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Article

Innovating Pedagogical Approaches in Industrial Technology and Livelihood Education: A Comparative Study of BTVTED and BTLED Programs in Enhancing Technical Competency and Workforce Readiness in Philippine State Universities

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Abstract

This study investigated the pedagogical practices, technical competency levels, and contextualized instructional innovations in the Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs across selected Philippine State Universities, namely Don Mariano Marcos Memorial State University (DMMMSU), Pangasinan State University (PSU), Mariano Marcos State University (MMSU) and Isabela State University (ISU). Using a qualitative-descriptive approach, the study examined how teaching strategies align with national standards such as the Philippine Qualifications Framework (PQF) and TESDA's Training Regulations, and how effectively they prepare pre-service teachers for real-world technical and vocational education (TVE) settings. Findings revealed a significant alignment between curricular content and industry-required competencies, with respondents citing integration of TESDA-accredited National Certificates (NC II) and task-based instruction. However, the study also identified critical gaps in access to modern equipment, real-life simulations, and updated teaching resources. In addition, the programs showed evidence of fostering soft skills such as leadership, communication, and professional behavior through internships and community engagements. The effectiveness of innovative and contextualized pedagogies was evident in bridging the gap between academic learning and workplace application, although implementation remains inconsistent across institutions. The study recommends enhancing curriculum design to incorporate more experiential and industry-based learning, investing in laboratory and training facilities, and conducting continuous teacher training to meet the evolving demands of the technical workforce. These insights contribute to strengthening the relevance and responsiveness of BTVTED and BTLED programs to the Philippine labor market and global TVET standards.

Keywords: *BTVTED, BTLED, technical competency, pedagogy, contextualized learning, TVET, TESDA, Philippine Qualifications Framework.*

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Introduction

Integrating innovative pedagogical approaches in Industrial Technology and Livelihood Education has gained prominence as education systems respond to the evolving demands of the 21st-century workforce. In the Philippine context, Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs are foundational in training pre-service teachers to deliver Technical-Vocational Education and Training (TVET) effectively. These programs must equip educators with technical expertise and foster pedagogical competence that supports skills development, employability, and lifelong learning among students (CHED, 2017). However, whether these programs sufficiently align their instructional frameworks with contemporary industry needs and educational innovations remains to be seen.

The global transition toward Industry 4.0, marked by automation, digital technologies, and demand for soft and technical skills, necessitates reforms in technical-vocational education. Trines (2019) states that technical teacher education programs must respond to industry changes by adopting flexible, learner-centered, and project-based teaching models. In the Philippines, Cabansag (2014) emphasized the significance of competency-based instruction and curriculum contextualization in Technology and Livelihood Education (TLE), aligning it with national learning outcomes and employability skills. These practices ensure that learning is theoretical and grounded in real-life applications.

Moreover, Padios and Umbao (2021) assert that BTVTED and BTLED must go beyond traditional instruction by incorporating experiential learning, industry immersion, and skills assessments to improve graduates' readiness for teaching in technical-vocational settings. Their study revealed gaps in teacher education institutions' implementation of performance-based evaluation, differentiated learning tasks, and industry linkage activities. Similarly, Evangelista (2018) found that graduates of TVET programs often lack confidence in teaching practical skills, suggesting a disconnection between pedagogical training and workplace expectations.

In addition, research by Torres and Barte (2020) highlighted that many teacher education programs in industrial technology do not sufficiently address digital literacy, technological adaptability, and critical thinking, key competencies required in both educational and industrial contexts. Ballesteros (2019) noted that while some SUCs (State Universities and Colleges) adopt innovative practices, these are often isolated initiatives rather than system-wide reforms, resulting in inconsistent teacher preparedness across institutions.

Despite the existing literature, comparative studies between BTVTED and BTLED programs are scarce. Most focus on individual institutional performance or curriculum compliance, without exploring the two programs' pedagogical nuances and strategic differences. This gap is critical because BTVTED is more industry-oriented, while BTLED is often aligned with basic education. A nuanced analysis is necessary to understand how each program prepares future educators for unique educational and vocational environments.

This study, therefore, seeks to fill this gap by examining and comparing the pedagogical strategies, technical competencies, and perceived workforce readiness of pre-service teachers enrolled in BTVTED and BTLED programs in selected Philippine State Universities. It will provide insights into best practices, areas for improvement, and institutional innovations that can shape more responsive and transformative teacher education in technical and livelihood fields.

Research Objectives

1. Examine and compare the pedagogical approaches employed in Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs across selected Philippine State Universities, focusing on instructional methods, curriculum design, and teacher competencies.
2. To assess the level of technical competency and workforce readiness among pre-service teachers enrolled in BTVTED and BTLED programs.
3. To determine the effectiveness of innovative and contextualized pedagogical practices in bridging the gap between academic preparation and real-world technical demands in Industrial Technology and Livelihood Education.

Methodology

This study employed a mixed-methods research design to comprehensively examine the pedagogical approaches and technical competencies embedded within the Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs in selected Philippine State Universities. The quantitative component utilized a researcher-validated survey questionnaire, which was administered to a purposive sample of 120 pre-service teachers, 60 from BTVTED and 60 from BTLED, across three State Universities: Don Mariano Marcos Memorial State University (DMMMSU), Pangasinan State University (PSU), Mariano Marcos State University (MMSU), and Isabela State University (ISU).

The questionnaire assessed instructional strategies, curriculum design, and perceived workforce readiness.

In addition to survey data, qualitative insights were obtained through semi-structured interviews and focus group discussions with 12 faculty members, four from each university, who were directly involved in delivering courses in Industrial Technology and Livelihood Education. These qualitative instruments explored themes related to curriculum alignment, challenges in implementation, and innovative teaching strategies.

The quantitative data were analyzed using descriptive statistics and independent samples t-tests to determine significant differences between BTVTED and BTLED programs. The qualitative data were subjected to thematic analysis, identifying recurring patterns and perspectives that supported or challenged the survey results. Ethical considerations were observed throughout the study. Informed consent was secured from all participants, and confidentiality of responses was maintained. Integrating both data strands aimed to provide a holistic understanding of how teacher education programs prepare future educators to meet the demands of technical-vocational instruction in the 21st century.

Results and Findings

The Pedagogical Approaches Employed in Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) Programs

The need to examine and innovate pedagogical practices in technical and livelihood education has grown increasingly important as higher education institutions (HEIs) adapt to 21st-century demands. This study compared the pedagogical approaches employed in Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs across selected Philippine State Universities. Guided by the objective to explore instructional methods, curriculum design, and teacher competencies, the findings revealed notable differences and overlaps in how these programs prepare future educators. BTVTED programs emphasized industry-aligned competencies and technical skill development, while BTLED programs integrated more contextualized, community-based, and livelihood-centered strategies. These differences reflect broader goals in technical education, such as balancing labor market relevance with cultural and local responsiveness (Navarro, 2020; UNESCO-UNEVOC, 2018).

Additionally, the variation in curriculum design and teacher competency development suggests the need for institutional support and continuous professional

development to bridge gaps in instructional delivery. Existing literature affirms that pedagogical effectiveness in TVET depends on content mastery and the teacher's ability to contextualize learning (Acala & Bañaga, 2021; Tabin & Cubillas, 2019). Therefore, a deeper understanding of how BTVTED and BTLED programs approach teaching may help inform national reforms and policy development, ensuring that graduates are equipped with technical proficiency and the pedagogical agility to meet diverse learner needs across industrial and livelihood sectors.

Contextualized and Competency-Based Teaching Strategies in BTVTED and BTLED Programs

BTVTED and BTLED programs aim to produce competent educators in the technical-vocational field; however, their teaching strategies vary in application and focus. While BTVTED commonly utilizes industry-based competency models, BTLED integrates livelihood-oriented projects contextualized in community settings. These strategies reflect a growing shift toward outcomes-based education (OBE) and learner-centered instruction in technical education.

Participant Responses:

"In BTVTED, we follow TESDA-based standards and simulate actual industrial work, especially in fields like automotive or electronics." – BTVTED Student, DMMMSU.

"Our BTLED classes often involve community immersion and micro-entrepreneurship, so we design tasks that reflect local livelihood needs." – BTLED Student, ISU.

"We make our instruction more hands-on, and sometimes blend it with business planning, especially in areas like cookery or agri-fishery." – BTLED Faculty, MMMSU.

The instructional strategies in both programs align with Kolb's Experiential Learning Theory (1984), emphasizing learning through doing. BTVTED's orientation to national competency standards underscores technical specialization, while BTLED's use of community-based activities reflects contextual responsiveness. Navarro (2020) states that competency-based instruction enhances employability, and contextualization supports lifelong learning skills. This differentiation suggests that while both programs aim to build technical proficiency, their pedagogical focus addresses different dimensions of educator readiness: technical execution versus socio-cultural relevance.

Curriculum Alignment and Divergence Based on Program Priorities

Curriculum content in BTVTED and BTLED programs shows overlapping core subjects yet differs in emphasis. BTVTED curricula prioritize industry standards and workshop-based learning, while BTLED integrates broader livelihood, home

economics, and entrepreneurship components. These variances reflect the philosophical underpinnings of each program, BTVTED for industrial expertise and BTLED for community-focused versatility.

Participant Responses:

"Our BTVTED curriculum is aligned with NC II requirements. We are trained to pass assessment centers and teach the same later." – BTVTED Student, MMSU.

"In BTLED, we learn about financial literacy and project feasibility alongside basic technology skills, especially in food processing." – BTLED Student, DMMMSU.

"Curriculum mapping helps ensure we meet both CHED and TESDA expectations, though it is more rigid in BTVTED." – Faculty, ISU.

The integration of TESDA's Training Regulations (TR) in BTVTED reflects a more rigid and industry-specific framework, as Pepito and Umali (2019) observed. In contrast, BTLED demonstrates a more eclectic curriculum that incorporates entrepreneurial and practical life skills that are aligned with UNESCO's TVET goals for sustainable development. This divergence implies that curriculum developers must balance national qualification requirements with contextual responsiveness, especially in preparing educators for varying teaching environments, whether urban workshops or rural livelihood centers.

Varying Levels of Teacher Competency Development in Industrial and Livelihood Education

Faculty development and pedagogical preparation shape how well pre-service teachers in BTVTED and BTLED programs translate theory into practice. While both programs require content mastery and pedagogy, BTVTED emphasizes technical proficiency and equipment handling more, while BTLED promotes integration of soft skills and local engagement strategies. Teacher competency outcomes vary with institutional resources, faculty qualifications, and practicum exposure.

Participant Responses:

"In BTVTED, we were taught to use technical machines like welding tools, but I wish we had more time for actual practicum." – BTVTED Student, ISU.

"Our BTLED instructors emphasize communication, empathy, and adaptability when dealing with diverse learners." – BTLED Student, DMMMSU.

"I believe both programs need more in-service training for faculty to stay updated with new technologies and teaching strategies." – Faculty, MMSU.

Teacher competency development in both tracks faces systemic challenges such as limited access to modern equipment and insufficient faculty upskilling. Acala and Bañaga (2021) underscored that effective TVET teaching requires continuous professional development to meet evolving industry demands and classroom

complexities. The varied competency outcomes suggest that institutions must reinforce training programs, internships, and partnerships with industry to enhance technical expertise and pedagogical agility among faculty and students.

These themes collectively reveal that while BTVTED and BTLED programs share a commitment to technical and livelihood education, their pedagogical practices reflect differing priorities, BTVTED favoring standardization and technical mastery, and BTLED prioritizing community engagement and contextual learning. The findings are consistent with the studies of Tabin and Cubillas (2019), who argued that pedagogical diversity in teacher education must respond to local realities and global standards. Moreover, the comparative lens affirms the need for curriculum convergence and differentiated instruction that prepare graduates to teach across varied educational and industry contexts.

The Pedagogical Approaches Employed in Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED)

In the evolving landscape of technical and vocational education, the readiness of pre-service teachers to meet the demands of a competitive labor market has become a central concern among higher education institutions. The Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs play a vital role in shaping future educators equipped not only with technical knowledge, but also with practical competencies and workforce attributes aligned with national standards such as the Philippine Qualifications Framework (PQF) and TESDA's Training Regulations. This study assessed technical competency and workforce readiness among students in these programs across selected Philippine State Universities. It explored how effectively the programs prepare students for real-world teaching and industry practice through curriculum design, on-the-job training, and competency-based instruction. Furthermore, the research examined the integration of soft skills such as communication, collaboration, and professional ethics, which are critical for success in academic and industry settings. While literature supports the importance of aligning technical education with labor market needs (Rivera, 2024; Escalada & Bautista, 2021; PIDS, 2022), evaluating the actual implementation and outcomes of such alignment in state-run programs remains necessary. This section presents themes from the data,

revealing the strengths and gaps in preparing technically competent and workforce-ready educators.

Alignment of Acquired Competencies with Industry Standards

This theme underscores how well the BTVTED and BTLED programs equip students with technical competencies that align with the demands of the labor market and the standards set by national agencies such as the Technical Education and Skills Development Authority (TESDA) and the Philippine Qualifications Framework (PQF). These frameworks emphasize competency-based education, ensuring learners demonstrate the knowledge, skills, and values required in real work environments. In BTVTED, this often translates to a curriculum that incorporates TESDA National Certificate (NC) levels, especially in fields like welding, electronics, ICT, and automotive. Meanwhile, BTLED integrates applied learning in agriculture, home economics, and business technologies, focusing on community-based applications. The emphasis on workplace simulation, national certification, and performance-based assessment reflects the shift from theoretical instruction to practical, outcomes-based learning. Participant Responses:

"Our school integrates NC II certifications into the BTVTED program. By graduation, most of us already have TESDA-accredited competencies, which we use in on-the-job training." – DMMMSU Assistant Prof.

"We were trained not only to teach, but also to perform real-life tasks in agriculture and ICT, which is crucial for livelihood education." – ISU Associate Prof.

"We experienced simulations of workplace environments, especially in dressmaking and cookery. This boosted our confidence to enter the workforce right after graduation." – Mariano Marcos State University.

Incorporating TESDA-recognized competencies in BTVTED and BTLED programs provides a solid foundation for workforce readiness. Rivera (2024) affirms that aligning academic content with national competency standards improves employability and practical relevance. Dela Cruz and Cristobal (2023) also stress that mapping curriculum outcomes to PQF levels ensures that graduates are qualified and competitive across industries. These programs' emphasis on skills certification and simulation-based training supports the World Bank's (2018) recommendation that employer-based standards and assessment methods drive TVET programs in the Philippines. This alignment suggests that students are entering the workforce with

technical proficiency and confidence, a vital indicator of instructional effectiveness and curriculum responsiveness.

Gaps in Practical Application and Resource Availability

Despite the curriculum's strength, resource availability disparities continue to affect the quality of technical training in both BTVTED and BTLED programs. Issues such as outdated tools, limited access to laboratory equipment, and inadequate exposure to real industrial environments hinder students' complete mastery of practical skills. These gaps create inconsistencies in learning outcomes, particularly in regional or resource-challenged universities. Even when curriculum alignment is achieved, the lack of institutional investment in tools, facilities, and training technology undermines instructional goals and contributes to unequal workforce preparedness among graduates. Furthermore, instructors often compensate for these gaps with creative teaching methods or peer collaboration, but these workarounds do not fully replicate authentic workplace conditions.

Participant Responses:

"We do have workshops, but sometimes the tools are outdated or insufficient for everyone in the class." – Student, DMMMSU.

"Limited tools during our laboratory classes made it hard to master the skills." – Student, ISU.

"Our instructors are good, but without actual machines or field exposure, it is difficult to claim we are fully ready." – Student, MMSU.

These concerns echo the findings of Uwameiye (2019), who argued that a lack of modern facilities in technical-vocational institutions creates a bottleneck in skill acquisition. The Philippine Institute for Development Studies (PIDS, 2022) also noted that many state-run programs, particularly outside Metro Manila, struggle to upgrade equipment in line with global standards. These limitations hinder the development of high-level technical competencies and reduce students' confidence during job applications and assessments. This gap between curriculum intent and instructional reality reveals a systemic issue that calls for government and institutional support, including increased budget allocations for TVET infrastructure, industry-academe linkages, and regular upgrading of tools and training devices.

Development of Soft Skills and Professional Attributes

Technical skills alone are no longer sufficient in today's workplace. Soft skills such as communication, collaboration, emotional intelligence, initiative, and ethical decision-making have become essential to workforce readiness. The BTVTED and

BTLED programs recognize this by integrating microteaching, community immersion, leadership roles in capstone projects, and practicum engagements that foster these attributes. These experiences prepare students to deliver instruction and lead, collaborate, and respond to the diverse needs of learners and workplace stakeholders. This holistic development approach reflects global TVET models that prioritize skill and character formation in preparing future educators and professionals.

Participant Responses:

"*We had microteaching and community immersion. Those experiences trained us to communicate better and become more responsible.*" – ISU faculty.

"I was the team leader in our capstone project, which taught me much about planning and accountability." – MMSU faculty.

"Our on-the-job training not only taught us technical tasks but also how to interact with co-workers professionally." – DMMMSU faculty.

These insights align with OECD (2019) findings, which emphasize that 21st-century job markets prioritize workers with strong interpersonal and problem-solving skills alongside technical expertise. Escalada & Bautista (2021) also confirm that experiential learning opportunities embedded in TVET programs enhance students' ability to adapt in real-world settings. By integrating opportunities for students to lead, collaborate, and reflect, BTVTED and BTLED programs help shape well-rounded professionals ready for teaching and industry roles. The emphasis on soft skills development ensures graduates can navigate complex, dynamic work environments, a critical outcome of transformative TVET education.

Effectiveness of Innovative and Contextualized Pedagogical Practices in Bridging the Gap Between Academic Preparation and Real-World Technical Demands in the Field of Industrial Technology and Livelihood Education

In the ever-evolving landscape of technical-vocational education, the effectiveness of teaching practices in bridging the gap between academic preparation and real-world technical demands has become a crucial focus of educational research and policy. This study explored the pedagogical strategies employed in BTVTED and BTLED programs in selected Philippine State Universities, particularly their alignment with industry expectations and relevance to learners' practical needs. The findings revealed three significant themes: the value of contextualized instruction in enhancing real-life applicability of learning; the role of innovative pedagogies such as project-based learning and simulations in developing technical proficiency; and the persistent gap between progressive educational policies and actual classroom implementation. These themes highlight the progress made in instructional design and the systemic

barriers that hinder the full realization of transformative pedagogy. Literature affirms that aligning TVET curricula with industry standards (Tan, 2022; UNESCO-UNEVOC, 2018), embedding culturally responsive teaching (Gay, 2018), and improving institutional support (Dela Cruz & Cristobal, 2023) are vital steps in developing competent and adaptable future educators. However, the findings also call attention to the structural and resource-based limitations that continue to challenge the holistic preparation of pre-service teachers. Thus, the study underscores the importance of curriculum enhancement, continuous teacher training, and policy reforms tailored to the contextual realities of technical-vocational institutions in the Philippines.

Contextualization as a Catalyst for Practical Learning

This theme reflects how contextualized instruction has been a meaningful pedagogical approach in bridging the gap between academic theory and hands-on technical skills. Educators can make technical content more relatable and applicable by anchoring lessons on local culture, community-based experiences, and real-life livelihood contexts. In teacher education programs like BTVTED and BTLED, contextualization enhances understanding and promotes critical thinking, community engagement, and innovation among pre-service teachers. Participant Responses:

"Our lessons in carpentry and masonry included actual community projects, which helped us understand not just the techniques, but also how to manage client expectations." – DMMMSU student.

"We were encouraged to apply agricultural concepts to our family farms. It made the learning personal and more relevant." – ISU student.

"During cookery classes, we used local ingredients and recipes, which improved our confidence in presenting practical solutions to local livelihood needs." – MMSU student.

These accounts affirm Ocampo and Antonio's (2020) claim that contextualization enhances learner engagement and motivation, especially in TVET programs where real-world relevance is critical. Contextualized learning resonates with culturally responsive pedagogy as emphasized by Gay (2018), who argued that when instruction acknowledges learners' cultural and socioeconomic backgrounds, it leads to deeper understanding and long-term retention. This pedagogical perspective is substantiated by the findings of Navasca et al. (2025), whose study highlights enhanced instructional engagement by integrating localized examples and community-based resources such as neighborhood crafts and cultural traditions into lesson delivery. These culturally rooted approaches not only heighten relevance and authenticity but also contribute to increased learner motivation and self-esteem. In this study, contextualization also fostered students' ability to adapt to diverse technical

challenges and to apply knowledge in community-driven projects, skills highly valued in rural development and local livelihood initiatives.

Innovation in Pedagogical Strategies for Technical Preparedness

This theme captures the implementation of modern and creative instructional strategies such as project-based learning, flipped classrooms, and digital simulations that aim to prepare students for the rapidly evolving demands of technical professions. Innovative pedagogy empowers pre-service teachers to become problem-solvers, designers, and facilitators of knowledge, going beyond rote instruction toward a more dynamic and reflective practice aligned with 21st-century TVET goals.

Participant Responses:

"Our instructor used project-based assessments. For example, we had to build a prototype machine based on an industry brief; it was challenging but practical." – Isabela State University.

"We experienced flipped classrooms in electronics. We would study theory at home and apply it in class, much like how tasks work in the field." – DMMMSU.

"In our ICT course, we were trained using industry software simulations, which gave us an edge during OJT." – MMSU.

These examples mirror Tan's (2022) findings that innovative approaches such as PBL (project-based learning) and digital integration in teaching significantly improve learners' readiness for technical careers. Using simulated work environments, prototyping tasks, and collaborative projects allows students to practice problem-solving and design-thinking skills deemed essential by UNESCO-UNEVOC (2018) for workforce success. These pedagogical innovations also support *"learning by doing,"* a central tenet of experiential education that ensures learners can apply concepts in real-world contexts, rather than relying solely on theory.

Disconnect Between Policy Goals and Instructional Realities

Despite progressive curricular frameworks such as the Outcomes-Based Education (OBE) and competency-based models, this theme reveals the persistent gap between pedagogical policy and on-the-ground classroom practices. While teacher education institutions recognize the importance of innovative and contextualized

approaches, these are often hampered by structural challenges such as outdated facilities, insufficient instructional support, and limited training opportunities.

Participant Responses:

"The curriculum is progressive, but we lack access to updated machines or learning tools that can make it work." – MMSU.

"There are training modules that we need to follow, but we are not given enough time or funding for implementation." – DMMMSU.

"We want to integrate industry standards, but sometimes, our institutional policies are too rigid to adapt." – Isabela State University.

These reflections are consistent with Dela Cruz and Cristobal (2023), who highlighted that educational policy reforms often remain aspirational due to the mismatch between curriculum design and institutional capacities. Rivera (2024) also noted that while many state universities have adopted OBE principles, they often struggle to implement these due to inadequate funding and professional development programs. The gap is especially pronounced in rural or developing regions, where logistical constraints and inflexible systems limit the actualization of innovative teaching strategies. For reforms to succeed, there must be policy mandates, contextual support, localized implementation frameworks, and sustained faculty training.

Discussion

The findings of this study revealed three critical insights into the effectiveness of innovative and contextualized pedagogical practices in bridging the academic-industry gap in BTVTED and BTLED programs across selected Philippine State Universities. These insights were categorized into the following themes: contextualized instruction and industry alignment, innovative strategies and skill application, and gaps in policy implementation and institutional support.

Firstly, the strong emphasis on contextualized instruction and industry alignment among faculty members of Don Mariano Marcos Memorial State University, Mariano Marcos State University (MMSU), Pangasinan State University (PSU), and Isabela State University reflects a pedagogical shift toward real-world relevance. Participants reported designing lessons based on local livelihood needs and incorporating community-based practices such as sustainable agriculture and local craft production. This finding supports the assertion of Tabaquero and Lopez (2021), who highlighted that contextualized instruction enhances student motivation and relevance, particularly in the technical-vocational track. Moreover, Tan (2022) emphasized that curriculum localization aligned with national industry standards,

such as TESDA and PQF, fosters better employability and skill retention among pre-service teachers.

Secondly, innovative teaching strategies, such as project-based learning, simulations, and community immersion, have enabled students to apply their technical knowledge in realistic scenarios. These approaches correspond with UNESCO-UNEVOC's (2018) recommendation to infuse 21st-century skills through experiential learning in TVET programs. Escalada and Bautista (2021) also underscored that students who undergo authentic learning experiences develop stronger adaptability and workplace readiness. The participants' accounts of leading community livelihood projects and performing in simulated industrial environments illustrate the transformative potential of such pedagogies.

However, the study also surfaced persistent gaps in policy implementation and institutional support. Despite progressive curricular frameworks, participants noted the lack of instructional materials, outdated equipment, and insufficient field exposure. These challenges echo the findings of Uwameiye (2019), who identified infrastructural limitations as a significant barrier to skill acquisition in vocational programs. Furthermore, Dela Cruz and Cristobal (2023) asserted that while national policies promote outcomes-based education and contextualized learning, their classroom-level implementation remains inconsistent without adequate faculty development and material support.

In sum, while the study affirms the effectiveness of innovative and contextualized pedagogies in narrowing the gap between academic training and real-world application, it also reveals a disconnect between pedagogical intent and institutional readiness. To truly enhance the relevance and quality of Industrial Technology and Livelihood Education, sustained investments in teacher training, curriculum development, and educational infrastructure are essential. These findings call for collaborative efforts among policymakers, academic leaders, and industry stakeholders to ensure that teacher education programs meet the evolving demands of the Philippine labor market and empower future educators with competence and confidence.

Conclusion

This study comprehensively examined the pedagogical approaches, technical competencies, and innovative teaching practices implemented in the Bachelor of Technical-Vocational Teacher Education (BTVTED) and Bachelor of Technology and Livelihood Education (BTLED) programs across selected Philippine State Universities. Findings revealed a strong alignment between acquired technical competencies and

national industry standards such as those defined by the Philippine Qualifications Framework (PQF) and TESDA Training Regulations. Students from Don Mariano Marcos Memorial State University (DMMMSU), Mariano Marcos State University (MMSU), Pangasinan State University (PSU), and Isabela State University (ISU) affirmed the integration of National Certificate (NC) credentials and workplace simulations, contributing significantly to their workforce readiness.

Despite this alignment, resource limitations and inconsistent access to updated tools and equipment were identified as persistent challenges, affecting the complete mastery of skills. In addition, developing soft skills such as leadership, communication, and adaptability emerged as critical components of holistic teacher preparation. These competencies were primarily cultivated through community immersion, capstone projects, and internship programs. Furthermore, the study emphasized the role of contextualized and innovative pedagogical practices in bridging the academic-practical gap, though variability in implementation across universities remains.

In conclusion, while BTVTED and BTLED programs show promise in aligning with labor market demands, improvements in facilities, pedagogical innovation, and continuous curriculum enhancement are necessary. Strengthening teacher training and institutional support can further ensure that graduates are equipped with technical expertise and the adaptability and professional attributes needed in today's dynamic industrial and livelihood education landscape.

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