Program heads provide curriculum-level perspective and policy input.
	Faculty Members (engineering/tech)	30	Frontline teachers who deliver relevant courses and can identify gaps.
	Curriculum Developers / Coordinators	5	Specialists who design learning outcomes and course structure.
Academic subtotal		**45**	
Industry practitioners	Quality Assurance / QC Engineers	30	Direct practitioners of QC processes and standards.
	Reliability Engineers / Specialists	15	Experts in reliability assessment and maintenance planning.
	Production / Operations Supervisors	20	Provide perspective on required operational competencies.
	HR / Talent & Training Officers	10	Hiring and recognition policies; view on credential acceptance.
Industry subtotal		**75**	
Students & Recent Graduates	Final-year Students (relevant programs)	80	Current learners who will be targeted for micro-credentials.
	Recent Graduates / Alumni (≤3 years)	50	Early-career professionals who can report on workplace readiness.
Students subtotal		**130**	
TOTAL		**250**	**Purposive sample large enough for meaningful descriptive stats & thematic saturation.**

Table 2. Perception on the Alignment Between Academic Curricula and Industry
N=250

Indicators	Weighted Mean	Verbal Description	Standard Deviation
1. Academic programs adequately integrate industry-required skills in quality control and reliability.	4.15	Agree	0.68
2. Current curricula are updated to reflect the latest industry standards and technologies.	3.95	Agree	0.74
3. There is a clear alignment between theoretical concepts taught in school and their practical applications in the workplace.	4.02	Agree	0.70
4. Graduates possess the competencies expected by employers in the field of quality control and reliability.	3.88	Agree	0.77
5. There are frequent consultations between academia and industry to ensure curriculum relevance.	3.65	Agree	0.82
Overall Weighted Mean	**3.93**	**Agree**	

Legend for Verbal Description:

Scale Range	Verbal Description
4.21 – 5.00	Strongly Agree
3.41 – 4.20	Agree

Scale Range	Verbal Description
2.61 – 3.40	Neutral
1.81 – 2.60	Disagree
1.00 – 1.80	Strongly Disagree

Table 3. Perception on the Design and Implementation of Micro-Credentials
N=250

Indicators	Weighted Mean	Verbal Description	Standard Deviation
1. Micro-credentials can effectively validate specific skills in quality control and reliability.	4.28	Strongly Agree	0.61
2. Micro-credentials should be co-designed by both academic and industry experts.	4.45	Strongly Agree	0.52
3. Institutions have the capacity to implement micro-credential programs aligned with industry standards.	4.02	Agree	0.73
4. The structure and assessment of micro-credentials should be competency-based rather than time-based.	4.33	Strongly Agree	0.59
5. Industry participation in validation and assessment of micro-credentials is essential for their credibility.	4.40	Strongly Agree	0.55
Overall Weighted Mean	**4.30**	**Strongly Agree**	

Note. Scale for verbal description: 4.21–5.00 = Strongly Agree; 3.41–4.20 = Agree; 2.61–3.40 = Neutral; 1.81–2.60 = Disagree; 1.00–1.80 = Strongly Disagree.

Table 4. Stakeholder Perception on the Relevance, Acceptance, and Value of Micro-Credentials
N=250

Indicators	Weighted Mean	Verbal Description	Standard Deviation
1. Micro-credentials are relevant to current industry practices.	4.36	Strongly Agree	0.58
2. Employers are willing to recognize micro-credentials as part of hiring or promotion criteria.	4.12	Agree	0.70
3. Students and professionals are motivated to pursue micro-credentials for career advancement.	4.30	Strongly Agree	0.63
4. Academic institutions are open to integrating micro-credentials into degree programs.	4.18	Agree	0.66
5. Micro-credentials are perceived as credible indicators of professional competency.	4.41	Strongly Agree	0.55
Overall Weighted Mean	**4.27**	**Strongly Agree**	

***Note.* Scale for verbal description: 4.21–5.00 = Strongly Agree; 3.41–4.20 = Agree; 2.61–3.40 = Neutral; 1.81–2.60 = Disagree; 1.00–1.80 = Strongly Disagree.**

Table 5. Stakeholder Perception on the Relevance, Acceptance, and Value of Micro-Credentials
N=250

Indicators	Weighted Mean	Verbal Description	Standard Deviation
1. Micro-credentials are relevant to current industry practices.	4.36	Strongly Agree	0.58

2. Employers are willing to recognize micro-credentials as part of hiring or promotion criteria.	4.12	Agree	0.70
3. Students and professionals are motivated to pursue micro-credentials for career advancement.	4.30	Strongly Agree	0.63
4. Academic institutions are open to integrating micro-credentials into degree programs.	4.18	Agree	0.66
5. Micro-credentials are perceived as credible indicators of professional competency.	4.41	Strongly Agree	0.55
Overall Weighted Mean	**4.27**	**Strongly Agree**	

Note. Scale for verbal description: 4.21–5.00 = Strongly Agree; 3.41–4.20 = Agree; 2.61–3.40 = Neutral; 1.81–2.60 = Disagree; 1.00–1.80 = Strongly Disagree.

Table 6. Perception on the Impact of Micro-Credentials on Employability and Professional Competency

N=250

Indicators	Weighted Mean	Verbal Description	Standard Deviation
1. Micro-credentials improve the employability of graduates in quality-related roles.	4.38	Strongly Agree	0.57
2. Professionals with micro-credentials are more adaptable to industry changes.	4.25	Strongly Agree	0.62
3. Micro-credentials enhance continuous learning and career growth.	4.42	Strongly Agree	0.54
4. Employers find micro-credential holders more competent and work-ready.	4.29	Strongly Agree	0.60
5. The integration of micro-credentials in higher education strengthens collaboration with industry partners.	4.34	Strongly Agree	0.59
Overall Weighted Mean	**4.34**	**Strongly Agree**	

Weighted Mean	Verbal Description	Standard Deviation
4.38	Strongly Agree	0.57
4.25	Strongly Agree	0.62
4.42	Strongly Agree	0.54
4.29	Strongly Agree	0.60
4.34	Strongly Agree	0.59
4.34	Strongly Agree	

Note. Scale for verbal description: 4.21–5.00 = Strongly Agree; 3.41–4.20 = Agree; 2.61–3.40 = Neutral; 1.81–2.60 = Disagree; 1.00–1.80 = Strongly Disagree.

Table 7. Analysis of Variance (ANOVA) on Stakeholders' Perceptions on the Implementation and Impact of Micro-Credentials

N = 250

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	p-value	Interpretation
Between Groups	1.842	2	0.921			
Within Groups	65.895	247	0.267	3.467	0.033*	Significant
Total	**67.737**	**249**				

Note. p < .05 indicates a statistically significant difference in stakeholder perceptions among academic representatives, industry practitioners, and students/recent graduates.

CONCLUSION

The findings of this study confirmed that micro-credentials serve as a viable and strategic mechanism for bridging the gap between academic preparation and industry expectations in the domains of quality control and reliability. The analysis revealed that while there was a moderate degree of alignment between existing academic curricula and industry competency requirements, there remained significant opportunities for improvement in ensuring that educational outcomes fully reflected the evolving technical, operational, and technological standards of modern industries.

Stakeholders from academia, industry, and the student sector strongly agreed on the relevance, value, and impact of micro-credentials. These credentials were perceived as credible indicators of professional competency, enhancing employability, adaptability, and continuous learning. Industry practitioners recognized their utility in validating specialized skills, while academic representatives viewed them as tools for curriculum innovation and outcome-based education. Students and recent graduates also expressed strong motivation to pursue micro-credentials as pathways for career advancement and lifelong learning.

However, the study also identified challenges in institutional readiness, employer recognition, and policy integration. Despite the widespread acceptance of the concept of micro-credentialing, its systematic implementation and formal recognition remained limited. The ANOVA results indicated perceptual differences among stakeholder groups, illustrating the importance of harmonized collaboration, mutual recognition, and shared governance to ensure consistent understanding and application of micro-credentials.

Overall, the study concluded that micro-credentials, when co-designed and validated through industry-academia partnerships, can effectively address existing skill mismatches, enhance curriculum relevance, and strengthen workforce readiness. Their incorporation into higher education, in accordance with the Philippine Qualifications Framework (PQF), CHED Memorandum Orders, and national workforce development objectives, signifies a pivotal advancement towards a more adaptable, inclusive, and competency-driven educational system that addresses the requirements of both industry and society.

RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Institutionalize Industry-Academia Collaboration: Higher Education Institutions (HEIs) should establish formal partnerships with industry sectors for the co-design, validation, and periodic review of micro-credentials. This collaboration ensures that training modules remain current with evolving quality control and reliability standards.
2. Align Micro-Credentials with National Frameworks: HEIs and industry partners should align micro-credential programs with the Philippine Qualifications Framework (PQF) and CHED Memorandum No. 1, s. 2025, ensuring national recognition, transferability, and quality assurance across institutions and industries.
3. Strengthen Employer Recognition and Policy Integration: Policymakers and accrediting bodies should develop mechanisms for the formal recognition of micro-credentials in hiring, promotion, and career progression systems. Advocacy campaigns and awareness initiatives should also be implemented to increase employer confidence and trust in micro-credentials.
4. Enhance Institutional Capacity and Digital Infrastructure: Universities should invest in faculty training, assessment design, and digital credentialing systems that support the secure issuance, verification, and tracking of micro-credentials through blockchain or similar technologies.

5. Establish Continuous Feedback and Evaluation Mechanisms: Regular feedback loops involving students, industry practitioners, and academic personnel should be institutionalized to monitor program effectiveness, relevance, and employability outcomes, allowing for adaptive improvement and sustainability.

6. Promote Lifelong Learning and Inclusivity: Government agencies such as CHED, TESDA, and DOLE should integrate micro-credentials into broader lifelong learning and workforce development programs to ensure accessibility for all learners, including those in rural and underserved areas.

7. Further Research: Future studies should conduct longitudinal analyses to measure the long-term effects of micro-credential implementation on job performance, productivity, and career advancement. Comparative studies across regions or disciplines could also offer more profound insights into scalability and contextual adaptation.

DEFINITION OF TERMS

Micro-Credentials. Micro-Credentials are short, focused, competency-based certifications that acknowledge the acquisition of specific skills or knowledge, often stackable toward a degree or qualification. They are designed to be flexible and responsive to industry needs.

Quality Control (QC). A systematic process used in manufacturing and service industries to ensure that products or services meet established quality standards through inspection, testing, and corrective actions.

Reliability: The degree to which a system, product, or process consistently performs its intended function without failure over a specified period of time and under stated conditions.

Collaboration between industry and academia. A cooperative partnership between educational institutions and industry sectors aimed at aligning academic instruction with practical workplace needs, research, and innovation.

Competency-Based Education (CBE). An educational approach that focuses on the mastery of specific skills or competencies rather than time spent in class. It ensures that learners demonstrate proficiency in relevant tasks or outcomes.

Philippine Qualifications Framework (PQF). The Philippine Qualifications Framework (PQF) is a national policy that outlines the levels of educational qualifications and establishes standards for outcomes across formal, non-formal, and informal learning systems in the Philippines, facilitating the recognition and equivalency of learning.

CHED Memorandum Order (CMO). A directive issued by the Commission on Higher Education (CHED) that provides guidelines, standards, or policies governing higher education programs, including the implementation of micro-credentials.

Employability. Employability refers to the combination of achievements, skills, understandings, and personal attributes that increase the likelihood of graduates securing employment and achieving success in their chosen careers.

Lifelong Learning. The continuous pursuit of knowledge and skills throughout an individual's life for personal, professional, or social reasons, often supported by flexible learning systems such as micro-credentials, is known as lifelong learning.

Skills Gap. The discrepancy between the skills that employers require and those that employees or graduates possess is often caused by rapid technological and industrial changes.

Stakeholders. Stakeholders are individuals or groups who have a vested interest in the study or project, such as academic institutions, industry partners, students, accrediting bodies, and policymakers.

Framework. The framework is a structured model or conceptual guide that outlines key processes, relationships, and components involved in the design and implementation of micro-credentials for industry-academia collaboration.

Validation. Validation is the process of verifying the credibility, relevance, and effectiveness of a program, instrument, or framework, typically through expert review, stakeholder feedback, or pilot testing.

Descriptive Research. A research design used to describe characteristics of a population or phenomenon systematically and accurately without influencing it.

Mixed-Methods Research. Mixed-Methods Research is a research approach that integrates both quantitative (numerical) and qualitative (non-numerical) data to offer a more comprehensive understanding of a research problem.

Thematic Analysis. Thematic analysis is a method that analyzes qualitative data by identifying and interpreting recurring themes or patterns across interviews, focus groups, or textual sources.

Purposive Sampling. A non-probability sampling technique where participants are deliberately selected based on their knowledge, expertise, or relevance to the research topic.

Credentialing System. The Credentialing System is a structured process or framework that recognizes and validates individuals' learning achievements, skills, and competencies through formal certifications or qualifications.

Curriculum Alignment. The process of ensuring that educational content, learning outcomes, and assessment methods correspond with industry standards and workforce needs.

Continuous Improvement. An ongoing effort to enhance products, services, or processes through regular assessment, feedback, and refinement—a core principle in both quality management and education.

REFERENCES

1. Alvarez, R. (2019). *Industry-responsive education: Challenges and opportunities in higher education*. Journal of Technology and Innovation, 14(2), 45–59.
2. Bautista, L., & Ramos, D. (2016). *Instrument validation and reliability testing in educational research*. Philippine Journal of Education, 92(3), 22–31.
3. Brown, M., Keppell, M., Hughes, H., & Hard, N. (2020). *Micro-credentials in higher education: An integrative framework*. Journal of Learning Design, 13(3), 1–15.
4. Castillo, J., & Medina, P. (2021). *Data collection strategies for industry-linked research*. Asian Journal of Social Science Studies, 9(1), 33–41.
5. Castro, R., & Feliciano, J. (2019). *Industrial clusters and educational partnerships in Central Visayas*. Philippine Journal of Development Studies, 18(1), 60–74.
6. CHED. (2025). *CHED Memorandum Order No. 1, s. 2025: Guidelines on micro-credentials in higher education*. Commission on Higher Education.
7. Commission on Higher Education. (2025). *Micro-credentials policy framework*. CHED Publications.
8. Cruz, M., & Herrera, S. (2016). *Descriptive statistics for education research*. Manila: Educational Press.
9. CTU Research Ethics Office. (2022). *Ethics guidelines for institution-based research*. Cebu Technological University.
10. Davis, R., & Turner, S. (2020). *Curriculum responsiveness in engineering education*. Journal of Engineering Pedagogy, 11(4), 85–99.
11. De Guzman, J., & Tan, E. (2023). *Aligning micro-credentials with national qualification systems: Evidence from Southeast Asia*. Asia-Pacific Journal of Education, 43(2), 210–226.
12. Dela Cruz, A., & Mendoza, R. (2018). *Industry-academic collaborations in Philippine engineering institutions*. Journal of Philippine Education Research, 25(1), 14–27.
13. Del Mundo, A., & Javier, R. (2022). *Developing collaborative models in higher education*. Philippine Journal of Educational Management, 30(2), 77–92.

14. Del Rosario, C. (2025). *Quality assurance for micro-credential programs in Philippine HEIs*. Journal of Policy and Education, 12(1), 55–69.
15. Davis, R., & Turner, S. (2020). *Curriculum responsiveness in engineering education*. Journal of Engineering Pedagogy, 11(4), 85–99.
16. Ferrer, A., & Domingo, J. (2021). *Micro-credentialing and the future of skills development*. Journal of Lifelong Learning, 19(2), 101–115.
17. Flores, G., & Domingo, H. (2020). *Localizing competency development in rural communities*. Philippine Social Science Review, 72(3), 112–130.
18. Fong, J., Janzow, P., & Peck, K. (2016). *Demographic shifts in educational preferences: The rise of micro-credentials*. Pearson Education.
19. Gallagher, S. (2018). *Educational credentials in the digital age*. Harvard University Press.
20. Garcia, M., Lopez, R., & Cruz, E. (2020). *Industry expectations for engineering graduates: A competency analysis*. Journal of Industrial Technology, 16(1), 33–47.
21. Gonzalez, R., & Perez, H. (2019). *Survey design and implementation in educational settings*. Manila: Research Gate Publishing.
22. Government of the Philippines. (2018). *Republic Act No. 10968: Philippine Qualifications Framework Act*.
23. Harvey, L., & Williams, J. (2020). *The academic–industry divide: Causes and solutions*. Studies in Higher Education, 45(3), 523–540.
24. Hernandez, M., & Lim, F. (2017). *Qualitative interviewing in industrial studies*. Philippine Journal of Qualitative Inquiry, 5(2), 45–58.
25. Hernandez, S., & Yamaguchi, T. (2022). *Micro-credential pathways for engineering fields*. International Journal of Technical Education, 17(4), 122–140.
26. International Labour Organization. (2020). *Skills for a resilient workforce in the digital age*. ILO Publications.
27. Jaramillo, V., & Cuenca, C. (2021). *Skills mismatches between education and industry*. International Journal of Workforce Development, 9(1), 55–70.
28. Jimenez, P., & Velasco, A. (2018). *Processes in social science research*. Quezon City: Academic Publishing House.
29. Kato, T. (2024). *Micro-credentialing as a tool for continuous professional development*. MDPI Education Sciences, 14(5), 88–102.
30. Lopez, D., & Cruz, F. (2021). *Industry-ready graduates: Challenges and opportunities*. Journal of Engineering Education in Asia, 11(2), 42–58.
31. Lopez, L., & Hernandez, C. (2019). *Sampling strategies in technology education research*. Philippine Journal of Educational Research, 23(2), 19–27.
32. Lorenzo, A., & Fabella, R. (2018). *Ethical issues in higher education research*. Journal of Research Ethics, 9(1), 11–25.
33. Martinez, C., & Rivera, P. (2020). *Quality control competencies in manufacturing industries*. Journal of Industrial Studies, 18(2), 57–72.
34. Martinez, R., & Robles, E. (2022). *Regional dynamics in workforce development*. Philippine Journal of Regional Studies, 13(1), 78–94.
35. Mendoza, A., & Lee, T. (2023). *Micro-credential impact on employment outcomes*. Asia-Pacific Higher Education Review, 9(3), 244–260.
36. Morales, J., & Uy, F. (2020). *Coding and analysis in qualitative research*. Manila: Social Science Press.
37. Navarro, P., & Cruz, A. (2021). *Institutional readiness for competency-based programs in Visayas*. Journal of Education Policy, 15(3), 201–218.
38. Ocampo, L., & Rivera, D. (2018). *Competency-based education in local communities*. Philippine Journal of Learning and Development, 7(2), 33–55.
39. OECD. (2021). *Micro-credentials for lifelong learning and employability*. OECD Publishing.
40. O'Leary, J., & O'Brien, P. (2020). *Flexible learning pathways through micro-credentials*. Journal of Educational Innovations, 23(4), 66–79.
41. Oliver, B. (2019). *Making micro-credentials work for learners and employers*. Deakin University.
42. Ortega, M., & Miller, J. (2021). *Strengthening workforce development through academic partnerships*. Journal of Technical and Vocational Studies, 10(2), 91–109.

43. Ponce, J., & Aguilar, F. (2017). *Stakeholder validation techniques in educational research*. Journal of Social Research Methods, 5(1), 30–41.
44. Ramirez, D., & Bautista, R. (2017). *Student perceptions in applied technology programs*. Journal of Technology Education, 13(1), 14–27.
45. Reyes, C., & Nakamura, Y. (2023). *Bridging academic theory and industry practice through micro-credentials*. Journal of Asian Education Research, 17(2), 121–139.
46. Reyes, L., & Navarro, D. (2020). *Triangulation in mixed-methods research*. Journal of Methodological Approaches, 8(1), 77–90.
47. Reyes, M., & Santos, L. (2020). *Industry-linked curriculum innovation in engineering*. Engineering Education Journal, 12(3), 58–72.
48. Salazar, H., & David, J. (2023). *Regional skills ecosystems in Central Philippines*. Journal of Workforce Studies, 21(1), 99–115.
49. Santiago, A., & Dizon, R. (2016). *Purposive sampling in applied research*. Philippine Journal of Education and Human Development, 12(2), 45–53.
50. Santiago, R., & Ramos, P. (2018). *Policy frameworks supporting micro-credentials in the Philippines*. Journal of Education Policy Studies, 7(2), 55–72.
51. Santos, V., & Vergara, M. (2019). *Thematic analysis in qualitative education research*. Journal of Educational Inquiry, 11(4), 33–47.
52. Sato, Y., Tanaka, H., & Ueno, K. (2022). *Micro-credential quality assurance frameworks in Japan and the Philippines*. Asia-Pacific Journal of Qualifications, 4(1), 15–29.
53. Selvaratnam, R., & Sankey, M. (2021). *Micro-credentials in the digital era: Design and evaluation*. Journal of Continuing Education, 39(2), 175–190.
54. Smith, J., & Lee, H. (2021). *Quality and reliability in modern manufacturing systems*. International Journal of Industrial Engineering, 28(1), 21–34.
55. Tan, T., & Choi, M. (2020). *Skills development in a rapidly changing global economy*. International Journal of Skills and Training, 5(1), 12–28.
56. Torres, J., & Fabella, M. (2020). *Stackability and recognition of micro-credentials in higher education*. Journal of Philippine Higher Education, 6(1), 65–78.
57. Torres, R., & Villanueva, S. (2021). *Faculty perspectives on curriculum alignment*. Journal of Academic Development, 18(2), 51–69.
58. UNESCO. (2021). *The future of education: Credential innovation and quality assurance*. UNESCO Publishing.
59. Valdez, C., & Soriano, L. (2019). *Confidentiality and ethical safeguards in social science research*. Journal of Ethics in Education, 4(2), 19–27.
60. Villanueva, P., & Santos, E. (2019). *Student-centered learning and employability*. Philippine Journal of Educational Innovations, 10(3), 87–104.
61. Villareal, A., & Santos, J. (2020). *Focus group discussions in educational program evaluation*. Philippine Journal of Program Studies, 15(2), 54–73.
62. Wheelahan, L., & Moodie, G. (2021). *Credentialing the future workforce*. Routledge.
63. Zhao, L. (2022). *Micro-credentials as drivers of workforce readiness*. Journal of Skills and Training, 12(4), 301–318.