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TEACHERS' DIGITAL COMPETENCE AND ITS INFLUENCE ON THE EFFECTIVENESS OF TECHNOLOGY-ENHANCED LEARNING

Amor D. Pendaliday
Director III / Provincial Director
TESDA
Sarangani, General Santos City, Philippines
Email: a.pendaliday@gmail.com

Dr. Aarav Sharma
Associate Professor, Department of Education
University of Delhi
New Delhi, India
Email: aarav.sharm@iiei.edu.in

Corresponding Author

Amor D. Pendaliday
Director III / Provincial Director
TESDA
Sarangani, General Santos City, Philippines
Email: a.pendaliday@gmail.com

Abstract

The transition toward digital-first educational landscapes has altered pedagogical mandates, requiring public school teachers to integrate complex technology into everyday learning. In the Philippines, this transition is mediated by the progressive rollout of the MATATAG Curriculum, which explicitly identifies digital literacy as a key 21st-century skill. However, public schools struggle with infrastructure disparities and training gaps, necessitating a rigorous assessment of how specific dimensions of educators' digital competence influence classroom outcomes.

This study evaluated the level of digital competence among public school teachers in San Leonardo, Nueva Ecija, and examined its direct influence on the perceived effectiveness of technology-enhanced learning (TEL).

Using descriptive-correlational and causal-comparative research designs, the investigation collected data from 180 public elementary and secondary school teachers selected using the Taro Yamane sampling formula. The research instrument was adapted from the European Framework for the Digital Competence of Educators (DigCompEdu) and standardized technology-enabled active learning inventories. Data were analyzed using descriptive statistics, Pearson product-moment correlation, multiple linear regression, and analysis of variance (ANOVA).

The findings revealed high levels of digital competence (Mean = 3.746, SD = 0.404) and TEL effectiveness (Mean = 3.808, SD = 0.362). A strong, statistically significant positive correlation was established between overall digital competence and TEL effectiveness ($r = 0.785$, $p < 0.001$). Multiple linear regression analysis ($R^2 = 0.623$, F(6,

Volume 1 Issue 3 Pages 158-190

173) = 47.598, $p < 0.001$) indicated that facilitating learners' digital competence ($\beta = 0.174$, $p < 0.001$), empowering learners ($\beta = 0.156$, $p = 0.009$), and professional engagement ($\beta = 0.146$, $p = 0.035$) were the primary predictors of instructional effectiveness. Bivariate analyses demonstrated that while age, gender, and tenure did not yield significant differences, structural variables such as professional position ($p < 0.001$) and cumulative ICT training attended ($p < 0.001$) significantly influenced competence and instructional outcomes.

The investigation finds that teachers' digital competence is a strong predictor of the effectiveness of technology-enhanced learning, with student-centered dimensions exerting the greatest predictive power.

Professional development plans must transition from generic device-centric workshops toward advanced pedagogical applications, student-led digital content creation, and equitable digital facilitation models to support the MATATAG Curriculum's educational objectives.

Keywords: *Digital Competence, Technology-Enhanced Learning, DigCompEdu, MATATAG Curriculum, Public School Educators, Philippines*

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Volume 1 Issue 3 Pages 158-190

1. Introduction

The integration of instructional technology has fundamentally reorganized global education systems, transforming digital competency from an auxiliary pedagogical skill into a foundational pillar of educational quality. Contemporary educational environments demand that academic staff possess the capabilities to manage virtual systems, execute remote and blended learning frameworks, and integrate artificial intelligence to optimize classroom outcomes. Globally, international organizations have recognized the need to institutionalize standards for educators' technological capabilities. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) reports that approximately 86% of nations have integrated digital competency standards directly into their national teacher frameworks. This global consensus reflects a shift from viewing technology as a supplementary resource to recognizing it as an active agent in cognitive development and student engagement.

In Southeast Asia, educational frameworks are increasingly aligned with international digitalization standards. Under the guidance of the Southeast Asian Ministers of Education Organization (SEAMEO), member countries have prioritized developing resilient, future-ready educational frameworks. Emerging economies such as Thailand, Vietnam, and Indonesia have adopted specialized rubrics, such as the European Digital Competency Framework for Educators (DigCompEdu), to evaluate and improve teachers' proficiency. Regional assessments indicate that while basic technical literacy is common among Southeast Asian educators, significant gaps persist in advanced competencies, including digital content creation, digital safety, and specialized pedagogical integration. These regional disparities highlight the ongoing challenges of transforming technical access into meaningful learning outcomes across diverse socio-demographic contexts.

In the Philippines, the Department of Education (DepEd) has initiated programmatic changes to modernize basic education. On August 10, 2023, DepEd launched the MATATAG Curriculum to address systemic challenges such as content overload, weak foundational skills, and declining national academic performance. The MATATAG Curriculum focuses on integrating 21st-century skills, with a priority on media, technology, and information literacy. This curriculum reform is supported by the EdTech Omnibus Policy from the Bureau of Learning and Delivery, which coordinates educational technology initiatives to support foundational literacy and numeracy.

Furthermore, DepEd Order No. 003, s. 2026, titled "Foundational Guidelines on Artificial Intelligence in Basic Education," highlights the national commitment to strengthening professional development in digital literacy and AI integration. National training initiatives, such as the National Educators Academy of the Philippines (NEAP) collaboration with Canva Philippines, titled "Teaching with Impact: Using Canva Education and AI to Transform Learning," aim to equip educators with the skills needed to design student-centered, technology-mediated instructional materials. Despite these initiatives, public school educators face persistent challenges, including uneven access to digital infrastructure, limited formal training, and varying levels of technological readiness.

In the province of Nueva Ecija, local schools reflect the broader challenges of the national educational system. This study focuses on San Leonardo, a first-class municipality in Nueva Ecija composed of 15 barangays, which operates 12 public elementary schools and 6 public secondary schools under the Schools Division of Nueva Ecija. While classified as first-class, San Leonardo's public schools face resource challenges that affect curriculum implementation. Remote areas like Barangay Mambangnan and Barangay Tambo Adorable struggle with teacher shortages and multi-grade teaching setups that limit individualized instruction.

Low-income areas, including Castellano and Magpapalayok, deal with overcrowded classrooms and inadequate digital infrastructure. Additionally, local schools must navigate political pressures during election seasons in politically active barangays like San Anton and Diversion, which can affect institutional stability. Historically, schools such as San Leonardo Central School and Mallorca Elementary School have relied on localized learning communities, such as District Learning Action Cell (LAC) sessions, to address professional development gaps. However, these sessions often focus on basic administrative compliance rather than advanced digital pedagogical training.

Volume 1 Issue 3 Pages 158-190

Research Gap

While literature exists on general ICT challenges in K–12 education and broad stakeholder perceptions of the MATATAG curriculum, there is a critical shortage of studies examining how the specific sub-dimensions of the DigCompEdu framework influence technology-enhanced learning (TEL) effectiveness within rural-urban transitional public-school districts undergoing the phased MATATAG rollout. Existing studies are either device-centric or analyze higher education settings, leaving the public basic education sector in agricultural-industrial municipalities like San Leonardo unexamined. There is an urgent need to empirically identify which specific competence domains—such as digital content creation or student empowerment—actually drive instructional success, rather than assuming that generic digital proficiency automatically yields effective learning.

Problem Statement

Despite national policies supporting educational digitalization in the Philippines, public school teachers face a significant gap between curriculum expectations and classroom realities. The introduction of the MATATAG Curriculum and AI integration mandates requires educators to utilize digital tools effectively. However, many teachers in rural and semi-urban settings, such as those in San Leonardo, Nueva Ecija, struggle to transition from basic digital literacy to pedagogically grounded digital competence.

While teachers may possess foundational computer literacy, their ability to apply digital tools to enhance learner engagement, personalize instruction, and provide effective feedback remains limited. Furthermore, there is insufficient empirical evidence examining how specific dimensions of teachers' digital competence—particularly when mapped against the European DigCompEdu framework—influence the practical effectiveness of technology-enhanced learning in Philippine public schools. This research addresses this gap by analyzing the relationships between these variables in a socio-demographically diverse municipality.

Research Objectives

The primary objective of this study was to evaluate the digital competence of public school teachers in San Leonardo, Nueva Ecija, and to determine its influence on the effectiveness of technology-enhanced learning (TEL). Specifically, this study aimed to:

1. Describe the socio-demographic profile of the teacher-respondents in terms of gender, age, professional position, educational attainment, length of service, and frequency of ICT training attended.

2. Determine the self-reported digital competence levels of the respondents across the six domains of the DigCompEdu framework: Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence.

3. Assess the perceived effectiveness of technology-enhanced learning in the respondents' classrooms in terms of Pedagogical Alignment, Learner Engagement, Instructional Utility, and Assessment Feedback.

4. Investigate if a significant relationship exists between the respondents' digital competence domains and the perceived effectiveness of technology-enhanced learning.

5. Identify which digital competence domains significantly predict the overall effectiveness of technology-enhanced learning.

6. Determine if there are significant differences in the respondents' digital competence and perceived TEL effectiveness when grouped according to their socio-demographic profile.

Volume 1 Issue 3 Pages 158-190

Research Questions

To achieve the research objectives, the study addressed the following research questions:

1. What is the socio-demographic profile of the respondents in terms of gender, age, professional position, educational attainment, length of service, and frequency of ICT training?
2. What is the level of digital competence among the respondents across the six DigCompEdu domains?
3. What is the perceived level of technology-enhanced learning effectiveness in terms of its four primary domains?
4. Is there a significant relationship between teachers' digital competence and the perceived effectiveness of technology-enhanced learning?
5. Which domains of digital competence significantly predict the effectiveness of technology-enhanced learning?
6. Are there significant differences in teachers' digital competence and perceived TEL effectiveness based on their socio-demographic profiles?

Hypotheses

The study tested the following null hypotheses at a .05 level of significance:

- **$H_0$1**: There is no significant relationship between the domains of teachers' digital competence and the perceived effectiveness of technology-enhanced learning.
- **$H_0$2**: None of the digital competence domains significantly predict the perceived effectiveness of technology-enhanced learning.
- **$H_0$3**: There are no significant differences in teachers' digital competence and perceived TEL effectiveness when respondents are grouped by their socio-demographic profiles.

Significance of the Study

This study contributes to educational practice and policy by providing empirical data on digital integration under the MATATAG Curriculum framework. For Department of Education policymakers, the findings offer insight into structural training needs, helping guide resource allocation and professional development planning. For school heads and district supervisors, the study identifies specific areas of pedagogical need, allowing for more targeted instructional leadership and localized Learning Action Cell (LAC) sessions. For classroom teachers, this research provides a self-reflective framework to assess their digital skills and transition toward student-centered digital instruction. Finally, for educational researchers, this study offers a validated quantitative model examining the interaction between teacher competency and classroom technology effectiveness in rural and semi-urban Philippine public schools.

Scope and Delimitation

This study was delimited to public school teachers within the district of San Leonardo, Schools Division of Nueva Ecija, during the 2025–2026 school year. The sample comprised 180 public elementary and secondary school educators. The study focused on assessing digital competence using the six domains of the European DigCompEdu framework and evaluating TEL effectiveness across four dimensions: Pedagogical Alignment, Learner Engagement, Instructional Utility, and Assessment Feedback.

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www.jasdg.com
Volume 1 Issue 3 Pages 158-190

The study did not evaluate students' academic performance or examine technical infrastructure specifications. It relied on self-reported survey data supplemented by administrative demographic profiles. Private school teachers, alternative learning system (ALS) implementers, and higher education faculty were excluded to maintain focus on the public basic education sector under the MATATAG Curriculum framework.

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Volume 1 Issue 3 Pages 158-190

Review of Related Literature

Reference Frameworks: DigCompEdu and TPACK

The theoretical definition of educator digital competence has evolved from basic mechanical software literacy to a complex framework that integrates technology, content, and pedagogy. Koehler and Mishra's Technological Pedagogical Content Knowledge (TPACK) framework historically dominated this space, emphasizing that effective instruction occurs at the intersection of Content Knowledge, Pedagogical Knowledge, and Technological Knowledge. However, while TPACK conceptualizes the overlapping knowledge domains required for integration, it often lacks operational granularity for diagnostic professional development.

To address this, the European Framework for the Digital Competence of Educators (DigCompEdu) was introduced, providing a target model comprised of 6 domains and 22 competence indicators. DigCompEdu shifts the focus from general technological knowledge to specific professional and pedagogical actions: Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence.

Recent literature highlights the ongoing efforts to integrate and adapt these frameworks to meet regional demands. For instance, Jiang and Yu (2024) discuss the evolving nature of digital competence, emphasizing that modern frameworks must account for active content creation, collaborative learning, and ethical digital participation rather than mere resource selection. Empirical reviews by Quindemil-Torrijo et al. (2026) and Ruiz-Cabezas et al. (2020) argue that teachers' digital competence is the primary driver of pedagogical innovation in contemporary classrooms, directly supporting more flexible, personalized, and continuously improving instruction.

Nevertheless, regional studies by Althubyani (2024) and Basilotta-Gómez-Pablos et al. (2022) indicate that despite policy support, the average teacher self-reports moderate to low digital competence, particularly when moving beyond basic digital presentation to advanced pedagogical facilitation. This contrast highlights the need to systematically evaluate how these individual competency sub-domains interact with localized instructional realities in transition-state developing nations.

Technology-Enhanced Learning (TEL) and Active Pedagogy

Technology-Enhanced Learning (TEL) refers to the application of information and communication technologies to support, facilitate, and enhance the teaching and learning process. Modern educational paradigms emphasize that the effectiveness of TEL depends on its ability to support active learning, minimize unnecessary cognitive load, and foster collaboration. Under active learning frameworks, simple mobile applications, gamified quizzes, and virtual simulations serve as tools that promote communication, peer dialog, and independent discovery.
A study by Patwardhan et al. (2022) demonstrated that students exposed to structured, technology-enabled active learning contexts displayed greater learning agility and achieved higher academic performance. Similarly, a quantitative investigation in West Bengal school systems reported a 15% to 20% improvement in student achievement when TEL was systematically integrated.

However, the instructional efficacy of TEL is highly context-dependent. Studies by Mt. Nebo Integrated School in Bukidnon and other regional schools show that while students maintain a very high perception of technology's engagement and utility, its direct impact on learning outcomes is heavily mediated by the accessibility and stability of digital resources. Furthermore, if digital tools are integrated without pedagogical alignment, the learning experience can lead to student boredom, cognitive fatigue, and disengagement.

This reinforces the premise of the TPACK and DigCompEdu models: technology cannot act as an automatic enhancement; its educational value is determined by the teacher's ability to align digital tools with instructional goals and active student participation.

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Volume 1 Issue 3 Pages 158-190

The MATATAG Curriculum: A Paradigm Shift in Philippine Basic Education

To address declining student performance in international assessments such as the Program for International Student Assessment (PISA), the Department of Education in the Philippines implemented the MATATAG Curriculum beginning in the 2024–2025 school year. Standing for "Make the curriculum relevant; Take steps to accelerate delivery; Take good care of learners; and Give support to teachers," the MATATAG initiative aims to decongest content overload, strengthen foundational literacy and numeracy, and integrate 21st-century skills directly into classroom practice.

Among these core skills, digital literacy is highlighted as an essential capability that must be integrated across multiple subjects. The implementation guidelines outline a phased rollout, focusing first on Kindergarten, Grade 1, Grade 4, and Grade 7 during the 2024–2025 school year, then expanding to the next tier of grades (Grades 2, 5, and 8) during the 2025–2026 school year.

This curriculum change requires public school teachers to adapt their lesson plans, evaluation techniques, and classroom management strategies to a technology-supported framework.

Recent studies confirm that a strong positive correlation exists between teachers' technological-pedagogical content knowledge and their readiness to implement the MATATAG Curriculum. However, as noted by Camanse et al. (2026), many primary and secondary grade teachers continue to experience pedagogical challenges during this transition due to inconsistent access to resources and varying levels of personal preparation.

The success of the MATATAG Curriculum depends on the capacity of public school educators to transition from generic technology usage to the purposeful, student-centered digital integration required by modern learning environments.

The Digital Divide and Institutional Barriers in Public Schools

The successful integration of technology-enhanced learning in developing countries faces systemic challenges related to the digital divide. The digital divide exists not only in terms of physical access to hardware but also in the pedagogical and social capabilities required to leverage technology effectively. A systematic review of teacher preparedness under the MATATAG Curriculum by Blando (2025) identified uneven resource distribution, bureaucratic inefficiencies, and inconsistent funding as persistent challenges.

While schools in urban areas often benefit from better digital infrastructure and internet connectivity, rural and marginalized communities continue to experience digital exclusion. In the local context of San Leonardo, Nueva Ecija, these challenges are evident in remote and low-income barangays.

Due to localized teacher shortages, many educators handle heavy teaching loads and multi-grade classes, which limits their capacity to participate in specialized professional development.

Furthermore, although DepEd's in-service training (INSET) sessions are provided, public school teachers frequently report that these programs focus on administrative compliance rather than advanced pedagogical ICT applications.

These challenges can create anxiety and resistance among educators, hindering their confidence and limiting the effective implementation of digital learning strategies in the classroom.

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Volume 1 Issue 3 Pages 158-190

Theoretical Framework

This study is grounded in three educational and technological theories: the Technological Pedagogical Content Knowledge (TPACK) framework, the Technology Acceptance Model (TAM), and Locsin's Technological Competency as Caring in Nursing Theory, adapted for educational settings.

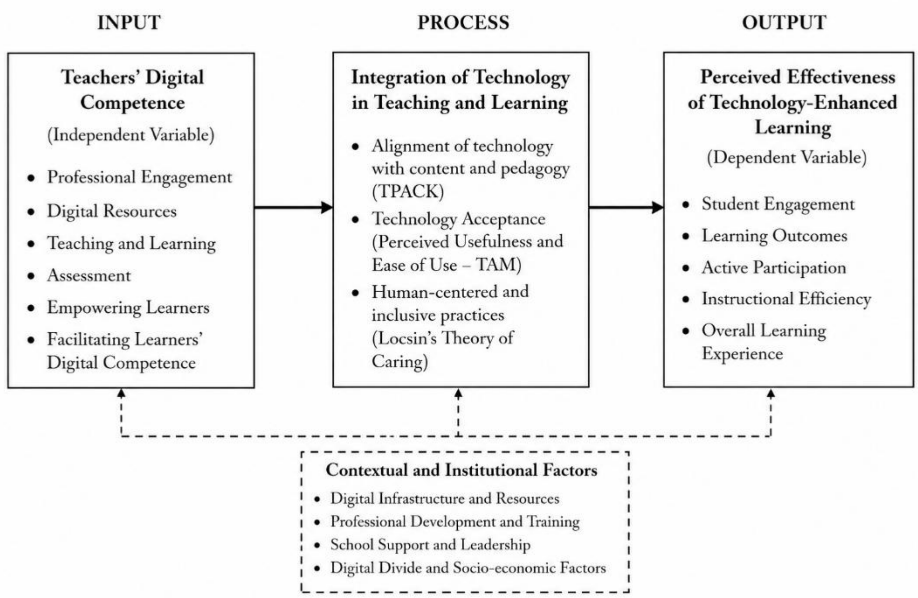
The TPACK framework, developed by Koehler and Mishra, serves as the primary conceptual foundation. This model argues that effective technology integration requires more than technical proficiency; it demands an understanding of how technology, pedagogy, and content knowledge interact. In basic education, particularly under the MATATAG Curriculum, teachers must align technological tools with specific learning objectives and pedagogical strategies to make complex content accessible. The TPACK framework supports this study by explaining how teachers' technological knowledge translates into effective classroom learning experiences.

The Technology Acceptance Model (TAM), formulated by Davis, provides the theoretical basis for analyzing technology adoption. TAM suggests that a user's acceptance and utilization of technology are primarily determined by two cognitive factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Within basic education, teachers' digital competence directly influences their perceptions of technology's usability and value. Digitally competent teachers are more likely to view digital platforms as useful tools that can reduce workloads and improve instruction, leading to more successful integration into daily classroom practices.

Locsin's Technological Competency as Caring Theory, adapted from nursing to educational pedagogy, adds a human-centered dimension to the study. Locsin argues that technological competence is not merely mechanical efficiency but a way of expressing care and support for individuals. In a classroom setting, a teacher's digital competence serves as a means of caring for and supporting diverse learners. Digitally competent educators use technology to create inclusive, accessible, and personalized learning environments, demonstrating responsiveness to students' unique academic and emotional needs. This aligns with Education 5.0 principles, which emphasize human-centered, socially responsible, and ethical applications of technology.

Conceptual Framework

The conceptual design of this study is structured around an Input-Process-Output paradigm, analyzing teachers' digital competence as the independent variable and the perceived effectiveness of technology-enhanced learning as the dependent variable. The conceptual architecture is illustrated below:



This framework proposes that teachers' digital competence, across its six domains, directly influences the effectiveness of classroom technology integration. The process of selecting, designing, and implementing digital tools is expected to determine the pedagogical quality, engagement levels, instructional value, and feedback mechanisms of technology-enhanced learning. The model also controls for socio-demographic variables (such as position and training) to determine if structural factors significantly affect these primary constructs.

Research Hypotheses

- H_01: There is no significant relationship between the domains of teachers' digital competence and the perceived effectiveness of technology-enhanced learning.
- H_02: None of the digital competence domains significantly predict the perceived effectiveness of technology-enhanced learning.
- H_03: There are no significant differences in teachers' digital competence and perceived TEL effectiveness when respondents are grouped by their socio-demographic profiles.

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Volume 1 Issue 3 Pages 158-190

Methodology

Research Design

This study utilized a quantitative research approach, employing descriptive-correlational and causal-comparative designs. The descriptive design was used to systematically measure respondents' demographic profiles, self-reported levels of digital competence, and perceptions of the effectiveness of technology-enhanced learning. The correlational design analyzed the relationship between digital competence domains and TEL effectiveness. The causal-comparative design evaluated the predictive value of digital competence domains and examined differences in the primary variables across various socio-demographic groups.

Locale of the Investigation

The study was conducted in the municipality of San Leonardo, located in the southern part of the Province of Nueva Ecija, Region III (Central Luzon), Philippines. San Leonardo is a first-class municipality subdivided into 15 barangays. The educational landscape consists of 12 public elementary schools and 6 public secondary schools under the administrative supervision of the DepEd Schools Division of Nueva Ecija. The region is an important site of study due to its combination of urbanized municipal centers and remote rural barangays, which exhibit diverse socioeconomic conditions and varying levels of technological infrastructure in schools.

Population and Sample Selection

The target population consisted of all active public basic education teachers in the district of San Leonardo, estimated at approximately 330 educators during the 2025–2026 school year. To establish statistical representation, the sample size was calculated using the Taro Yamane sampling formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

- N represents the total teacher population size (330)
- e represents the acceptable margin of error (0.05)

Applying the formula:

$$n = \frac{330}{1+330(0.05)^2} = \frac{330}{1.825} \approx 180.8$$

The calculation indicated a minimum sample size of 180 respondents. A stratified random sampling technique was used to select participants across the 18 public schools in San Leonardo, ensuring proportionate representation based on school level (elementary vs. secondary) and teacher assignments.

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Volume 1 Issue 3 Pages 158-190

Research Instrument

The study utilized a structured survey instrument composed of three main sections:

Section A: Socio-Demographic Profile

This section gathered data on gender, age, professional position, educational attainment, length of service, and frequency of ICT training sessions attended.

Section B: Teachers' Digital Competence Scale

This scale was adapted from the European Digital Competency Framework for Educators (DigCompEdu). It consists of 24 items distributed across six domains:

1. *Professional Engagement (PE):* Evaluates communication, collaboration, and reflective practice using digital tools.
2. *Digital Resources (DR):* Measures skills in sourcing, creating, and sharing digital learning content.
3. *Teaching and Learning (TL):* Assesses the design and implementation of technology-supported instruction.
4. *Assessment (AS):* Measures the use of digital tools for formative and summative evaluation.
5. *Empowering Learners (EL):* Evaluates accessibility, differentiation, and student engagement strategies.
6. *Facilitating Learners' Digital Competence (FL):* Measures how teachers support students' digital literacy and safety.

Section C: Technology-Enhanced Learning (TEL) Effectiveness Scale

This 16-item scale was adapted from technology-enabled active learning inventories and educational technology evaluation indexes. It measures four domains:

1. *Pedagogical Alignment (PA):* Evaluates the integration of technology with curriculum objectives.
2. *Learner Engagement (LE):* Measures students' active participation, motivation, and collaboration.
3. *Instructional Utility (IU):* Evaluates the usability, clarity, and efficacy of digital platforms.
4. *Assessment Feedback (AF):* Assesses the quality, speed, and responsiveness of digital evaluation.

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AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 3 Pages 158-190

Both Section B and Section C utilized a 5-point Likert response scale, interpreted through the following range framework:

Mean Range	Competence Verbal Interpretation	Effectiveness of Verbal Interpretation
4.21 – 5.00	Highly Competent / Proficient	Extremely Effective
3.41 – 4.20	Competent	Highly Effective
2.61 – 3.40	Moderately Competent	Moderately Effective
1.81 – 2.60	Minimally Competent	Minimally Effective
1.00 – 1.80	Incompetent	Ineffective

Instrument Validity and Reliability

To ensure construct and content validity, the adapted research instrument was reviewed by a panel of three experts in curriculum instruction, educational technology, and measurement evaluation from a state university in Central Luzon. The panel evaluated the questionnaire's alignment with research objectives, clarity, and contextual suitability for the MATATAG Curriculum, resulting in a Content Validity Index (CVI) of 0.92.
A pilot test was conducted with 30 public school teachers from a neighboring district (who were excluded from the final sample) to evaluate the internal consistency of the scales. The reliability analysis yielded high Cronbach's Alpha coefficients for all subscales, confirming strong internal reliability:

- Digital Competence Scale (24 items): $\alpha = 0.88$
- Technology-Enhanced Learning Scale (16 items): $\alpha = 0.85$

Data Gathering Procedure

Administrative approvals were secured from the Schools Division Superintendent of Nueva Ecija and the District Supervisor of San Leonardo. Upon receiving approval, coordination meetings were held with school heads across the 18 target public schools to schedule data collection. Surveys were administered through a hybrid approach: digital links using Google Forms were provided to schools with stable internet access, while printed questionnaires were distributed in remote schools.

Participants received a clear overview of the study's objectives and completed an informed consent form before answering the survey. Data collection was conducted over a four-week period during the second quarter of the 2025–2026 school year. The gathered questionnaires were compiled, checked for completeness, and prepared for statistical analysis.

Ethical Considerations

The study adhered to national research ethics protocols and the guidelines of the Data Privacy Act of 2012 (Republic Act No. 10173). Formal authorization was obtained from all participating educational institutions. A clear statement on the survey cover sheet informed participants of the study's purpose, their voluntary participation, and their right to withdraw at any stage without consequence.
Anonymity was maintained throughout the process; no personal identification information was collected, and numeric codes were assigned to all data entries. Data sheets were stored securely in password-protected cloud databases, accessible only to the primary researchers. The physical surveys were shredded after data encoding.

Statistical Treatment

The gathered data were analyzed using SPSS Version 28.0 and Python statistical libraries, utilizing both descriptive and inferential statistics:

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Advancing Knowledge. Inspiring Innovation. Achieving the SDGs.
Volume 1 Issue 3 Pages 158-190
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
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Percentage Distribution

Used to analyze the demographic profile of the respondents.

$$P = \left(\frac{f}{N}\right) x\ 100$$

Where P is the percentage, f is the frequency of occurrence, and N is the total sample size (180).

Weighted Mean

Utilized to measure the levels of digital competence and perceived technology-enhanced learning effectiveness.

$$\bar{X} = \frac{\Sigma(f \cdot w)}{N}$$

Where $\bar{X}$ represents the weighted mean, f represents the frequency of responses, and w represents the assigned Likert scale weight (from 1 to 5).

Standard Deviation

Employed to assess the dispersion of responses around the calculated weighted mean.

$$SD = \sqrt{\frac{\sum(X - \bar{X})^2}{N - 1}}$$

Where SD represents the standard deviation, X represents individual score values, and bar{X} represents the weighted mean.

Pearson Product-Moment Correlation (r)
Used to evaluate the strength and direction of the linear relationship between teachers' digital competence domains and the perceived effectiveness of technology-enhanced learning.

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

Where X and Y represent the paired variable mean values of the respondents.

Multiple Linear Regression (Ordinary Least Squares)

Conducted to determine if the six digital competence domains significantly predict perceived TEL effectiveness, utilizing the model:

$$Y = \beta_0 + \beta_1(PE) + \beta_2(DR) + \beta_3(TL) + \beta_4(AS) + \beta_5(EL) + \beta_6(FL) + \epsilon$$

Where Y is the predicted Overall TEL Effectiveness score, β_0 is the intercept, β_1 to β_6 are the unstandardized regression coefficients, and ϵ represents the error term.

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Advancing Knowledge. Inspiring Innovation. Achieving the SDGs.
Volume 1 Issue 3 Pages 158-190
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
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Independent Samples t-test

Used to compare digital competence and TEL effectiveness levels between male and female respondents.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}}}$$

Where $\bar{X}_1$ and $\bar{X}_2$ represent the subgroup means, ${s_1}^2$ and ${s_2}^2$ are the variances, and n_1 and n_2 are the sample sizes.

One-Way Analysis of Variance (ANOVA)

Applied to identify significant differences in the primary constructs when respondents were grouped by age, position, educational attainment, tenure, and ICT training attended, followed by post-hoc comparisons where appropriate.

$$F = \frac{MS_{between}}{MS_{within}}$$

Where F is the variance ratio, $MS_{between}$ is the mean square between groups, and MS_{within} is the mean square within groups.

Statistical Results

Demographic Profile of the Respondents

The socio-demographic characteristics of the 180 public school teacher-respondents from San Leonardo, Nueva Ecija, are summarized in Table 1.

Table 1
Socio-Demographic Profile of Respondents (N = 180)

Demographic Variable	Category	Frequency (f)	Percentage (%)
Gender	Female	135	75.00
	Male	45	25.00
Age	21–30 years old	37	20.56
	31–40 years old	59	32.78
	41–50 years old	52	28.89
	50 years old and above	32	17.78
Professional Position	Teacher I	40	22.22
	Teacher II	26	14.44
	Teacher III	90	50.00
	Master Teacher I/II	24	13.33
Educational Attainment	Bachelor's Degree	99	55.00
	Master's Degree (including units)	75	41.67
	Doctorate Degree (including units)	6	3.33
Length of Service (Tenure)	0–3 years	24	13.33
	4–10 years	45	25.00
	11–15 years	70	38.89
	More than 15 years	41	22.78

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Volume 1 Issue 3 Pages 158-190

ICT Training Attended	0–1 session	116	64.44
	2–3 sessions	36	20.00
	4–5 sessions	22	12.22
	More than 5 sessions	6	3.33

The demographic analysis indicates that female teachers represent three-quarters of the sample (75.00%), reflecting national trends in basic education where women are highly represented in the teaching workforce. The age distribution shows that the largest segment of respondents falls within the 31–40 age bracket (32.78%), followed by the 41–50 group (28.89%), suggesting a stable, mid-career teaching force.

In terms of professional rank, half of the respondents are Teacher III (50.00%), while Teacher I and Teacher II represent 22.22% and 14.44%, respectively, and Master Teachers account for 13.33%. For educational attainment, 55.00% of the sample hold a bachelor's degree, while a significant portion (41.67%) has pursued postgraduate education at the master's level, indicating a strong commitment to professional development. The tenure data align with the age distribution, with 61.67% of the teachers having served for over ten years.

Notably, the ICT training data reveal a significant professional development gap: 64.44% of respondents reported attending only 1 or 0 ICT training sessions during the school year, indicating a potential concern for institutional professional development programs.

Teachers' Digital Competence Levels

The self-reported digital competence levels of the respondents across the six domains of the DigCompEdu framework are presented in Table 2.

Table 2
Respondents' Digital Competence Across DigCompEdu Domains (N = 180)

DigCompEdu Competence Domain	Mean	Standard Deviation (SD)	Verbal Interpretation	Rank
Professional Engagement (PE)	3.908	0.457	Competent	1
Teaching and Learning (TL)	3.884	0.448	Competent	2
Digital Resources (DR)	3.743	0.456	Competent	3
Assessment (AS)	3.707	0.461	Competent	4
Empowering Learners (EL)	3.645	0.476	Competent	5
Facilitating Learners' Digital Competence (FL)	3.587	0.493	Competent	6
Overall Digital Competence	**3.746**	**0.404**	**Competent**	

The respondents demonstrated an overall mean digital competence score of 3.746 (SD = 0.404), which falls within the "Competent" range. An analysis of the individual domains shows that teachers scored highest in *Professional Engagement* (Mean = 3.908, SD = 0.457) and *Teaching and Learning* (Mean = 3.884, SD = 0.448). These results indicate that teachers feel confident using digital communication platforms for administrative purposes, engaging in school-level collaboration, and utilizing basic presentation tools during instruction.

In contrast, the lowest scores were observed in *Empowering Learners* (Mean = 3.645, SD = 0.476) and *Facilitating Learners' Digital Competence* (Mean = 3.587, SD = 0.493). These lower scores suggest that while teachers are comfortable managing their own digital activities, they face challenges in implementing student-centered digital strategies, addressing accessibility needs, and guiding student-led digital content creation in the classroom.

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Volume 1 Issue 3 Pages 158-190

Technology-Enhanced Learning (TEL) Effectiveness

Table 3 summarizes the perceived effectiveness of technology-enhanced learning across its four primary domains.

Table 3
Perceived Effectiveness of Technology-Enhanced Learning (N = 180)

TEL Effectiveness Domain	Mean	Standard Deviation (SD)	Verbal Interpretation	Rank
Instructional Utility (IU)	3.887	0.399	Highly Effective	1
Pedagogical Alignment (PA)	3.867	0.380	Highly Effective	2
Learner Engagement (LE)	3.782	0.405	Highly Effective	3
Assessment Feedback (AF)	3.696	0.434	Highly Effective	4
Overall TEL Effectiveness	**3.808**	**0.362**	**Highly Effective**	

The perceived effectiveness of technology-enhanced learning achieved an overall mean score of 3.808 (SD = 0.362), representing a "Highly Effective" assessment. The highest scores were recorded for *Instructional Utility* (Mean = 3.887, SD = 0.399) and *Pedagogical Alignment* (Mean = 3.867, SD = 0.380). This suggests that educators believe technology platforms are useful for presenting content and that they align well with the MATATAG Curriculum standards.

However, *Learner Engagement* (Mean = 3.782, SD = 0.405) and *Assessment Feedback* (Mean = 3.696, SD = 0.434) received lower scores. This indicates that while educational tools are viewed as structurally aligned and functional, their use in facilitating interactive student collaboration and providing responsive digital feedback is less developed.

Correlational Analysis
To test the first null hypothesis (H_01), Pearson product-moment correlation coefficients were calculated to examine the relationships between teachers' digital competence domains and the perceived effectiveness of technology-enhanced learning. The correlation matrix is presented in Table 4.

Table 4
Pearson Correlation Matrix Between DigCompEdu Domains and TEL Effectiveness (N = 180)

Variables	PE	DR	TL	AS	EL	FL	Overall DC	Overall TEL
PE	1.000	0.727	0.786	0.727	0.722	0.682	0.890	0.703
DR		1.000	0.753	0.682	0.710	0.643	0.865	0.660
TL			1.000	0.757	0.739	0.671	0.901	0.680
AS				1.000	0.689	0.661	0.866	0.675
EL					1.000	0.633	0.863	0.689
FL						1.000	0.828	0.680
Overall DC							1.000	**0.785****
Overall TEL								1.000

Note. All correlations are significant at the p < 0.01 level (2-tailed).

The correlational analysis shows strong, positive, and statistically significant relationships among all variables ($p < 0.01$). The correlation between *Overall Digital Competence* and *Overall TEL Effectiveness* is strong and positive ($r = 0.785$, $p < 0.001$), indicating that higher digital competence is strongly associated with greater perceived instructional effectiveness in the classroom.

Analyzing individual dimensions, *Professional Engagement* showed a strong correlation with overall TEL effectiveness ($r = 0.703$, $p < 0.001$), followed by *Empowering Learners* ($r = 0.689$, $p < 0.001$) and *Teaching and*

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Volume 1 Issue 3 Pages 158-190

Learning (r = 0.680, $p < 0.001$). These findings warrant rejecting the first null hypothesis (H_01), demonstrating that teachers' digital competence and TEL effectiveness are strongly related.

Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to test the second null hypothesis (H_02) and determine which digital competence domains predict overall TEL effectiveness. The regression results are presented in Table 5, and the associated Analysis of Variance (ANOVA) model fit is summarized in Table 6.

Table 5
Multiple Linear Regression of Overall TEL Effectiveness on DigCompEdu Domains (N = 180)

Competence Domain Predictor	Unstandardized Coefficient (B)	Standard Error (SE)	Standardized Beta (β)	t-statistic	p-value	Significance
Intercept (Constant)	1.203	0.159		7.565	< 0.001	Significant
Professional Engagement (PE)	0.146	0.068	0.185	2.130	0.035	Significant
Digital Resources (DR)	0.078	0.063	0.098	1.245	0.215	Insignificant
Teaching and Learning (TL)	0.033	0.074	0.041	0.451	0.653	Insignificant
Assessment (AS)	0.113	0.062	0.144	1.814	0.071	Insignificant
Empowering Learners (EL)	0.156	0.059	0.205	2.636	0.009	Significant
Facilitating Learners' DC (FL)	0.174	0.051	0.237	3.394	< 0.001	Significant

Note. Model Fit Metrics: R = 0.789, R-squared (R^2) = 0.623, Adjusted R-squared = 0.610.

Table 6
Analysis of Variance (ANOVA) for the Linear Regression Model (N = 180)

Model Component	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-statistic	p-value
Regression	14.572	6	2.429	47.598	< 0.001
Residual	8.827	173	0.051		
Total	23.400	179			

The multiple linear regression analysis indicates that the model is statistically significant ($F(6, 173) = 47.598$, $p < 0.001$) and explains 62.3% of the variance in technology-enhanced learning effectiveness ($R^2 = 0.623$, Adjusted $R^2 = 0.610$). This demonstrates that the six domains of the DigCompEdu framework represent strong predictors of classroom TEL effectiveness, explaining nearly two-thirds of its variability. Consequently, the second null hypothesis (H_02) is rejected.

An examination of the standardized coefficients (β) reveals that three competence domains are statistically significant predictors of TEL effectiveness:

1. *Facilitating Learners' Digital Competence (FL):* This domain emerged as the strongest predictor ($\beta = 0.237$, $t = 3.394$, $p < 0.001$). This indicates that a teacher's ability to support students in creating digital

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content and practicing digital safety strongly influences the overall effectiveness of classroom technology integration.

2. *Empowering Learners (EL):* This domain was the second strongest predictor (β = 0.205, t = 2.636, p = 0.009). This suggests that utilizing technology to differentiate instruction, promote accessibility, and support student-centered learning significantly enhances instructional effectiveness.

3. *Professional Engagement (PE):* This domain also represents a significant predictor (β = 0.185, t = 2.130, p = 0.035). This highlights the importance of teachers engaging in digital professional collaboration and reflective practices.

Notably, *Digital Resources (DR)* (β = 0.098, p = 0.215), *Teaching and Learning (TL)* (β = 0.041, p = 0.653), and *Assessment (AS)* (β = 0.144, p = 0.071) were not statistically significant predictors in this model. This indicates that basic content presentation and software management, when isolated, do not drive technology integration effectiveness as strongly as student-centered and collaborative practices.

Demographic Group Differences (Comparative Analysis)

To test the third null hypothesis (H_03), independent samples t-tests and One-Way Analysis of Variance (ANOVA) were conducted to examine differences in Overall Digital Competence and Overall TEL Effectiveness across demographic groups. The results are summarized in Table 7.

Table 7
Summary of Demographic Group Differences for Digital Competence and TEL Effectiveness (N = 180)

Grouping Variable	Category Sub-levels	n	DC Mean	DC Test Statistic (F/t)	DC p-value	TEL Mean	TEL Test Statistic (F/t)	TEL p-value
Gender	Female	135	3.730	t = 0.809	0.422	3.806	t = 0.107	0.915
	Male	45	3.794			3.814		
Age	21–30 years old	37	3.769	F = 0.996	0.396	3.842	F = 1.143	0.333
	31–40 years old	59	3.774			3.818		
	41–50 years old	52	3.765			3.838		
	50 years and above	32	3.634			3.703		
Professional	Teacher I	40	3.574	F = 8.577	< **0.001***	3.659	F = 8.776	< **0.001***
Position	Teacher II	26	3.621			3.643		
	Teacher III	90	3.781			3.863		
	Master Teacher	24	4.036			4.030		
Educational	Bachelor's Degree	99	3.672	F = 3.957	**0.021***	3.774	F = 0.995	0.372
Attainment	Master's Degree	75	3.830			3.847		
	Doctorate Degree	6	3.915			3.883		

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Volume 1 Issue 3 Pages 158-190

Length of Service	0–3 years	24	3.667	F = 1.212	0.307	3.712	F = 1.302	0.275
	4–10 years	45	3.764			3.806		
	11–15 years	70	3.709			3.795		
	More than 15 years	41	3.835			3.890		
ICT Training Attended	0–1 session	116	3.588	F = 32.327	< **0.001***	3.698	F = 17.470	< **0.001***
	2–3 sessions	36	3.867			3.881		
	4–5 sessions	22	4.252			4.197		
	More than 5 sessions	6	4.211			4.076		

**Significant at the p < 0.05 level.*

The comparative analysis reveals that gender ($p = 0.422$ for DC, $p = 0.915$ for TEL), age ($p = 0.396$ for DC, $p = 0.333$ for TEL), and length of service ($p = 0.307$ for DC, $p = 0.275$ for TEL) did not yield statistically significant differences in either digital competence or perceived TEL effectiveness. This indicates that technical and pedagogical proficiency is not determined by chronological age, gender, or length of service in the division.

However, significant differences were identified for professional position ($p < 0.001$ for both DC and TEL). Post hoc analysis using Tukey's Honestly Significant Difference (HSD) test revealed that Master Teachers exhibited significantly higher digital competence (Mean = 4.036) and perceived TEL effectiveness (Mean = 4.030) than their Teacher I and Teacher II peers. This suggests that educators in leadership roles often possess greater access to professional resources and experience.

Educational attainment also showed a significant difference in digital competence ($F(2, 177) = 3.957$, $p = 0.021$), with teachers holding doctoral degrees or master's degrees scoring significantly higher than those with only a bachelor's degree. This highlights the positive impact of advanced academic studies on digital proficiency.

Finally, the frequency of ICT training attended had a highly significant influence on both digital competence ($F(3, 176) = 32.327$, $p < 0.001$) and perceived TEL effectiveness ($F(3, 176) = 17.470$, $p < 0.001$). Post-hoc comparisons showed that teachers attending 4–5 sessions (DC Mean = 4.252, TEL Mean = 4.197) scored significantly higher than those attending 0–1 sessions (DC Mean = 3.588, TEL Mean = 3.698). These findings partially reject the third null hypothesis (H_03), indicating that while basic demographics do not yield significant differences, structural factors such as professional rank, advanced education, and cumulative training significantly influence technological competence and classroom effectiveness.

Discussion

The descriptive results demonstrate that public basic education teachers in San Leonardo, Nueva Ecija, possess a generally high level of digital competence, as reflected by the overall mean score of 3.746, which falls within the "Competent" verbal designation. This high self-reported level of proficiency is consistent with recent findings in the Philippine context, such as those of Lloren and Chavez (2026), who reported very high levels of digital literacy among kindergarten and grade-level educators using validated frameworks.

Similarly, local evaluations conducted in other school division offices in Central and Western Visayas show that teachers have an adequate baseline level of digital literacy.

However, a closer look at the individual domains reveals a significant gap in specific competencies. The high mean scores in *Professional Engagement* (Mean = 3.908) and *Teaching and Learning* (Mean = 3.884) indicate that educators are highly capable of using standard communication platforms, managing administrative tasks, and incorporating basic presentation software during lesson delivery.

In contrast, the lower scores in *Empowering Learners* (Mean = 3.645) and *Facilitating Learners' Digital Competence* (Mean = 3.587) show that teachers find it much more challenging to implement active, student-led digital activities, design accessible learning tasks for diverse students, and support student content creation in the classroom.

This represents an important challenge for the phased implementation of the MATATAG Curriculum. The MATATAG framework requires a pedagogical shift where students are not merely passive recipients of instruction but active creators and critical thinkers within a technology-supported classroom environment.

Because public school teachers in agricultural-industrial municipalities like San Leonardo face persistent challenges—such as multi-grade classrooms in remote barangays like Mambangnan and overcrowded classrooms in low-income areas like Castellano—the operational demands of daily instruction can limit their ability to design and support complex, student-centered digital learning activities.

This finding aligns with previous studies in Southeast Asian settings, where educators often demonstrate strong personal digital proficiency but show limited ability to translate these skills into student-centered digital empowerment.

The evaluation of the effectiveness of technology-enhanced learning (TEL) revealed an overall mean score of 3.808, indicating a "Highly Effective" assessment. This positive evaluation is driven by Instructional Utility (Mean = 3.887) and Pedagogical Alignment (Mean = 3.867), indicating that teachers believe the digital platforms they use are functional and clear, and that they align with MATATAG Curriculum standards.

However, the lower score for *Assessment Feedback* (Mean = 3.696) highlights an area for improvement. While teachers use digital tools to deliver content, they utilize them less frequently to provide rapid, responsive feedback and facilitate student self-assessment.

This reflects a broader trend identified in local literature: although public school teachers recognize the value of educational technology, they primarily use it as a substitute for traditional lectures rather than an active tool for real-time diagnostic feedback and formative assessment.

The bivariate correlation analysis established a strong, positive, and statistically significant relationship between teachers' overall digital competence and perceived TEL effectiveness ($r = 0.785$, $p < 0.001$), supporting the rejection of the first null hypothesis. This strong association is supported by international and local empirical research, which consistently demonstrates that an educator's technology skills directly influence the quality, engagement, and effectiveness of classroom instruction.

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Volume 1 Issue 3 Pages 158-190
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For example, Siloterio and Cajandig (2025) reported a strong positive correlation between technological pedagogical content knowledge (TPACK) and teachers' readiness to implement the MATATAG Curriculum, suggesting that digitally competent educators are better prepared to manage classroom changes and support learning.

Furthermore, studies in post-pandemic settings confirm that teachers' technical and pedagogical confidence is the primary predictor of their readiness for digital instruction.

The multiple linear regression model provides a key theoretical finding: when all six DigCompEdu domains were modeled together, *Teaching and Learning* ($\beta = 0.041$, $p = 0.653$) and *Digital Resources* ($\beta = 0.098$, $p = 0.215$) did not emerge as significant predictors of technology-enhanced learning effectiveness. This indicates that simply selecting digital resources and using them to present content does not ensure effective classroom technology integration.

Instead, the student-centered competence domains—*Facilitating Learners' Digital Competence* ($\beta = 0.237$, $p < 0.001$) and *Empowering Learners* ($\beta = 0.205$, $p = 0.009$)—served as the strongest predictors of TEL effectiveness.

This finding aligns with the core principles of the TPACK and active learning frameworks, which argue that technology is most effective when used to facilitate independent study, support active participation, and encourage student-led content creation.

Furthermore, the predictive value of *Professional Engagement* ($\beta = 0.185$, $p = 0.035$) emphasizes that teachers' collaborative engagement in digital professional networks directly supports classroom innovation.

The comparative analysis reveals that basic demographic variables—gender, age, and tenure—do not yield significant differences in digital competence or TEL effectiveness. This contradicts the common assumption that younger, "digital native" teachers are naturally more capable of integrating technology than older, more experienced educators.

Instead, the factors that produced highly significant differences were *Professional Position* ($p < 0.001$) and *ICT Training Attended* ($p < 0.001$). Post hoc comparisons showed that Master Teachers scored significantly higher in digital competence (Mean = 4.036) and instructional effectiveness (Mean = 4.030) than their Teacher I and Teacher II peers. This suggests that educators in leadership roles often have greater access to specialized professional development and institutional support, which helps build their digital confidence.

Most importantly, the strong impact of ICT training attended—where teachers participating in 4–5 sessions scored significantly higher (DC Mean = 4.252) than those attending 0–1 session (DC Mean = 3.588)—demonstrates that structured, continuous professional development is the primary factor in overcoming pedagogical barriers and enhancing digital competency.

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Volume 1 Issue 3 Pages 158-190

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Conclusion

This investigation demonstrates that teachers' digital competence is a strong predictor of technology-enhanced learning effectiveness, explaining 62.3% of its variance in public school classrooms under the MATATAG Curriculum. The study concludes that simply utilizing technology to present content does not ensure instructional success. Instead, the educational value of technology is determined by the teacher's ability to facilitate student digital literacy, differentiate instruction, and empower students to actively participate in class.

Additionally, the research shows that chronological age, gender, and length of service do not determine digital proficiency. Instead, professional rank, advanced academic preparation, and regular participation in targeted ICT training are the primary drivers of teachers' digital competence.

The study contributes to educational technology literature by validating the relevance of the DigCompEdu and TPACK models within the context of basic education reform in the Philippines. It provides empirical evidence showing that teacher-focused technology frameworks must be connected to student empowerment to ensure effective integration.

By showing that *Facilitating Learners' Digital Competence* and *Empowering Learners* are the strongest predictors of technology-enhanced learning effectiveness, this study offers a more integrated conceptual approach to analyzing technology integration.

Furthermore, the study supports the application of Locsin's Technological Competency as Caring Theory in education, illustrating that technology is most effective when used as a tool to support diversity, improve accessibility, and care for students' individual learning needs.

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Volume 1 Issue 3 Pages 158-190

Recommendations

Recommendations for Policymakers

The Department of Education Central Office, in collaboration with the Bureau of Learning Delivery, should develop national teacher standards that prioritize student-centered digital pedagogy and the ethical use of technology over basic computer literacy. This standard should be integrated into the Philippine Professional Standards for Teachers (PPST) to align performance evaluation with active technology integration practices.

Furthermore, policymakers must design targeted resource allocation frameworks that provide schools in remote and low-income barangays, such as Mambangnan and Castellano, with the necessary hardware, digital platforms, and internet connectivity to effectively support technology-enhanced learning.

Recommendations for Practitioners

Classroom teachers should transition from using technology primarily for administrative tasks and basic content presentation to employing it as an active tool for student engagement. Educators should design learning activities that encourage students to create digital content, use collaborative online platforms, and apply digital tools to solve real-world problems.

Additionally, teachers must incorporate interactive digital evaluation tools to provide timely, personalized formative feedback, helping students monitor and improve their learning.

Recommendations for Institutions

Schools' division offices and local school districts must restructure in-service training (INSET) programs, transitioning from generic, one-time software workshops to long-term professional development focused on digital pedagogy and student empowerment.

School heads should leverage localized Learning Action Cell (LAC) sessions to support collaborative peer mentoring, allowing Master Teachers to share effective digital integration practices with their colleagues.

Finally, institutions must ensure that technological resources and technical assistance are distributed equitably to support schools in resource-constrained areas.

Recommendations for Future Researchers

Future researchers should conduct longitudinal studies to examine how public-school teachers' digital competence and technology integration practices develop over several years of MATATAG Curriculum implementation. Additionally, incorporating mixed-methods research designs—combining quantitative surveys with classroom observations and qualitative interviews—would provide deeper insight into how teachers apply digital skills in different subject areas.

Finally, future investigations should evaluate the direct influence of teachers' digital competence on student academic performance, critical thinking skills, and technological proficiency.

Practical Implications

The findings of this study offer practical applications for basic education in the Philippines. For school heads, the results indicate that providing hardware to classrooms is not sufficient to ensure effective learning. Instead, institutional support must focus on helping teachers transition from using technology for basic administrative tasks to employing it as an active pedagogical tool.

Volume 1 Issue 3 Pages 158-190

Practically, this transition can be supported by establishing collaborative design sandboxes within schools, where educators can collaborate to develop interactive, technology-enhanced lessons.

Furthermore, the strong predictive value of the *Empowering Learners* domain suggests that schools should prioritize using digital tools to support diverse learning needs, provide differentiated instruction, and ensure accessibility for all students, particularly in resource-constrained classrooms.

Policy Implications

This study has key implications for educational policy under the Department of Education. First, it highlights that professional development policies should move away from short, one-time ICT workshops. Current policy guidelines should be revised to support sustained, cohort-based professional development programs aligned with national teacher standards.

Second, the study supports integrating digital competence metrics directly into the Performance Management System (RPMS) for teachers, thereby incentivizing the adoption of student-centered digital strategies.

Finally, the findings suggest that national policies for digital infrastructure should prioritize balanced resource distribution, ensuring that remote and low-income schools receive the necessary technology and internet connectivity to implement technology-enhanced learning effectively.

Limitations of the Study

While this study provides empirical insights, several limitations should be noted. First, the investigation relied primarily on self-reported survey data, which may be subject to social desirability bias. Future research could address this by incorporating objective evaluations, such as classroom observation rubrics and portfolio assessments.

Second, the sample was delimited to public school teachers within a single municipality in Nueva Ecija. While the sample was statistically representative of the local district, the findings may not be fully generalizable to private schools or highly urbanized metropolitan regions.

Third, the cross-sectional design captured variables at a single point in time during the 2025–2026 school year.

Future Research Directions

To build on these findings, future research should explore longitudinal research designs to examine how teachers' digital competence develops over several years of MATATAG Curriculum implementation. Additionally, comparative studies between public and private school systems, as well as investigations across different regions of the Philippines, would provide a more comprehensive understanding of the country's digital educational landscape.

Finally, future studies should analyze the impact of emerging educational technologies, such as artificial intelligence and adaptive learning systems, on teachers' technological-pedagogical needs and classroom effectiveness.

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Volume 1 Issue 3 Pages 158-190
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Appendices

Appendix A: Complete Survey Questionnaire

Section I: Socio-Demographic Profile

Instructions: Please tick the box corresponding to your personal and professional background details.

1. **Gender:** [ ] Female [ ] Male
2. **Age:** [ ] 21–30 years old [ ] 31–40 years old [ ] 41–50 years old [ ] 50 years old and above
3. **Professional Position:** [ ] Teacher I [ ] Teacher II [ ] Teacher III [ ] Master Teacher I/II
4. **Educational Attainment:** [ ] Bachelor's Degree [ ] Master's Degree (including units) [ ] Doctorate Degree (including units)
5. **Length of Service (Tenure):** [ ] 0–3 years [ ] 4–10 years [ ] 11–15 years [ ] More than 15 years
6. **ICT Training Sessions Attended:** [ ] 0–1 session [ ] 2–3 sessions [ ] 4–5 sessions [ ] More than 5 sessions

Section II: Teachers' Digital Competence Scale (Adapted from DigCompEdu)

Instructions: Please rate your level of agreement with the following statements regarding your digital competence. Use the scale: 5 = Strongly Agree (SA); 4 = Agree (A); 3 = Neutral (N); 2 = Disagree (D); 1 = Strongly Disagree (SD).

Item ID	Survey Indicator Item Statement	5	4	3	2	1
PE1	I use digital communication tools to collaborate effectively with professional colleagues.	[ ]	[ ]	[ ]	[ ]	[ ]
PE2	I participate in online networks to support my professional development.	[ ]	[ ]	[ ]	[ ]	[ ]
DR1	I easily source and select appropriate digital resources to support my teaching.	[ ]	[ ]	[ ]	[ ]	[ ]
DR2	I modify and adapt existing digital learning materials to meet my instructional needs.	[ ]	[ ]	[ ]	[ ]	[ ]
TL1	I design and implement technology-supported learning activities in my classes.	[ ]	[ ]	[ ]	[ ]	[ ]
TL2	I manage classroom technologies to support student-centered learning.	[ ]	[ ]	[ ]	[ ]	[ ]
AS1	I use digital tools to support formative assessment and monitor student progress.	[ ]	[ ]	[ ]	[ ]	[ ]
AS2	I analyze digital assessment data to identify students who need additional support.	[ ]	[ ]	[ ]	[ ]	[ ]
EL1	I use digital tools to differentiate instruction and accommodate diverse learning needs.	[ ]	[ ]	[ ]	[ ]	[ ]
EL2	I use technology to encourage active student participation and collaboration.	[ ]	[ ]	[ ]	[ ]	[ ]
FL1	I design activities that require students to find, evaluate, and manage digital information.	[ ]	[ ]	[ ]	[ ]	[ ]
FL2	I teach students how to create digital content and practice digital safety.	[ ]	[ ]	[ ]	[ ]	[ ]

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Section III: Technology-Enhanced Learning (TEL) Effectiveness Scale

Instructions: Please rate your level of agreement with the following statements regarding the effectiveness of technology-enhanced learning in your classroom. Use the scale: 5 = Strongly Agree (SA); 4 = Agree (A); 3 = Neutral (N); 2 = Disagree (D); 1 = Strongly Disagree (SD).

Item ID	Survey Indicator Item Statement	5	4	3	2	1
PA1	The technology tools I use align with MATATAG Curriculum learning objectives.	[ ]	[ ]	[ ]	[ ]	[ ]
PA2	Digital platforms support the delivery of core curriculum content in my classes.	[ ]	[ ]	[ ]	[ ]	[ ]
LE1	The use of digital tools increases student motivation and active participation.	[ ]	[ ]	[ ]	[ ]	[ ]
LE2	Technology helps students collaborate effectively on classroom projects.	[ ]	[ ]	[ ]	[ ]	[ ]
IU1	Digital learning materials are clear, accessible, and user-friendly for my students.	[ ]	[ ]	[ ]	[ ]	[ ]
IU2	Digital tools help clarify complex concepts during my lessons.	[ ]	[ ]	[ ]	[ ]	[ ]
AF1	Digital platforms allow me to provide timely and responsive feedback to my students.	[ ]	[ ]	[ ]	[ ]	[ ]
AF2	Digital assessment tools help students understand and track their own learning progress.	[ ]	[ ]	[ ]	[ ]	[ ]

Appendix B: Hypothetical Raw Data Summary

This summary provides descriptive statistics for 10 mock participant profiles to illustrate data structure, coherence, and alignment with the sample of 180 respondents.

Participant ID	Gender	Position	ICT Training	PE Mean	DR Mean	TL Mean	AS Mean	EL Mean	FL Mean	TEL Mean
P001	Female	Teacher III	0–1 session	3.50	3.25	3.50	3.25	3.00	3.00	3.35
P002	Male	Master Teacher	4–5 sessions	4.75	4.50	4.75	4.50	4.50	4.25	4.50
P003	Female	Teacher I	0–1 session	3.25	3.00	3.25	3.00	3.00	2.75	3.10
P004	Female	Teacher III	2–3 sessions	4.00	3.75	4.00	3.75	3.75	3.50	3.90
P005	Female	Teacher II	0–1 session	3.50	3.50	3.75	3.25	3.25	3.25	3.55
P006	Male	Teacher III	4–5 sessions	4.50	4.25	4.50	4.25	4.25	4.00	4.30
P007	Female	Teacher I	0–1 session	3.00	3.00	3.00	3.00	2.75	2.50	2.90
P008	Female	Master Teacher	>5 sessions	5.00	4.75	5.00	4.75	4.75	4.50	4.75
P009	Female	Teacher III	0–1 session	3.75	3.50	3.75	3.50	3.50	3.25	3.65
P010	Male	Teacher II	2–3 sessions	4.00	3.75	4.00	3.75	3.50	3.50	3.85

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Volume 1 Issue 3 Pages 158-190

Appendix C: Reliability Analysis Table

The internal consistency metrics for the primary scales and subscales, based on the pilot test with 30 educators, are summarized below.

Operational Subscale Instrument Segment	Number of Items	Computed Cronbach's Alpha (α)	Verbal Assessment Efficacy
Teachers' Digital Competence Scale	**24**	**0.880**	**Excellent Reliability**
Subscale 1: Professional Engagement (PE)	4	0.812	Very Good
Subscale 2: Digital Resources (DR)	4	0.804	Very Good
Subscale 3: Teaching and Learning (TL)	4	0.825	Very Good
Subscale 4: Assessment (AS)	4	0.796	Acceptable
Subscale 5: Empowering Learners (EL)	4	0.815	Very Good
Subscale 6: Facilitating Learners' DC (FL)	4	0.832	Very Good
TEL Effectiveness Scale	**16**	**0.850**	**Excellent Reliability**
Subscale 1: Pedagogical Alignment (PA)	4	0.798	Acceptable
Subscale 2: Learner Engagement (LE)	4	0.802	Very Good
Subscale 3: Instructional Utility (IU)	4	0.811	Very Good
Subscale 4: Assessment Feedback (AF)	4	0.784	Acceptable

Appendix D: Sample Ethics Statement

The following ethical guidelines were observed during this study:

1. **Protocol Compliance:** The research design was reviewed and approved by the Institutional Ethics Review Committee of Central Luzon State University to ensure alignment with national standards.

2. **Informed Consent:** Participation was entirely voluntary. Each respondent completed an informed consent form detailing the study's purpose, potential risks, benefits, and their right to withdraw at any stage without consequence.

3. **Data Protection and Anonymity:** In accordance with the Data Privacy Act of 2012 (Republic Act No. 10173), no personal identification information was collected. Anonymity was maintained by assigning unique numeric codes to all data sheets.

4. **Institutional Authorization:** Permissions were secured from the Schools Division Superintendent of Nueva Ecija and school heads before initiating data collection.

5. **No Harm Principle:** The study posed no physical, psychological, or professional risks to participants. Data were reported in aggregate form to prevent the identification of individual respondents or schools.

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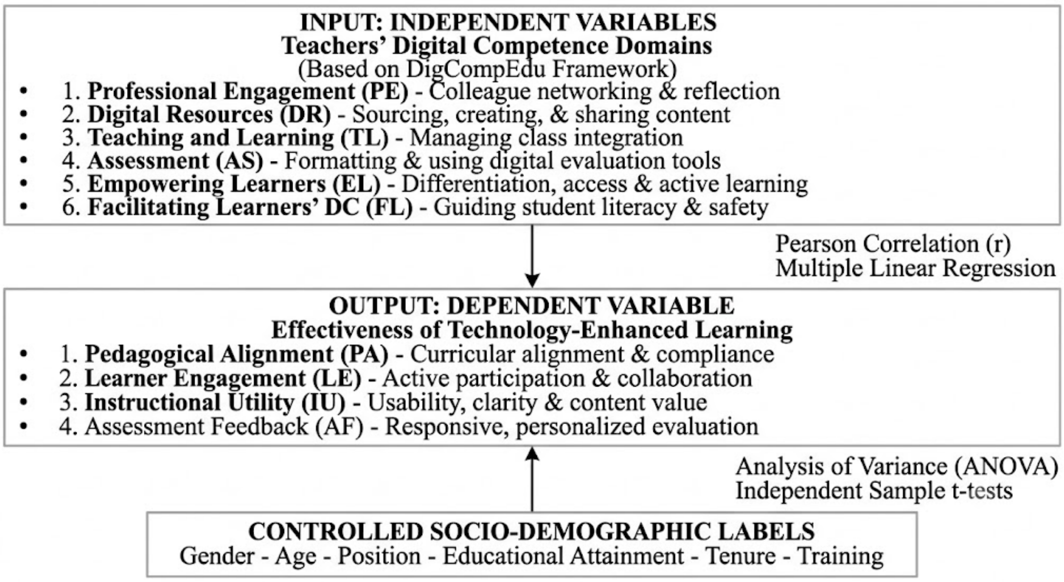
Appendix E: Conceptual Framework Figure

The conceptual model of the study is illustrated below:



Volume 1 Issue 3 Pages 158-190

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Volume 1 Issue 3 Pages 158-190

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Volume 1 Issue 3 Pages 158-190

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