ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 7 (July 2026)

Challenges And Effective Strategies for Classroom Technology Integration Among Private School Elementary Teachers in Las Piñas City

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Date Submitted:
February 24, 2026

Date Accepted:
April 12, 2026

Date Published:
July 13, 2026

DOI:
10.5281/zenodo.21337517

ABSTRACT

This study examined the pedagogical challenges and effective strategies for classroom technology integration among private elementary school teachers in Las Piñas City using the Technological Pedagogical Content Knowledge (TPACK) framework. Specifically, it explored the level of technology integration, the availability of institutional support factors, and their relationship in promoting effective teaching and student-centered learning. The study employed a quantitative descriptive-correlational research design. Data were collected from 200 private elementary school teachers through a researcher-developed and content-validated survey questionnaire with high reliability coefficients. Descriptive statistics, independent-samples t-test, one-way ANOVA, and Pearson product-moment correlation were utilized to analyze the data. Findings revealed that teachers sometimes practiced classroom technology integration (Composite Mean = 3.16), with the highest level observed in the enhancement of lesson content through technology and lower levels in student-centered learning, digital collaboration, and differentiated instruction. Institutional support factors were generally perceived as available (Composite Mean = 2.96), with administrative support receiving the highest rating. No significant differences were found in technology integration levels when teachers were grouped according to age, sex, teaching experience, and educational attainment. However, a statistically significant moderate positive relationship ($r = 0.311$, $p < .001$) was found between the availability of support factors and classroom technology integration. The study concludes that effective classroom technology integration depends more on institutional support systems than on teacher demographic characteristics. Strengthening administrative support, technological resources, and practice-based professional development can facilitate the transition from basic technology use toward transformative, collaborative, and personalized learning experiences. The proposed TECH-ALIGN Las Piñas framework provides a strategic model for enhancing technology-integrated instruction, teacher capacity building, and sustainable digital innovation in private elementary schools.

Keywords: *classroom technology integration, digital learning, educational technology, private elementary schools, professional development, TPACK framework.*

INTRODUCTION

The integration of technology in basic education has become a global priority as schools respond to rapid digitalization and the growing demand for 21st-century skills. According to UNESCO, over 65% of elementary-level instructional reforms worldwide now include technology-supported pedagogies, emphasizing digital literacy, collaboration, and problem-solving as core learning outcomes. In Southeast Asia, the post-pandemic shift

ISSN: 3116-3475
International Journal
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accelerated the use of classroom technology, with more than 70% of teachers reporting increased reliance on digital tools for lesson delivery and assessment (UNESCO, 2023). In the Philippines, the Department of Education (DepEd) continues to promote the integration of information and communication technology (ICT) to support learner-centered instruction and improve foundational competencies. However, national reports indicate that actual classroom integration remains uneven, particularly at the elementary level, where teachers require strong pedagogical alignment to ensure that technology enhances rather than replaces sound teaching practice. Recent local studies suggest that teacher preparedness, rather than mere device access, is a determining factor in effective technology use (Baticulon et al., 2021).

The global landscape of basic education has experienced a paradigm shift, moving past temporary crisis responses into a structured era of post-pandemic digital transformation. Contemporary digital pedagogy no longer views technology as a mere supplementary aid but as an ecosystem that reshapes the cognitive architecture of learning spaces, requiring targeted institutional frameworks to navigate instructional shifts (Scherer et al., 2021). Central to this evolution is the rapid emergence of generative artificial intelligence (AI), machine learning protocols, and adaptive learning platforms in primary education, which demand higher levels of teacher technological pedagogical content knowledge to ensure meaningful student engagement (Mishra & Koehler, 2006). International research underscores that navigating this technological integration requires teachers to transition from passive tool usage to transformative instructional innovation, balancing curriculum demands with data-informed personalized learning environments (Tondeur et al., 2021). While global frameworks emphasize these macro-level shifts, a significant localized research gap persists regarding the private basic education sector in urban centers like Las Piñas City. Unlike public schools governed by uniform national rollouts, private institutions operate under unique conditions characterized by agile administrative autonomy, accelerated market competitiveness, and heightened parental expectations for immediate technology-infused learning. The distinct novelty of this study lies in its use of a dual-framework conduit—synthesizing the Technological Pedagogical Content Knowledge (TPACK) framework with the Substitution, Augmentation, Modification, and Redefinition (SAMR) model—to empirically evaluate how private institutional resource management styles and training ecosystems directly dictate whether technology acts as a superficial substitute or a catalyst for cognitive transformation. By shifting the scholarly focus from mere infrastructural device access to the internal organizational factors influencing teacher pedagogical depth, this study contributes an empirical foundation for contextually grounded digital policies in private basic education.

Despite these national initiatives, a significant research gap exists regarding the specific relationship between institutional support structures and the pedagogical depth of technology use in private elementary schools. While many studies focus on public school settings, the private sector, which often possesses distinct resource management styles and administrative autonomy, remains under-investigated. Furthermore, there is a lack of empirical evidence regarding how these support factors enable teachers to move beyond simple "enhancement" of content toward the "transformation" of learning as defined by the Substitution, Augmentation, Modification, and Redefinition (SAMR) model. Private elementary schools in urban settings, such as Las Piñas City, provide a distinctive context for examining technology integration. Unlike public schools, private institutions operate with greater curricular flexibility, faster decision-making, and heightened parental expectations for instructional innovation. These conditions place elementary teachers at the forefront of balancing pedagogical effectiveness, technological competence, and curriculum demands.

The effectiveness of classroom technology integration depends largely on the ability to meaningfully connect content knowledge, pedagogy, and technology, as emphasized in the Technological Pedagogical Content Knowledge (TPACK) framework. Teachers who lack confidence or training in this integration often resort to superficial uses of technology, such as presentation slides or digital worksheets, rather than transformative instructional practices. Consequently, technology becomes an add-on rather than a pedagogical tool that promotes engagement, collaboration, and differentiated learning. Understanding how private-school teachers navigate pedagogical challenges and employ effective strategies within a technology-rich environment is essential for designing targeted professional development programs and institutional support mechanisms.

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Thus, this study examined the challenges and effective pedagogical strategies for classroom technology integration among private school elementary teachers in Las Piñas City, with specific emphasis on teachers' TPACK. By identifying the relationships among technology integration, key support factors, technological resources, and professional training, the study aims to propose a contextually grounded plan to strengthen sustainable, pedagogically sound technology integration.

Literature Review

Technology Integration in Elementary Education

Technology has become central to 21st-century elementary classrooms, especially after the expansion of blended and technology-supported instruction. Digital learning media such as videos, animations, and multimedia presentations enhance motivation, participation, and conceptual understanding among young learners (Chirima, 2024; Lubis, 2024). However, recent literature emphasizes that effective integration depends not merely on device availability but on how teachers use digital tools to strengthen interaction, feedback, collaboration, and differentiated learning (Bui, 2022). Student-centered models such as Project-Based Learning, Inquiry-Based Learning, flipped classrooms, simulations, and augmented reality further support exploration, collaboration, and higher-order thinking (Rosmaria, 2024; Riski et al., 2025; Kefalis et al., 2025). Culturally responsive digital content, such as ethnoscience-based materials, also improves relevance and motivation by connecting instruction to learners' local contexts (Cahyadi et al., 2025).

Administrative and Institutional Support

Institutional support is a major condition for successful technology integration. Teacher readiness is shaped not only by individual skills but also by access to resources, pedagogical guidelines, technical assistance, mentoring, and sustained professional learning (Amemasor et al., 2025). Schools with clear digital guidelines and collaborative learning communities are better positioned to support meaningful digital transformation (Nguyen et al., 2022; Weisberg & Dawson, 2023). Philippine studies similarly emphasize the role of school heads in ensuring adequate support, ICT tools, and administrative practices for classroom technology use (Gapoy-Landicho, 2024; Subingsubing & Guhao, 2025).

Global and Philippine Trends in Classroom Technology Use

Globally, elementary education is increasingly integrating artificial intelligence and other digital tools through peer-driven and hybrid adoption practices (Rosqueta, 2025). AI has been reported to improve engagement and streamline instructional tasks, although concerns remain regarding teacher preparedness and creativity (Haq, 2025). In the Philippines, the Department of Education has promoted ICT and 21st-century skills, but gaps persist between policy goals and classroom realities, particularly in infrastructure, support, and implementation (Rosqueta, 2025). Private schools may have more flexibility and resources, yet they also face pressure from parental expectations, competition, and the demand for innovation (Lumasag, 2024). The post-pandemic shift to face-to-face and hybrid learning further revealed uneven teacher readiness and the need for systematic, long-term support (Gyasi & Sun, 2026; Reuschl et al., 2022).

Comparative Analysis of Institutional Contexts: Private vs. Public Schools

ICT integration in the Philippines varies across school sectors. Private school teachers tend to report higher ICT implementation than public school teachers, partly due to greater institutional autonomy and flexibility in lesson design (Gamit, 2024). However, the difference between private and public schools should not be reduced to device availability. It also involves leadership, funding, class size, technical support, teacher development, and institutional expectations (Hossain, 2025). Public schools may benefit from government-supported ICT programs, but implementation is often affected by resource limitations, large class sizes, connectivity issues, and bureaucratic delays (Aldosemani, 2023). Thus, private elementary schools in Las Piñas City provide a relevant context for examining how institutional conditions shape technology integration.

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Teacher Readiness and Professional Development

Teacher readiness is commonly understood through Technological Pedagogical Content Knowledge, or TPACK, which refers to the integration of content, pedagogy, and technology. Stronger TPACK and technology integration self-efficacy improve teachers' confidence in selecting and using digital tools for instruction (Warmansyah et al., 2022). Professional development is essential in strengthening technological proficiency, innovative pedagogy, and interdisciplinary teaching (Rehman et al., 2025; Rosmaria, 2024). In the Philippine context, limited pre-service exposure, insufficient in-service training, and few opportunities to develop integrated technology-related competencies continue to affect teacher preparedness (Boncodin, 2025; Su et al., 2023; Sofwan et al., 2023).

The Digital Native Paradox: Technical Skill vs. Pedagogical Readiness

Recent Philippine literature highlights that technical competence does not automatically result in effective instructional practice. Although younger "digital native" teachers may demonstrate stronger technical skills, effective technology integration still depends on teacher mindset, pedagogical readiness, and institutional support (Journal of Interdisciplinary Perspectives, 2025).

Challenges in Technology Integration

Despite its benefits, technology integration faces several barriers. Technological and infrastructural challenges include limited device access, outdated hardware, unreliable internet, inadequate technical support, overcrowded classrooms, and insufficient learning materials (Aringo, 2025; Dageo-a, 2025; Rafiq-uz-Zaman, 2024). Pedagogical barriers include difficulty using software, aligning tools with objectives, rigid curricula, limited digital literacy integration, and insufficient guidance on ethical and effective use (Lubis, 2024; Rosmaria, 2024; Rafiq-uz-Zaman, 2025; Rosqueta, 2025). Psychological barriers such as fear of failure, technological intimidation, and anxiety over teacher autonomy also affect adoption (Robandi et al., 2025; Haq, 2025). Systemic barriers, including fragmented ICT policies, weak monitoring, limited institutional support, and unequal resource allocation, further widen the digital divide (Rosqueta, 2025; Bukhari et al., 2025; Bantali et al., 2025).

School Leadership, Policy, and Support Mechanism

School leadership is a critical enabler of ICT integration. Principals and school heads influence technology use by setting digital policies, allocating resources, providing technical support, encouraging collaboration, and aligning technology with instructional goals (Yang et al., 2025). Effective practices include equitable access to tools, technical support systems, and collaboration among teachers, parents, and stakeholders (Bantali et al., 2025). At the policy level, coherent and inclusive ICT frameworks must address infrastructure, training, resource allocation, data privacy, and regular policy review (Rosqueta, 2025; Bukhari et al., 2025).

Effective Strategies for Classroom Technology Integration

Research identifies collaboration, professional learning communities, and peer learning as effective strategies for improving teacher confidence and reducing anxiety in technology use (Rosqueta, 2025; Soffianningrum et al., 2022; OECD, 2025). Incremental adoption, where teachers begin with simple tools before progressing to more complex applications, also supports sustainable integration (Rosqueta, 2025; Warmansyah et al., 2022). Continuing professional learning, mentoring, and school-based support are more effective than one-time training sessions (Tawil et al., 2026). Contextualized and culturally relevant digital materials further enhance engagement and inclusivity (Cahyadi et al., 2025; Triana et al., 2025).

Impact of Technology Integration on Student Outcomes

Technology integration positively affects learner engagement, motivation, curiosity, and participation, especially in science and mathematics (Lubis, 2024; Dageo-a, 2025). Digital simulations, problem-based learning modules, and interactive tools improve critical thinking, problem-solving, scientific literacy, reading comprehension, and creativity (Riski et al., 2025; Kefalis et al., 2025; Pitaloka & Mahendra, 2025). Technology-enhanced instruction also supports 21st-century skills, including collaboration, creativity, digital citizenship, and

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differentiated learning through adaptive tools and digital assessments (Rafiq-uz-Zaman, 2025; Chander & Arora, 2025; Triana et al., 2025).

Managerial Challenges and Strategic Intervention

Recent studies show that barriers to technology integration are shifting from hardware concerns to management-related challenges. Limited planning time, insufficient technical infrastructure, and lack of human support remain major issues (Bola & Rogador, 2025). In urban areas such as Las Piñas City, internet reliability may be relatively high, but technical assistance and human support remain limited (Periña, 2024).

Synthesis

The reviewed literature shows that technology integration in elementary education offers strong pedagogical benefits but remains shaped by infrastructural, pedagogical, psychological, and institutional factors. Recent studies agree that effective integration requires more than access to devices; it requires teacher readiness, strong TPACK, administrative support, professional development, clear policies, and culturally relevant practices. Global and Philippine studies similarly emphasize the role of leadership, training, digital competence, and school-level support in sustaining technology-enhanced instruction.

Although private schools may have greater flexibility and access to resources, effective integration still depends on how well teachers are supported in using technology meaningfully. The literature also shows that technology improves student outcomes only when it is aligned with instructional goals and supported by prepared teachers and responsive institutions. Despite existing studies, there remains limited localized evidence on how private elementary teachers in Las Piñas City experience technology integration through TPACK-related pedagogical practices and support factors. This gap establishes the relevance of the present study.

Theoretical Framework

This study is anchored on two complementary theoretical frameworks: the Technological Pedagogical Content Knowledge (TPACK) Framework and the Substitution-Augmentation-Modification-Redefinition (SAMR) Model. The TPACK Framework asserts that truly effective classroom technology integration does not occur by treating technology as an isolated skill; instead, it requires a complex, dynamic interaction among Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). This framework guides the interpretation of the study's findings by shifting the evaluation away from simple device access and focusing instead on how teachers use digital tools to modify instruction. For instance, the dimensions of TPACK explain why private school educators might score exceptionally high in direct content enhancement but experience a sharp decline when designing student-centered, personalized learning pathways.

Complementing this, the SAMR Model provides a functional, operational lens to categorize the actual depth of that classroom execution, tracking whether digital tool application merely supports traditional teaching methods through Enhancement (Substitution and Augmentation) or fundamentally transforms learning tasks through Transformation (Modification and Redefinition). Within this study, the SAMR model serves as a diagnostic matrix to interpret the quantitative mean scores. It allows the researcher to analyze whether available administrative support and resources are being utilized to fundamentally alter the task architecture of the primary classroom, or if technology is simply acting as an expensive digital worksheet substitute. Together, TPACK explains the composite knowledge structures teachers require, while SAMR illustrates the observable depth of their instructional output.

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Conceptual Framework

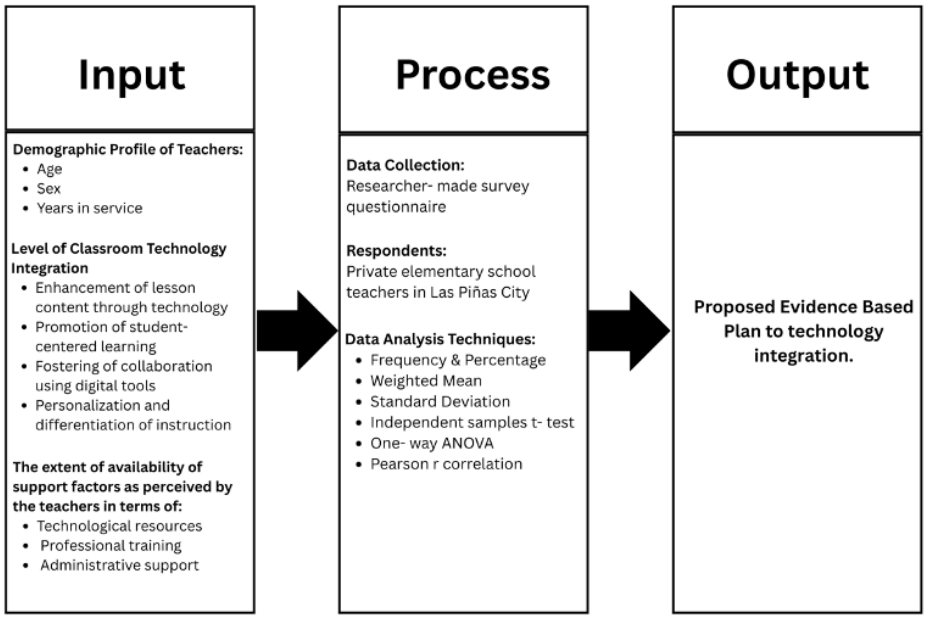

Figure 1. *Research Paradigm*

The conceptual synthesis of this study is operationalized through an Input-Process-Output (IPO) model, visually mapped out in Figure 1.

- **Input:** Comprises the independent variables, which include the demographic profile of the teachers (age, sex, years in service, and educational attainment) and the perceived availability of core institutional support factors (technological resources, professional training, and administrative support).
- **Process:** Outlines the methodological procedures, specifically the deployment of a content-validated survey questionnaire to private elementary school teachers in Las Piñas City, followed by statistical treatments including weighted mean, ANOVA, and Pearson correlation.
- **Output:** Reflects the definitive objective of the research—using empirical findings to construct a proposed evidence-based intervention framework, TECH-ALIGN Las Piñas, designed to synchronize administrative support and pedagogical training with day-to-day classroom execution.

Statement of the Problem

The integration of technology into classroom instruction has become an essential component of quality basic education, supporting learner engagement, collaboration, critical thinking, and the development of 21st-century competencies. As schools continue to adopt digital tools and technology-enhanced learning environments, teachers are expected to integrate technology in ways that promote meaningful, student-centered learning experiences rather than merely supporting traditional instructional practices. However, many elementary school teachers continue to experience challenges in implementing technology-rich pedagogies that extend beyond content presentation and basic digital applications.

In private elementary schools, the demand for innovative and technology-supported instruction is heightened by increasing parental expectations, institutional competitiveness, and rapid educational digitalization. Despite the availability of technological resources in many schools, teachers often encounter barriers related to professional training, technical support, instructional planning, and pedagogical integration. These challenges may limit their ability to maximize technology as a tool for collaboration, differentiation, creativity, and deeper learning.

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Existing studies have extensively examined technology integration in public school settings; however, limited empirical evidence exists regarding the relationship between institutional support mechanisms and the pedagogical depth of technology integration among private elementary school teachers. Furthermore, few studies have examined these relationships using the complementary perspectives of the Technological Pedagogical Content Knowledge (TPACK) framework and the Substitution, Augmentation, Modification, and Redefinition (SAMR) model. Given these concerns, it became necessary to investigate the pedagogical challenges and effective strategies for classroom technology integration among private elementary school teachers in Las Piñas City. Specifically, the study sought to determine the level of classroom technology integration, assess the availability of institutional support factors, examine differences across teacher characteristics, and explore the relationship between support mechanisms and technology integration practices. The findings of the study are expected to provide evidence-based insights for teachers, school leaders, curriculum planners, and educational policymakers in designing sustainable technology-enhanced learning initiatives and professional development programs.

General Objective

To determine the pedagogical challenges and effective strategies for classroom technology integration among private elementary school teachers in Las Piñas City using the Technological Pedagogical Content Knowledge (TPACK) Framework.

Specific Objectives

1. To determine the demographic profile of private elementary school teachers in terms of age, sex, years in service, and educational attainment.
2. To evaluate the level of classroom technology integration based on TPACK-related pedagogical practices across four dimensions: enhancement of lesson content, promotion of student-centered learning, fostering of collaboration using digital tools, and personalization and differentiation of instruction.
3. To determine the extent of availability of institutional support factors in terms of technological resources, professional training, and administrative support.
4. To examine whether significant differences exist in the level of classroom technology integration when teachers are grouped according to their demographic profile in terms of age, sex, years in service, and educational attainment.
5. To determine whether a significant relationship exists between classroom technology integration and the perceived availability of institutional support factors.
6. To propose an evidence-based technology integration enhancement program for private elementary schools.

Research Questions

1. What is the demographic profile of the respondents in terms of age, sex, years in service, and educational attainment?
2. What is the level of classroom technology integration based on teachers' TPACK-related pedagogical practices in terms of enhancement of lesson content, promotion of student-centered learning, fostering of collaboration, and personalization of instruction?
3. What is the extent of availability of institutional support factors in terms of technological resources, professional training, and administrative support?
4. Is there a significant difference in the level of classroom technology integration when teachers are grouped according to their demographic profile in terms of age, sex, years in service, and educational attainment?
5. Is there a significant relationship between classroom technology integration and the availability of institutional support factors?
6. Based on the findings, what evidence-based program may be proposed to enhance classroom technology integration in private elementary schools?

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METHODS

Research Design

The study utilized a quantitative descriptive-correlational research design. This framework was appropriate because it allowed the researcher to systematically describe the current level of classroom technology integration among private elementary school teachers and empirically determine the relationship between technology integration and selected institutional support factors—namely technological resources, professional training, and administrative support. In accordance with the parameters of descriptive-correlational frameworks, the design did not seek to establish direct cause-and-effect conclusions or manipulate variables. Instead, it investigated the existing status, degree, and direction of relationships among the variables in a natural educational setting, perfectly aligning with the overarching objectives of the study.

Population and Sampling

The target population for this study consisted of full-time private elementary school teachers (Grades 1 to 6) active within the private basic education sector of Las Piñas City, Metro Manila. The total accessible population size (N) across the participating target school clusters in the locale was estimated at approximately 200 educators.

To determine the minimum statistically sound sample size required to achieve research validity, Slovin's Formula was applied at a standard 5% margin of error (e = 0.05). The formal mathematical derivation is structured as follows:

$$n = N / [1 + N(e)^2]$$

$$n = 200 / [1 + 200(0.05)^2]$$

$$n = 200 / [1 + 200(0.0025)] = 200 / [1 + 0.50] = 200 / 1.50 = 133.33 \approx 133$$

Participant Verification Procedure

To guarantee strict sample eligibility and maintain research integrity, an explicit two-stage verification portal was built into the opening section of the electronic survey. Before accessing the core data items, respondents were required to answer two mandatory filter questions: (1) "Are you currently employed as a full-time basic education teacher in a private school within Las Piñas City?" and (2) "Do you handle teaching loads in any elementary grade from Grades 1 to 6?" Any submission selecting "No" to either filter query was automatically blocked by the survey logic and excluded from the data pool. Non-qualified or incomplete responses were systematically purged before analysis, ensuring that all 200 entries represented active, eligible practitioners.

Instrument Validation and Pilot Testing

The primary data-gathering tool was a researcher-developed survey instrument tailored around the TPACK framework. For content validity, the questionnaire was submitted to a panel of three (3) expert validators, consisting of one (1) Doctor of Education specializing in Educational Management, one (1) Master of Arts in Education specializing in Educational Technology, and one (1) senior statistician, all holding active institutional affiliations with accredited higher education institutions in Metro Manila.

To evaluate internal consistency and reliability, a preliminary pilot test was administered to a separate group of twenty (20) private school teachers who shared identical demographic traits but were not part of the final sample pool. The pilot data yielded an excellent Cronbach's Alpha coefficient of 0.909 for the Level of Classroom Technology Integration section and 0.996 for the Perceived Support Factors section, comfortably surpassing the standard validation threshold of 0.70.

Data Gathering Procedure

First, written permission to conduct the study was obtained from the school heads and principals of the private elementary schools through a formal letter of request signed by the researcher and the thesis adviser. Once institutional access was granted, the survey was administered electronically via Google Forms to accommodate the digital distribution nature of the study and reach teacher networks within Las Piñas City.

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The empirical data collection process was systematically executed over a duration of two months, beginning in March 2026 and concluding in April 2026. This data gathering occurred during regular academic operations of the second semester of the school year, ensuring that teachers' responses accurately reflected their day-to-day instructional practices and active technology deployment. Completed questionnaires were automatically compiled from the online platform, verified for completeness, and safely exported into a statistical software program for numerical data analysis.

Treatment of Data

Descriptive and inferential statistical methods were used to process the quantitative data. Frequency and percentage distributions were applied to summarize the demographic profiles of the teachers. Weighted mean and standard deviation were utilized to determine the level of classroom technology integration and the perceived availability of institutional support factors.

To evaluate whether statistically significant differences existed in technology integration when teachers were grouped by demographic profile, an independent-samples t-test and a one-way Analysis of Variance (ANOVA) were executed. To evaluate the relationship between the level of technology integration and the availability of support factors, the Pearson product-moment correlation coefficient (r) was computed. All inferential statistical hypotheses were tested at a 0.05 level of significance.

To provide a rigorous and standardized interpretation of the calculated quantitative means, the following operational scoring matrices were utilized. For Part II of the instrument, which measures the level of classroom technology integration across the four TPACK dimensions, the mean ranges and their corresponding descriptive interpretations are structured in a progressive hierarchy as detailed in Table 1.

Table 1. *Operational Statistical Scale for Classroom Technology Integration*

Weighted Mean	Descriptive Interpretation
3.51–4.00	Always Practiced (AP)
2.51–3.50	Often Practiced (OP)
1.51–2.50	Sometimes Practiced (SP)
1.00–1.50	Never Practiced (NP)

Table 2. *Operational Statistical Scale for Perceived Availability of Institutional Support Factors*

Weighted Mean	Descriptive Interpretation
3.51–4.00	Highly Available (HA)
2.51–3.50	Available (A)
1.51–2.50	Moderately Available (MA)
1.00–1.50	Not Available (NA)

Ethical Considerations

The study strictly adhered to the ethical mandates of responsible scholarly research and data privacy frameworks. Prior to data distribution, formal ethical clearance and institutional administrative approval were officially reviewed and obtained from the Graduate School Research Ethics Committee of the University of Perpetual Help System-DALTA. Written informed consent was secured digitally from each participant via a mandatory page built into the opening section of the electronic form. Participation remained entirely voluntary, and respondents retained the absolute right to withdraw at any stage of the study without penalty. To guarantee anonymity and confidentiality, personal identifiers and specific institutional names were completely omitted from data processing, and all gathered electronic records were securely encrypted and archived, accessible solely to the researchers.

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RESULTS AND DISCUSSION

This section presents, analyzes, and interprets the quantitative data gathered from the respondents to address the specific research questions regarding classroom technology integration in private elementary schools in Las Piñas City.

Demographic Profile of the Respondents

The demographic overview establishes the baseline professional characteristics of the participating private basic education workforce.

Table 3. *Consolidated Demographic Profile of Respondent Teachers (N = 200)*

Demographic Variable	Classification	Frequency	Percentage (%)
Age	20–29 years old	119	59.50
	30–39 years old	61	30.50
	40–49 years old	18	9.00
	50 years old and above	2	1.00
Sex	Male	33	16.50
	Female	162	81.00
	Prefer not to say	5	2.50
Teaching Experience	1–5 years	94	47.00
	6–10 years	56	28.00
	11–15 years	38	19.00
	16 years and above	12	6.00
Educational Attainment	Bachelor's Degree	164	82.00
	Master's Units	33	16.50
	Master's Degree	3	1.50
	Doctorate (Units/Degree)	0	0.00

Table 3 presents the demographic profile of the 200 respondents in terms of age, sex, teaching experience, and educational attainment. In terms of age, most respondents were 20–29 years old (n = 119, 59.50%), followed by those aged 30–39 years (n = 61, 30.50%), 40–49 years (n = 18, 9.00%), and 50 years and older (n = 2, 1.00%). Regarding sex, female respondents comprised the majority (n = 162, 81.00%), followed by male respondents (n = 33, 16.50%) and those who preferred not to disclose their sex (n = 5, 2.50%).

In terms of teaching experience, the largest group consisted of respondents with 1–5 years of experience (n = 94, 47.00%), followed by those with 6–10 years (n = 56, 28.00%), 11–15 years (n = 38, 19.00%), and 16 years or more (n = 12, 6.00%). Regarding educational attainment, most respondents held a bachelor's degree (n = 164, 82.00%), while 33 respondents (16.50%) had earned master's units and 3 respondents (1.50%) had completed a master's degree. No respondent reported having doctoral units or a doctoral degree. Overall, the respondents were predominantly 20–29 years old, female, relatively early in their teaching careers, and bachelor's degree holders.

Level of Classroom Technology Integration

To evaluate the depth of digital practice, the four primary dimensions of the Technological Pedagogical Content Knowledge (TPACK) framework were surveyed.

Table 4. *Summary Matrix on the Level of Classroom Technology Integration*

TPACK-Related Pedagogical Dimensions	Weighted Mean	Rank	Descriptive Remarks
Enhancement of Lesson Content through Technology	3.72	1	Always Practiced (AP)
Promotion of Student-Centered Learning	3.28	2	Often Practiced (OP)

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Fostering of Collaboration Using Digital Tools	3.23	3	Often Practiced (OP)
Personalization and Differentiation of Instruction	3.18	4	Often Practiced (OP)
Composite Mean	3.16		Often Practiced (OP)

Table 4 presents the level of classroom technology integration among private elementary school teachers across four TPACK-informed pedagogical dimensions. Enhancement of lesson content through technology obtained the highest mean score (M = 3.72) and was interpreted as always practiced. This was followed by the promotion of student-centered learning (M = 3.28), fostering collaboration using digital tools (M = 3.23), and personalization and differentiation of instruction (M = 3.18), all of which were interpreted as often practiced. Overall, classroom technology integration was reported as often practiced, with a composite mean of 3.16.

The findings indicate that teachers use technology more consistently to enhance lesson content and improve instructional delivery than to facilitate student-centered, collaborative, and differentiated learning experiences. From the perspectives of the TPACK framework and the SAMR model, the higher rating for content enhancement suggests that teachers may be more comfortable using technology to support or improve existing instructional practices than to redesign learning activities in transformative ways (Mishra & Koehler, 2006; Puentedura, 2014). The difference between lesson-content enhancement (M = 3.72) and personalization and differentiation of instruction (M = 3.18) further suggests that familiarity with digital tools does not necessarily translate into advanced technology-supported pedagogy. Sustained, practice-based professional development may therefore be necessary to strengthen teachers' capacity to use technology for interactive, collaborative, personalized, and learner-centered instruction (Dong et al., 2020; Warmansyah et al., 2022).

3. Extent of Availability of Support Factors

Institutional support was assessed across administrative support, technological resources, and professional training.

Table 5. *Summary of the Perceived Extent of Availability of Support Factors*

Institutional Support Factors	Weighted Mean	Rank	Descriptive Remarks
Administrative Support	3.11	1	Available (A)
Technological Resources	2.88	2	Available (A)
Professional Training	2.88	2	Available (A)
Composite Mean	2.96		Available (A)

Table 5 presents the perceived availability of institutional support factors for classroom technology integration. Administrative support obtained the highest mean score (M = 3.11) and was interpreted as available. Technological resources (M = 2.88) and professional training (M = 2.88) received equal mean scores and shared the second rank, with both interpreted as available. Overall, institutional support factors were perceived as available, as reflected by the composite mean of 2.96.

The findings indicate that teachers perceive stronger support from school administrators than from the technological resources and professional training provided by their institutions. Although administrative encouragement is present, the lower ratings for technological resources and professional training suggest that leadership support may not always be accompanied by adequate devices, reliable technical assistance, accessible digital materials, and sustained practice-based learning opportunities. This disparity may restrict teachers' capacity to advance from basic technology-supported instruction toward more student-centered, collaborative, and differentiated learning practices. Previous studies similarly emphasize that meaningful technology integration requires coordinated administrative leadership, sufficient technological resources, technical assistance, and continuous professional learning opportunities (Nguyen et al., 2022; Trust et al., 2020; Yang et al., 2025). Therefore, private schools should strengthen their support systems through improved resource provision, sustained professional development, peer mentoring, technical assistance, and collaborative instructional planning.

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 7 (July 2026)

Table 6. *Inferential Statistics Matrix on Demographic Differences and Support Factor Relationships*

A. One-Way ANOVA on Classroom Technology Integration by Demographic Profile

Demographic Variable	F-Value	P-Value	Remarks
Age	2.04	0.110	Not Significant
Sex	0.16	0.690	Not Significant
Years in Teaching	1.33	0.270	Not Significant
Educational Attainment	2.03	0.130	Not Significant

B. Pearson Product-Moment Correlation between Support Factors and Integration

Correlated Variables	R-Value	P-Value	Remarks
Integration x Support Factors	0.311**	0.000	Significantly Correlated

Note: **p < 0.01 level (two-tailed)

Table 6 presents the results of the one-way analyses of variance and Pearson product–moment correlation. No statistically significant differences in classroom technology integration were found when respondents were grouped according to age, $F = 2.04$, $p = .110$; sex, $F = 0.16$, $p = .690$; years of teaching experience, $F = 1.33$, $p = .270$; and educational attainment, $F = 2.03$, $p = .130$. Because all probability values were greater than the .05 level of significance, the study failed to reject the first null hypothesis. These findings indicate that the level of classroom technology integration did not significantly differ across the demographic groups examined.

In contrast, the Pearson correlation analysis revealed a statistically significant positive relationship between institutional support factors and classroom technology integration, $r = .311$, $p < .001$. The magnitude of the coefficient indicates a moderate positive association, suggesting that greater availability of administrative support, technological resources, and professional training tends to be associated with higher levels of classroom technology integration. Therefore, the second null hypothesis was rejected. The result is consistent with previous studies emphasizing that school-level resources, professional development, leadership, and institutional support are important conditions associated with meaningful digital pedagogy (Amemasor et al., 2025; Scherer et al., 2021; Tondeur et al., 2021). Overall, the findings suggest that institutional support is significantly associated with teachers' technology-integration practices, whereas the demographic characteristics examined were not associated with significant differences in integration levels.

CONCLUSION

Based on the analysis and interpretation of the data, the following conclusions were drawn:

1. Based on the findings, private elementary school teachers in Las Piñas City demonstrate an often-practiced level of classroom technology integration, with stronger implementation in the enhancement of lesson content through technology than in student-centered learning, collaboration, and personalization of instruction. This indicates that teachers are able to use digital tools to support lesson delivery and improve content presentation, but their use of technology for more transformative, learner-centered, collaborative, and differentiated instruction remains less consistent. Viewed through the TPACK and SAMR perspectives, the findings suggest that teachers are more commonly operating within technology-supported lesson enhancement rather than consistently reaching deeper levels of technology-enabled learning transformation. This supports recent studies which emphasize that digital competence must be accompanied by pedagogical readiness, instructional planning, and sustained professional development to produce meaningful technology integration (Scherer et al., 2021; Tondeur et al., 2021; Warmansyah et al., 2022).
2. The findings further show that demographic characteristics such as age, sex, years in teaching, and educational attainment do not significantly influence teachers' level of classroom technology integration.

This means that technology integration should not be assumed to depend on whether teachers are younger or older, male or female, more experienced or less experienced, or have higher educational attainment. Instead, the results indicate that teachers across demographic groups may experience similar instructional and institutional conditions that shape their use of technology. This confirms that professional development and intervention programs should not be limited to specific demographic groups but should be provided equitably to all teachers. Such findings are consistent with recent studies emphasizing that school-level support, teacher readiness, and collaborative professional learning environments are stronger influences on technology integration than teacher characteristics alone (Scherer et al., 2021; Tondeur et al., 2021; Nguyen et al., 2022).

3. The study also concludes that institutional support factors are significantly related to classroom technology integration. The positive correlation between support factors and technology integration indicates that when administrative support, technological resources, and professional training become more available, teachers' use of technology in classroom instruction also tends to improve. Although administrative support was perceived as the strongest support factor, technological resources and professional training still require further strengthening. This shows that leadership encouragement alone is not sufficient if it is not supported by adequate devices, technical assistance, planning time, and continuous practice-based training. Therefore, the identified support gap highlights the need for private schools to align leadership advocacy with concrete operational and pedagogical support systems, including mentoring, collaborative learning communities, and sustained teacher development programs (Nguyen et al., 2022; Weisberg & Dawson, 2023; Amemasor et al., 2025).
4. Overall, successful classroom technology integration depends on a coordinated institutional framework that connects teacher readiness, technological resources, administrative support, and sustained professional development. The findings suggest that private elementary schools must move beyond basic ICT use and one-time technology training toward continuous, collaborative, and classroom-based digital pedagogy development. The proposed TECH-ALIGN Las Piñas program responds to this need by providing a structured pathway for strengthening administrative coordination, teacher training, resource sharing, and peer mentoring. Through this program, teachers may be better supported in moving from technology-assisted content delivery toward student-centered, collaborative, personalized, and transformative digital learning experiences. This direction is consistent with recent educational technology literature emphasizing that effective digital instruction requires school-based support systems, professional learning, and pedagogically aligned technology use (Rosmaria, 2024; Rehman et al., 2025; Tawil et al., 2026).

Recommendations

Based on the conclusions of the study, the following recommendations are offered:

1. ***Private elementary school teachers*** should actively participate in competency-based and context-aware professional development programs that strengthen technology-supported pedagogy, student-centered learning, digital collaboration, and differentiated instruction. Teachers should not limit technology use to lesson presentation or content enhancement but should explore tools that allow learners to interact, collaborate, create outputs, receive feedback, and work according to their learning needs. They are also encouraged to form peer-learning communities and digital mentoring groups where they can share strategies, troubleshoot common classroom technology concerns, and develop confidence in using digital tools meaningfully. Such collaborative professional learning can help teachers move from basic technology use toward more pedagogically sound and learner-responsive instruction (Scherer et al., 2021; Tondeur et al., 2021; Warmansyah et al., 2022).
2. ***School heads and basic education administrators*** should strengthen institutional support systems by embedding digital pedagogy competencies into school-based instructional planning, supervision, and professional development programs. Since the findings showed that administrative support was available but technological resources and professional training still required improvement, administrators should

ensure that leadership encouragement is matched with sufficient devices, reliable internet access, technical assistance, planning time, and continuous practice-based training. Budget allocations should therefore go beyond hardware acquisition and include instructional design support, teacher coaching, digital resource development, and collaborative lesson planning. Administrators should also establish clear school-level mechanisms that help teachers apply technology for student-centered, collaborative, and differentiated learning rather than for content delivery alone (Nguyen et al., 2022; Weisberg & Dawson, 2023; Yang et al., 2025).

3. ***The Department of Education and curriculum planners*** should develop localized digital integration guidelines and quality benchmarks that are responsive to the realities of private basic education institutions. These benchmarks should help schools assess not only the availability of devices and connectivity but also the pedagogical depth of technology use in actual classroom practice. Curriculum planners may also provide guidance on how digital tools can support learner engagement, formative assessment, collaboration, differentiation, creativity, and 21st-century competencies. Since technology integration is influenced by support systems, policy directions should emphasize teacher training, institutional readiness, data privacy, digital citizenship, resource equity, and continuous monitoring of implementation (UNESCO, 2023; Rosqueta, 2025; Bukhari et al., 2025).
4. ***Teacher Education Institutions and higher education programs*** should strengthen pre-service and in-service teacher education by embedding advanced digital pedagogy training into professional courses, field study, practicum, and graduate education programs. Training should focus not only on technical skills but also on the meaningful alignment of technology with content, pedagogy, assessment, learner diversity, and classroom management. Teacher education programs may include simulation-based activities, lesson design laboratories, digital assessment tasks, collaborative technology projects, and mentorship partnerships with basic education schools. These experiences can help future and practicing teachers bridge the gap between digital familiarity and effective classroom application (Tondeur et al., 2021; Su et al., 2023; Rehman et al., 2025).
5. ***Future researchers*** should conduct mixed-methods, longitudinal, or intervention-based studies to examine the long-term effectiveness of structured programs such as TECH-ALIGN Las Piñas on teachers' actual classroom practices and student learning outcomes. Future studies may also compare public and private schools, different grade levels, or different urban and non-urban contexts to determine whether the relationship between institutional support and technology integration remains consistent across settings. Qualitative investigations may further explore teachers' lived experiences, challenges, coping strategies, and perceptions regarding digital pedagogy, technical support, and professional training. These future research directions can provide deeper evidence on how schools can sustain meaningful, collaborative, and differentiated technology integration over time (Scherer et al., 2021; Gyasi & Sun, 2026; Tawil et al., 2026).

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