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# The Impact of the Technology-Assisted Learning in Teaching Technology and Livelihood Education in the Public Junior High Schools in Labo West District, Division of Camarines Norte

Rolando Z. Valenzuela[1]

[1]School of Graduate Studies, University of Northeastern Philippines

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ABSTRACT

This study examined the utilization and impact of technology-assisted learning in teaching Technology and Livelihood Education (TLE) in Public Junior High Schools in Labo West District, Division of Camarines Norte during School Year 2024–2025. Anchored on national educational reforms promoting digital integration and 21st-century skills development, the research investigated four dimensions of technology utilization: lesson integration, practical simulations, interactive platforms, and resource accessibility. It further assessed the extent to which technology-assisted learning influences learners' academic performance and skill acquisition in terms of knowledge retention and mastery of concepts, development of technical skills, engagement, and critical thinking and problem-solving. A descriptive–evaluative–inferential research design was employed, involving total enumeration of thirty (30) TLE teachers. Data were analyzed using weighted mean, rank order, and Wilcoxon Mann–Whitney U Test at the 0.05 level of significance. Results revealed that technology-assisted learning in TLE instruction was Very Much Evident overall (M = 4.69). Among the utilization dimensions, practical simulations ranked highest (M = 4.85), followed by interactive platforms (M = 4.79) and lesson integration (M = 4.68), while resource accessibility was rated Much Evident (M = 4.45). No significant differences were found in lesson integration, practical simulations, and interactive platforms across school groups; however, a significant difference was observed in resource accessibility ($p < 0.05$), indicating disparities in technological access. In terms of impact, technology-assisted learning was found to be Very Much Evident in enhancing knowledge retention (M = 4.74), development of technical skills (M = 4.69), engagement (M = 4.71), and critical thinking and problem-solving (M = 4.76). Significant differences were observed across groups in all impact domains ($p < 0.05$), suggesting variations in perceived outcomes. The findings affirm that technology-assisted learning strengthens both cognitive mastery and practical skill development in TLE, while highlighting the need for equitable resource allocation and sustained professional development to maximize instructional effectiveness.

## 1. Introduction

The rapid advancement of digital technologies has significantly transformed the educational landscape, redefining traditional pedagogical practices and reshaping instructional delivery across disciplines. Technology-assisted learning (TAL) has emerged as a strategic innovation that enhances learner engagement, supports differentiated instruction, and bridges theoretical knowledge with practical application. In the Philippine educational context, the integration of technology aligns with national reforms promoting 21st-century competencies, digital literacy, and workforce readiness. For skill-oriented subjects such as Technology and Livelihood Education (TLE), which require both conceptual understanding and hands-on proficiency, technology-assisted learning offers meaningful opportunities to simulate real-world environments, foster technical skills, and enrich learner experiences.

TLE plays a critical role in equipping Junior High School learners with competencies relevant to employment, entrepreneurship, and lifelong learning. However, persistent challenges such as limited instructional materials, inadequate access to equipment, disparities in digital infrastructure, and varying levels of teacher technological readiness affect the effective delivery of TLE programs. The emergence of virtual simulations, interactive platforms, digital tutorials, and cloud-based resources presents viable solutions to these constraints. Through these tools, educators can create dynamic learning environments that promote knowledge retention, skill mastery, collaboration, and critical thinking. Consequently, evaluating the extent to which technology-assisted learning is utilized in TLE classrooms becomes essential in determining its effectiveness and sustainability.

The integration of technology in Philippine basic education is strongly supported by constitutional and legislative mandates. Article XIV of the 1987 Philippine Constitution emphasizes the State's responsibility to provide quality and accessible education. Republic Act No. 9155 (Governance of Basic Education Act of 2001) and Republic Act No. 10533 (Enhanced Basic Education

Act of 2013) further institutionalize reforms aimed at improving learning outcomes and ensuring curriculum relevance. More recently, the Basic Education Development Plan (BEDP) 2022–2030 and the Department of Education's MATATAG Agenda highlight the importance of curriculum responsiveness, teacher empowerment, and digital transformation. These policy frameworks underscore the urgency of integrating technology to enhance instructional quality and learner performance, particularly in competency-based subjects like TLE.

Despite these reforms, empirical investigations on the utilization and impact of technology-assisted learning in TLE at the district level remain limited. Existing studies largely focus on general ICT integration without examining specific dimensions such as lesson integration, practical simulations, interactive platforms, and resource accessibility, nor do they comprehensively analyze their impact on knowledge retention, technical skill development, engagement, and critical thinking. Addressing this gap, the present study examined the extent of utilization of technology-assisted learning in teaching TLE in Public Junior High Schools in Labo West District, Division of Camarines Norte, and assessed its impact on learners' academic performance and skill acquisition. By providing empirical evidence on technology integration practices and their instructional outcomes, this research contributes to the broader discourse on educational innovation and offers policy-relevant insights for strengthening technology-enhanced TLE instruction in Philippine basic education.

## 2. Methodology

This study employed a descriptive–evaluative–inferential research design to determine the extent of utilization and impact of technology-assisted learning in teaching Technology and Livelihood Education (TLE) in Public Junior High Schools in Labo West District, Division of Camarines Norte. The descriptive component was used to determine the level of technology utilization and its perceived impact on learners' academic performance and skill acquisition. The evaluative aspect interpreted the magnitude of responses using established scale descriptors, while the inferential component examined significant differences in rank orders across groups of respondents. The level of significance was set at 0.05.

The study was conducted in Labo West District, a first-class municipality in the province of Camarines Norte. The district is composed of ten public secondary schools categorized as big, medium, and small schools. This classification allowed comparative analysis of responses based on school size and resource availability. Labo West District was purposively selected as the locale of the study due to its active implementation of technology-assisted learning initiatives and its diverse school contexts.

The respondents of the study consisted of thirty (30) Technology and Livelihood Education (TLE) teachers from the identified public junior high schools. A total enumeration sampling technique was employed to ensure that all eligible TLE teachers in the district were included in the investigation. This approach minimized sampling bias and provided a comprehensive representation of teachers' perceptions regarding the utilization and impact of technology-assisted learning tools in their instructional practice.

Data were gathered using a structured questionnaire developed based on the objectives of the study and related literature on technology integration in education. The instrument consisted of two major parts: (1) the extent of the utilization of technology-assisted learning in teaching TLE in terms of lesson integration, practical simulations, interactive platforms, and resource accessibility; and (2) the extent of the impact of technology-assisted learning on learners' academic performance and skill acquisition in terms of knowledge retention and mastery of concepts, development of technical skills, engagement, and critical thinking and problem-solving. Responses were measured using a five-point Likert scale ranging from "Not at All" to "Very Much Evident."

Prior to data collection, permission to conduct the study was secured from the Schools Division Office and respective school heads. The questionnaires were personally administered by the researcher to ensure clarity of instructions and accuracy of responses. Completed instruments were retrieved, checked for completeness, and systematically encoded for statistical analysis. Ethical considerations were observed by ensuring voluntary participation, confidentiality of responses, and proper handling of data.

The statistical tools utilized in the analysis included frequency count and percentage to describe respondent distribution, weighted mean to determine the extent of utilization and impact, and rank order to identify priority areas. To test the significance of differences in rank orders between groups, the Wilcoxon Mann–Whitney U Test was employed. Computed z-values and associated probability values were compared against the 0.05 level of significance to determine whether to accept or reject the null hypotheses. These procedures ensured objective interpretation of data and strengthened the reliability of the study's findings.

## 3. Results and Discussions

*3.1 Extent of Utilization of Technology-Assisted Learning in Teaching TLE*

Table 1: Summary of the Extent of Utilization of Technology-Assisted Learning in Teaching TLE

| Dimension | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Practical Simulations | 4.85 | Very Much Evident | 1 |
| Interactive Platforms | 4.79 | Very Much Evident | 2 |
| Lesson Integration | 4.68 | Very Much Evident | 3 |
| Resource Accessibility | 4.45 | Much Evident | 4 |
| Overall Mean | 4.69 | Very Much Evident | |

As shown in Table 1, the overall utilization of technology-assisted learning in teaching Technology and Livelihood Education (TLE) was Very Much Evident (M = 4.69). Among the four dimensions, Practical Simulations obtained the highest mean (M = 4.85), indicating that teachers extensively use virtual tools and simulation software to replicate real-world technical processes such

as carpentry, sewing, and culinary operations. The prominence of simulations demonstrates strong alignment between digital integration and competency-based instruction, as learners are afforded safe, repeatable, and structured opportunities to practice technical skills.

Interactive Platforms (M = 4.79) and Lesson Integration (M = 4.68) were likewise interpreted as Very Much Evident. These findings indicate that teachers actively integrate digital whiteboards, collaborative documents, learning management systems, gamified elements, and multimedia resources into daily instruction. Such integration enhances learner participation, facilitates real-time feedback, and strengthens the connection between theoretical instruction and practical application. Resource Accessibility, although positively rated (M = 4.45), ranked lowest, suggesting that while digital materials are generally available, disparities in access and infrastructure remain.

*3.2 Test of Significant Difference on Utilization Across Groups*

Table 2: Wilcoxon Mann–Whitney U Test on Utilization Dimensions

| Dimension | Computed z | p-value | Decision on $H_0$ | Interpretation |
|---|---|---|---|---|
| Lesson Integration | -1.44 | 0.0749 | Accepted | Not Significant |
| Practical Simulations | -0.57 | 0.2843 | Accepted | Not Significant |
| Interactive Platforms | -0.98 | 0.1635 | Accepted | Not Significant |
| Resource Accessibility | -1.70 | 0.0446 | Rejected | Significant |

Inferential analysis revealed no significant differences in Lesson Integration, Practical Simulations, and Interactive Platforms ($p > 0.05$), indicating consistent perceptions across school classifications. This suggests that teachers, regardless of school size, demonstrate relatively uniform implementation of digital instructional strategies in these areas.

However, Resource Accessibility yielded a significant difference ($p < 0.05$), indicating disparities between groups in access to digital libraries, repositories, internet connectivity, and specialized tools. This variation underscores structural inequalities in ICT infrastructure. While pedagogical practices may be comparable, the enabling technological environment differs, influencing the degree to which technology-assisted learning can be maximized.

3.3 Extent of the Impact of Technology-Assisted Learning on Academic Performance and Skill Acquisition

Table 3: Extent of the Impact of Technology-Assisted Learning on Learners

| Impact Domain | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Critical Thinking & Problem-Solving | 4.76 | Very Much Evident | 1 |
| Knowledge Retention & Mastery | 4.74 | Very Much Evident | 2 |
| Engagement | 4.71 | Very Much Evident | 3 |
| Development of Technical Skills | 4.69 | Very Much Evident | 4 |
| Overall Mean | 4.73 | Very Much Evident | |

The findings reveal that technology-assisted learning has a Very Much Evident impact on learners' academic performance and skill acquisition (M = 4.73). Critical Thinking and Problem-Solving ranked highest (M = 4.76), indicating that digital case studies, simulations, collaborative brainstorming platforms, and scenario-based tasks challenge learners to analyze information, troubleshoot issues, and devise informed solutions. This reflects technology's capacity to cultivate higher-order cognitive skills essential for industry readiness.

Knowledge Retention and Mastery (M = 4.74) also received a very high rating, suggesting that multimedia presentations, interactive quizzes, and personalized feedback systems enhance learners' ability to recall and apply concepts. Engagement (M = 4.71) indicates that technology increases learner motivation, enthusiasm, and active participation, reducing passivity during lessons. Development of Technical Skills (M = 4.69) confirms that virtual tools and adaptive platforms strengthen hands-on competencies aligned with current industry standards.

*3.4 Test of Significant Difference on Impact Across Groups*

Table 4: Wilcoxon Mann–Whitney U Test on Impact Domains

| Impact Domain | Computed z | p-value | Decision on $H_0$ | Interpretation |
|---|---|---|---|---|
| Knowledge Retention & Mastery | -1.74 | 0.0409 | Rejected | Significant |
| Development of Technical Skills | -2.34 | 0.0096 | Rejected | Significant |
| Engagement | -2.34 | 0.0096 | Rejected | Significant |
| Critical Thinking & Problem-Solving | -1.63 | <0.05 | Rejected | Significant |

The inferential results indicate significant differences across all impact domains ($p < 0.05$). This suggests that the perceived effectiveness of technology-assisted learning varies across school classifications. Contextual variables such as digital infrastructure, teacher expertise, institutional support, and learner access may influence the magnitude of observed outcomes.

The presence of significant differences in impact, contrasted with mostly non-significant differences in utilization, implies that while teachers may implement technology similarly, the quality and depth of its outcomes depend heavily on contextual readiness

and resource availability. Schools with stronger ICT support systems may experience more substantial gains in learner performance.

The findings collectively affirm that technology-assisted learning is deeply embedded in TLE instruction and plays a transformative role in enhancing both cognitive and technical competencies. Practical simulations and interactive platforms emerge as dominant strategies, reflecting a shift toward experiential and learner-centered pedagogy. Technology not only supports content mastery but also strengthens engagement and analytical thinking, which are central to 21st-century education.

Nevertheless, disparities in resource accessibility and significant variations in impact highlight systemic challenges that require strategic intervention. Effective technology integration must be supported by equitable infrastructure investment, continuous teacher training, and institutional monitoring mechanisms. While utilization is already strong, sustaining and equalizing its impact remains the critical next step for policy and educational leadership.

## 4. Conclusions and Implications

### *4.1 Conclusions*

The findings of this study establish that technology-assisted learning is extensively integrated in the teaching of Technology and Livelihood Education (TLE) in Public Junior High Schools in Labo West District. The overall extent of utilization was found to be Very Much Evident, particularly in the areas of practical simulations, interactive platforms, and lesson integration. These results indicate that teachers are actively leveraging digital tools to enhance instructional delivery, create experiential learning environments, and bridge theoretical concepts with real-world applications. Practical simulations, in particular, emerged as the most dominant dimension, reflecting a strong alignment between digital innovation and competency-based skill development in TLE.

The study further concludes that technology-assisted learning exerts a substantial positive impact on learners' academic performance and skill acquisition. Knowledge retention, engagement, development of technical skills, and critical thinking and problem-solving were all rated as Very Much Evident, demonstrating that technology not only strengthens cognitive mastery but also enhances higher-order thinking and hands-on competencies. The integration of multimedia resources, digital feedback systems, simulations, and collaborative platforms appears to foster active participation and deeper understanding, thereby contributing to learner readiness for industry and lifelong learning.

However, while utilization across most dimensions showed no significant differences among school groups, resource accessibility revealed a statistically significant disparity. This suggests that although teachers may apply similar digital strategies, inequities in technological infrastructure and access persist. Moreover, significant differences were observed in the perceived impact of technology across groups, indicating that contextual factors such as resource availability, connectivity, and institutional support influence educational outcomes. These findings underscore that effective technology integration is not solely dependent on pedagogical practice but also on systemic and infrastructural readiness.

Overall, the study concludes that technology-assisted learning serves as a transformative mechanism in TLE instruction, enhancing both teaching strategies and learner outcomes. Nonetheless, to achieve equitable and sustained impact, technology integration must be supported by comprehensive policy implementation, infrastructure development, and continuous professional capacity building. The effectiveness of digital innovation in education ultimately depends on the synergy between instructional competence and structural support systems.

### *4.2 Implications*

The findings carry significant implications for educational policy, instructional leadership, and program development. At the policy level, there is a critical need for the Department of Education and Local Government Units to prioritize equitable ICT infrastructure distribution. The significant disparity observed in resource accessibility highlights the urgency of investing in reliable internet connectivity, digital libraries, simulation software, and updated hardware across schools, particularly in smaller or under-resourced institutions. Strengthening infrastructure will ensure that technology-assisted learning yields consistent benefits regardless of school classification.

From an instructional perspective, sustained professional development is essential. Although teachers demonstrate strong utilization of simulations and interactive tools, ongoing training should focus on maximizing the pedagogical depth of digital platforms, particularly in assessment analytics, differentiated instruction, and advanced simulation design. Capacity-building programs should move beyond technical orientation and emphasize strategic digital pedagogy that integrates cognitive, technical, and problem-solving competencies within TLE curricula.

School leadership also plays a pivotal role in institutionalizing effective technology integration. Administrators should embed digital innovation within school improvement plans, establish monitoring frameworks to evaluate instructional impact, and foster collaborative professional learning communities where teachers share best practices. Structured supervision and mentoring systems can further ensure that technology is not used superficially but is aligned with curriculum standards and industry competencies.

Finally, the study has implications for future research and curriculum development. Curriculum writers should incorporate structured simulation-based modules, gamification strategies, and performance-based digital assessments aligned with real-world industry practices. Future research may explore longitudinal impacts of technology-assisted learning on employment readiness, comparative analyses across regions, or qualitative investigations into learner experiences. By advancing both empirical inquiry and policy refinement, educational stakeholders can maximize the transformative potential of technology-assisted learning in TLE and beyond.

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