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Technology Integration in Professional Development and Its Impact on Student Learning Outcomes in Elementary Public Schools in San Pedro City, Laguna

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Abstract:
This study explored the impact of technology integration in professional development (PD) on student learning outcomes in public elementary schools in San Pedro City, Laguna. Grounded in the Technological Pedagogical Content Knowledge (TPACK) Framework, Adult Learning Theory, and Guskey's Model of Teacher Change, the study aimed to determine the extent of technology integration in PD, its perceived effectiveness among teachers, and its relationship with student learning outcomes measured through General Weighted Average (GWA). The research methodology adopted in the study was descriptive-correlational design. The research participants included fifty (50) intermediate public elementary school teachers randomly chosen from three (3) schools. Questionnaires and GWA of the students' during the school year 2025–2026 were used as data collection tools in the study. Statistical treatments performed include the computation of the weighted mean, standard deviation, frequency and percentage distribution, Pearson's r, and Spearman rho. Findings of this study indicate that the use of technology integration in professional development is common knowledge but not necessarily effective if not used effectively in instructions since its direct effect is limited in improving student learning outcomes. On the contrary, teachers' perception of the effectiveness of PD plays a more critical role in improving student performance.

Keywords: *elementary education, learning outcomes, professional development, perceived effectiveness, technology integration*

1. INTRODUCTION

With rapid technological developments and changing learners' needs, technology integration in public elementary schools has become an important part of teaching and learning process. In many countries, digital tools and platforms are increasingly being integrated into educational systems to revolutionize teaching and learning practices, especially in the context where digital literacy is a basic skill for 21st century learners (Ma et al., 2024). Professional development (PD) for teachers is widely identified as the beginning point of successful technology use because it provides teachers with technical skills and pedagogical strategies to link digital technologies to learning goals (Amemasor et al., 2025). Casilao et al (2025) argued that when teachers go through a development program for technology integration they will get better at using digital technology in their teaching. This will allow teachers to create learning

opportunities that are more fun and meaningful for their students. Technology integration is important for teachers to learn. It will help them to create better lessons for their students. In the Philippine public-school context, in urbanizing communities such as San Pedro City, Laguna schools there continue to invest in technology-related teacher training programs as a strategy to assist teachers with meeting the teaching demands of the 21st century learner, but questions remain related to how those investments have translated into better learning for students (Nuncio et al., 2020).

Recent studies have begun to highlight the link between professional development and student achievement when technology integration is purposefully embedded. Ventista et al. (2023) revealed that professional development programs characterized by collaboration, sustained engagement, and classroom application contribute positively to student learning outcomes. Samsudin (2023) found that professional development programs incorporating educational technology significantly improved instructional quality and student academic performance. These findings suggest that the impact of technology integration extends beyond teacher competence, emphasizing the importance of PD designs that directly support classroom implementation and student learning, particularly at the elementary level.

Despite the growing emphasis on technology integration and teacher professional development, evidence for the effectiveness of technology-focused PD on student learning outcomes in elementary public schools is scant (Dahl-Leonard et al., 2024). Research found an enhanced performance of teachers on technology-related skills and teaching practices with attending professional development programs (Liu et al, 2024). However, few studies have extended this line of inquiry to further determine whether these improvements lead to any gains in student learning or academic performance. Moreover, much of the existing research on technology integration and professional development has been conducted in international settings or at the secondary school level. As a result, there is a lack of evidence grounded in the realities of elementary public schools in areas such as San Pedro City, Laguna (Silla et al., 2025).

This study focuses on the impact of integrating technology into teacher professional development on student learning outcomes. Its research setting is public elementary schools in San Pedro City, Laguna, the Philippines. Specifically, the study will verify whether a positive correlation exists between teachers' participation in structured professional development activities that include technology elements and elementary school students' learning outcomes. In addition, it will explore the explanatory role of teachers' perceptions of the effectiveness of this type of professional development in the relationship between the application of technology training and student performance. The study aims to generate targeted research knowledge that covers the dual impacts of professional development on both teachers and student learning outcomes.

2. METHODOLOGY

In this research study, a descriptive-correlational design was used to establish the existence of relationships among technology integration in professional development programs, teachers' perceived effectiveness of technology use, and the student learning outcomes. Descriptive analysis helped to provide a systematic presentation and evaluation of the current status of the variables, especially the integration of technology in professional development activities and the outcomes of student learning. This design made it possible for the researcher to accurately portray the prevailing condition without the need to manipulate any variable.

On the other hand, correlation analysis helped to determine the strength and direction of the association among the variables under consideration. It sought to discover the existence or non-existence of a

significant relationship among technology integration in professional development and the teachers' perceived effectiveness and among all three variables. This design is suitable for conducting the research because it helps to examine the existing relationships among different variables.
The data of the study were collected from both primary and secondary sources. The primary data were collected from the intermediate public elementary school teachers (Grades 4-6) through a structured survey questionnaire to determine the level of technology integration in professional development and the effectiveness of technology use among the teachers. The secondary data on the student learning outcomes were collected from the General Weighted Average (GWA) of their students for the Academic Year 2025-2026.
The population of the study consisted of intermediate public elementary school teachers (Grades 4–6) from selected public elementary schools in San Pedro City, Laguna. A total population of fifty-seven (57) teachers from three (3) selected schools was identified, from which fifty (50) teachers were chosen as the sample respondents. Stratified sampling with proportional allocation was employed to ensure that each subgroup was adequately represented in the sample. 31 out of 35 teachers from School A, 12 out of 14 teachers from School B, and 7 out of 8 teachers from School C. The selection of schools was based on accessibility and approval from school authorities. This stratified sampling approach ensures the manageability of data collection while maintaining the reliability and representativeness of the results.
The researcher used a two-part self- made questionnaire and GWA of students Grade 4-6. The questionnaire was divided into two major parts. Part I focused on identifying the level of technology integration in the professional development programs for teachers, while Part II determined teacher perceptions of the level of usefulness and effectiveness of this technology integration. Part 1 and 2 were composed of 25 statements. To provide additional data from the survey, Part III gathered the General Weighted Average (GWA) of the students handled by the respondents for the School Year 2025-2026. Prior to its administration, the research instrument underwent a validation process to ensure its reliability and content validity, and was reviewed and validated by the experts.
For this study, the researcher utilized a survey questionnaire as the main tool for data collection, which is suitable in generating quantifiable data from participants knowledgeable and experienced in relation to the variables under study. Through the use of this tool, data were systematically gathered on the extent of technology integration in professional development programs and the effectiveness that teachers perceive from these initiatives.
Prior to implementing the tool, permission was sought from the Schools Division Superintendent of the Division of San Pedro regarding the conduct of the study and the administration of the survey. Upon approval, coordination with the respective school principals of the three selected public elementary schools was conducted to explain the nature and scope of the research and to request their cooperation in data collection.

3. RESULTS AND DISCUSSION

This section presents, analyzes, and interprets the data gathered to determine the extent of technology integration in professional development, its perceived effectiveness, and its relationship to student learning outcomes in elementary public schools in San Pedro City, Laguna. The discussion is supported by relevant literature and studies to strengthen the findings.

I. Extent of Technology Integration in Professional Development (PD)

Table 1. Extent of Technology Integration in the Professional Development Program in terms of Availability of Technological Resources

Indicators	WM	SD	Interpretation
1. Our school provides reliable internet access during technology-integrated PD sessions.	3.20	.534	High
2. Functional devices (laptops, computers, tablets) are available for teachers during PD.	3.04	.668	High
3. Digital platforms and applications needed for training are accessible.	3.38	.602	Very High
4. Technical assistance is available when problems occur during PD sessions.	3.34	.557	Very High
5. Updated digital tools and software are introduced during PD programs.	3.16	.618	High
Average Weighted Mean	**3.22**	**.475**	**High**

Note. Scoring Range: 3.25 – 4.00 (Very High); 2.50 – 3.24 (High); 1.75 – 2.49 (Low); 1.00 – 1.74 (Very Low)

As seen in table 1, teachers have a high extent of technology integration in the professional development program in terms of availability of technological resources. This implies that most teachers have access to adequate technological resources like internet access, gadgets, and online tools during their professional development. However, the mean value indicates that while the resources are available, more can be done to make sure they are accessible to all teachers.

Studies done by Trust and Whalen (2020) reveals that technology is really important for teachers to learn about technology integration. This means teachers need to have the technology to learn how to use it. Kimmons et al. (2021) that teachers need to be able to use technology and get help when they need it so they can use technology properly. In addition, if teachers do not have access to the technology, it can be very hard for them to use digital instructional strategies even if they have been trained to use technology integration.

Table 2. Extent of Technology Integration in the Professional Development Program in terms of Frequency of Technology Use

Indicators	WM	SD	Interpretation
1. Technology-integrated PD sessions are conducted regularly.	3.06	.549	High
2. Digital tools are consistently used during teacher training activities.	3.30	.543	Very High
3. Online webinars and virtual workshops are frequently attended as part of PD.	3.44	.540	Very High
4. Collaborative digital platforms (e.g., shared drives, LMS) are often used in PD.	3.48	.543	Very High
5. Follow-up or enhancement training involving technology is regularly implemented.	3.14	.571	High

Average Weighted Mean	3.28	.4163	Very High

As shown in Table 2, teachers have a high extent of technology integration in the professional development program in terms of technology use, with the average score at 3.28. Such high scores indicate that technology is frequently used in professional development activities like webinars and online workshops.

These results align with Philipsen et al. (2021) who discovered that participating in professional development activities online and through technology enhances teachers' awareness and use of digital tools. Moreover, according to Darling-Hammond et al. (2017), continuous professional development, particularly through the use of technology, leads to improved instructional practices among teachers. Likewise, Koehler et al. (2022) observed that frequent use of technology during professional development increases technology integration within classroom instruction.

Table 3. Overall Extent of Technology Integration in the Professional Development Program

Scale	Domains	*WM*	*SD*	Interpretation
Extent of technology integration	Availability of technological resources	3.22	.475	High
	Frequency of technology use	3.28	.416	Very High
OVERALL		**3.25**	**.416**	**Very High**

As shown in Table 3, teachers have a very high overall extent of technology integration in the professional development program, with a weighted mean of 3.25. This result confirms the presence of technology integration in the professional development programs that were conducted in the selected schools.

It should be noted that the results obtained are supported by the theoretical approach known as TPACK. According to Valtonen et al. (2020), effective technology integration occurs when teachers are consistently exposed to opportunities that combine these domains. The high level of integration suggests that professional development programs in the selected schools are aligned with current trends in digital education.

II. Perceived Effectiveness of Technology Integration in Professional Development

Table 4. Perceived Effectiveness of Technology Integration in terms of Confidence in Using Technology

Indicators	WM	SD	Interpretation
1. Technology-integrated PD increased my confidence in using digital tools.	3.52	.504	Very High
2. I feel capable of integrating technology into my daily lessons.	3.42	.498	Very High
3. I can independently explore and use new educational technologies.	3.42	.574	Very High
4. I can manage minor technical issues during instruction.	3.38	.530	Very High
5. I feel confident guiding students in using digital tools	3.34	.519	Very High

effectively.			
Average Weighted Mean	**3.41**	**.453**	**Very High**

Table 4 reveals that teachers' perceived effectiveness of technology integration in terms of confidence in using technology has an average weighted mean of 3.41 (Very High). This result is in line with the study conducted by Tondeur et al. (2021), whereby the authors observed that professional development programs play a significant role in enhancing teachers' self-efficacy regarding the application of educational technologies. Likewise, Scherer et al. (2021) stated that self-efficacy concerning the use of technology was a significant predictor of actual classroom integration. Further, Instefjord and Munthe (2017) noted that regular engagement with technology training enhances teacher confidence, willingness and innovation in their teaching.

Table 5. Perceived Effectiveness of Technology Integration in terms of Improvement in Teaching Skills

Indicators	WM	SD	Interpretation
1. Technology-focused PD improved my lesson planning skills.	3.40	.494	Very High
2. I can design more engaging lessons using digital tools.	3.40	.494	Very High
3. My assessment strategies improved through technology integration.	3.32	.512	Very High
4. I can better differentiate instructions using digital resources.	3.30	.505	Very High
5. My instructional delivery became more effective due to technology integration.	3.40	.494	Very High
Average Weighted Mean	**3.36**	**.430**	**Very High**

Table 5 shows the perceived effectiveness of technology integration in terms of improvement in teaching skills, having an average weighted mean score of 3.36 and a standard deviation of 0.430, which means that the effectiveness level of technology integration was considered as Very High (Highly Evident). This indicates that technology integration plays an important role in helping teachers improve their teaching methods and techniques.

Table 6. Perceived Effectiveness of Technology Integration in terms of Relevance to Classroom Practice

Indicators	WM	SD	Interpretation
1. The technology skills learned in PD are applicable to my classroom.	3.40	.494	Very High
2. The digital tools introduced match my students' learning needs.	3.30	.505	Very High
3. PD sessions reflect real classroom situations.	3.26	.527	Very High
4. The training content is practical and usable.	3.34	.478	Very High
5. I regularly apply what I learned from technology-integrated PD.	3.40	.534	Very High

Average Weighted Mean	**3.34**	**.459**	**Very High**

Table 6 shows the perceived effectiveness of technology integration in terms of relevance to classroom practice, showing a weighted mean of 3.34 as very high. This means that teachers find technology-based professional development very highly relevant and applicable to classroom conditions. From the findings, teachers acquire knowledge and skills from professional development activities, which can be used effectively in their teaching practice in integrating technology into instruction.

The above finding is in line with the framework of Guskey (2002), which states that professional development becomes most effective when it is closely aligned with classroom application. Additionally, findings of Stavermann (2024) show that for any teacher professional development program that involves technology and online learning to be more successful, it must be realistic, relevant, and context-based. This relevance enables teachers to use new knowledge and skills to enhance their practice and thus improve teaching practices and ultimately students' performance.

Table 7. Perceived Effectiveness of Technology Integration

Scale	Domains	*WM*	*SD*	Interpretation
Effectiveness of technology integration	Confidence in using technology	3.41	.453	Very High
	Improvement in teaching skills	3.36	.430	Very High
	Relevance to classroom practice	3.34	.459	Very High
OVERALL		**3.37**	**.405**	**Very High**

As seen in Table 7, the perceived effectiveness of technology integration in professional development obtained an overall weighted mean of 3.37, interpreted as very high. This indicates that teachers in San Pedro City public elementary schools perceive technology-integrated professional development programs as highly effective in enhancing their confidence, improving teaching skills, and ensuring relevance to classroom practice.

III. Student Learning Outcomes

Table 8. Level of Student Learning Outcomes in terms of General Weighted Average (GWA)

	GWA	Frequency	Percentage (%)
	90-100 (Excellent)	10	20.0
	85-89 (Very Good)	27	54.0
	80-84 (Average)	13	26.0
	75-79 (Fair)	-	-

N=50

It can be observed from the findings above that the majority of the students fall within the very good range (54%), while 20% of them are excellent, and 26% average. Therefore, it can be assumed that the

performance of the students is quite high. It can also be noted that there are no students belonging to the fair category; hence, all the minimum standards have been attained.

IV. Relationship Between the Extent of Technology Integration and Its Perceived Effectiveness of Technology Integration

Table 9. Relationship Between the Extent of Technology Integration and Its Perceived Effectiveness of Technology Integration

Independent	Dependent	Pearson's r^a	*p*-value	Interpretation
Extent of technology integration	Perceived effectiveness of technology integration	.580 (moderate)	< .001	Significant

It can be seen from Table 9 that the calculated p-value is below 0.05 ($p < .001$), and therefore, the null hypothesis (H01) is rejected. It implies that there is a statistically significant correlation between the level of technology integration and the perceived effectiveness of professional development. The value of Pearson's r equals 0.580 and shows a moderate positive correlation; thus, it means that increased technology integration is related to increased teacher perception of professional development effectiveness. Therefore, it is possible to state that higher involvement of technology into professional development increases its perceived effectiveness.

Moreover, according to Siyam (2025), sustained technology integration improves teachers' teaching techniques and the effectiveness of professional development.

V. Relationship Between the Extent of Technology Integration and the Level of Student Learning Outcomes

Table 10. Relationship Between the Extent of Technology Integration and the Level of Student Learning Outcomes

Independent	Dependent	*Spearman rho*[a]	*p*-value	Interpretation[b]
Extent of technology integration	Student learning outcomes (GWA)	.387 (moderate)	.006	Significant

As seen in Table 10, the p-value obtained (0.006) falls below 0.05, it results in the rejection of H02. Statistically significant, the relationship between the degree of use of technology in professional development and student learning outcomes as represented by GWA implies that there is a connection between the two variables in public elementary schools in San Pedro, Laguna. With respect to its value, the Spearman rho obtained (0.387) implies that there is a moderate positive correlation between the two variables involved, thus indicating that an increase in technology integration in professional development will lead to better learning outcomes among students.

These findings imply that technology integration alone is insufficient in delivering strong gains from learning unless technology integration is adequately utilized under suitable teaching methodologies. The weaker correlation coefficient indicates that it is the way technology is integrated into the curriculum that matters more than the frequency with which it is employed. This is supported by Hillmayr et al. (2020), who found that digital tools have a positive but modest effect on student achievement, particularly when not accompanied by strong instructional strategies.

VI. Relationship Between the Perceived Effectiveness of Technology Integration and the Level of Student Learning Outcomes

Table 11. Relationship Between the Perceived Effectiveness of Technology Integration and the Level of Student Learning Outcomes

Independent	Dependent	*Spearman rho*[a]	*p*-value	Interpretation[b]
Effectiveness of technology integration	Student learning outcomes (GWA)	.597 (moderate)	< .001	Significant

Since the calculated p-value is below the 0.05 alpha level ($p < .001$), the null hypothesis (H03) is rejected. It means that there is a statistically significant association between the perceived effectiveness of technology use in professional development and student achievement based on GWA in public elementary schools located in San Pedro, Laguna. A Spearman rho value of 0.597 signifies a positive correlation; therefore, the stronger the perception of the effectiveness of technology use in professional development, the better the student performance. In other words, the greater the perception of the usefulness of the application of technology in professional development by teachers, the greater the likelihood of effective application and better academic achievement of the students.

A recent study has found strong evidence for the existence of a relationship between technology integration in professional development as perceived by teachers and student learning outcomes (Amemasor et al.,2025). Systematic analysis reveals that well-designed technology integration in professional development can improve teachers' self-confidence, instructional strategies, and application of skills, and hence have a positive impact on student learning. Similarly, other researchers reveal that teacher perceptions regarding the importance and usefulness of technology play a key role in determining how effectively these technologies are utilized for the purpose of instruction (Mekheimer, 2025). These results indicate that if teachers perceive technology integration to be significant and effective, then positive student learning outcomes would follow.

VII. Proposed Action Plan Based on the Findings of the Study

Rationale:

The proposed action plan is anchored on the need to sustain and further enhance the positive effects observed in the research because all major factors involved in the study had statistically significant relationships. Such findings show that an improvement in one area will have a positive influence on the other areas; therefore, there is a need to preserve and improve existing practices instead of implementing completely new initiatives.

Even though the level of technology integration and its effectiveness was extremely high, and the results of learning showed satisfaction to excellence, the relationship between technology integration and student learning outcomes revealed moderate. Thus, despite the fact that the existing initiatives work, it is necessary to continue developing and improving them to obtain better results.

Furthermore, this moderate relationship suggests that there are underlying factors that may influence how technology integration translates into improved student outcomes, such as teacher competency, quality of implementation, and learner engagement. Hence, the action plan aims to provide targeted interventions, continuous monitoring, and capacity-building opportunities to strengthen these areas. In doing so, the school can ensure that technology integration not only remains effective but also becomes more impactful in enhancing student learning outcomes.

Proposed Action Plan

KEY RESULT AREAS	OBJECTIVES	STRATEGY / ACTIVITY	TIME FRAME	PERSONS INVOLVED	BUDGET ALLOCATION	SUCCESS INDICATOR
Availability of technological resources	Further improve access and consistency of technological resources during PD	Upgrade internet connectivity and provide additional functional devices for training regularly	1st–2nd Quarter	School Heads, ICT Coordinator	₱10,000	90 % Increased capacity of the network.
Functional devices available for teachers	Ensure sufficient and accessible devices for all teachers	Conduct inventory and procurement of needed ICT equipment regularly	1st Quarter	School Heads, Property Custodian	₱10,000	All teachers have access to devices during PD
Updated digital tools introduced in PD	Enhance exposure to updated and relevant digital tools	Conduct training workshops on emerging educational technologies	Quarterly	ICT Coordinator, ICT Level Coordinator, Master Teachers	₱5,000	95% of teachers demonstrate use of updated tools in lesson plans
Follow-up/enhancement training	Strengthen continuity of professional development	Continuous implementation of regular follow-up training and coaching sessions	Quarterly	School Heads, Master Teachers	Minimal	95% Increased participation in enhancement trainings
Moderate relationship between technology integration and student learning outcomes	Further improve the impact of technology integration on student performance	Sustain trainings of teachers on effective pedagogical integration (TPACK-based strategies)	1st–3rd Quarter	School Heads, Teachers	₱10,000	90% Improved student GWA and classroom engagement

Moderate relationship between perceived effectiveness and student outcomes	Translate teacher perception into actual student gains	Monitor student performance and align PD with classroom needs	Quarterly	Teachers, School Heads	Minimal	95% Increased percentage of students in "Excellent" GWA
Need to strengthen instructional application of technology	Improve quality of technology use in teaching	Conduct demonstration teaching and peer coaching sessions	Quarterly	Master Teachers, Teachers	Minimal	95% of the teacher improved teaching performance and observation ratings

CONCLUSIONS

Based on the findings of the study, it was concluded that technology integration in professional development is widely practiced in public elementary schools in San Pedro City, Laguna, particularly in terms of frequency of use, although the availability of resources still needs improvement. Teachers generally perceived technology-integrated professional development as highly effective because it enhances their confidence, improves their teaching skills, and provides relevant applications that can be utilized in classroom instruction. Furthermore, student learning outcomes were found to be generally high, indicating that learners are achieving satisfactory academic performance.

The study further revealed that increased technology integration in professional development significantly improves teachers' perception of its effectiveness, suggesting that greater exposure to and engagement with technology strengthen its value among educators. However, technology integration alone has only a limited effect on student learning outcomes, implying that the mere use of technology does not automatically result in better academic performance. This emphasizes the importance of effective implementation and adequate teacher training in maximizing the benefits of technology in education. Moreover, teachers' perceived effectiveness of professional development was found to play a more significant role in improving student learning outcomes, highlighting that the manner in which teachers apply their learning is more important than the simple presence of technology in the classroom. In view of these findings, the proposed action plan is deemed necessary for implementation to further enhance technology integration and support improved teaching and learning outcomes.

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COMPETING INTERESTS

The authors declares that there are no financial or personal relationships that could have influenced the work reported in this study. The authors further confirm that no competing interests exist.

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