

The Convergence of Educational Leadership and Technology Integration in Enhancing Teaching and Learning: A Descriptive Study in Public Secondary Schools in Isabela, Philippines

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Keywords:

Educational leadership; Technology integration; Digital leadership; Teaching and learning; Public secondary schools

ABSTRACT

In the digital age, the fusion of educational leadership and technology integration has emerged as a vital force in transforming teaching and learning. This study explored the role of educational leadership in nurturing technology integration within public secondary schools in Isabela, Philippines. It painted a vivid picture of respondents' demographic and professional landscapes, evaluated school leaders' self-reflections on technology integration, uncovered leadership practices and hurdles, explored teachers' views on leadership support and its ripple effect on teaching and learning, and unearthed relationships and predictors of technology integration outcomes. Employing a quantitative descriptive-survey design, the study engaged 123 teachers and school heads, carefully chosen through purposive random sampling. Data collection was orchestrated via a researcher-adapted questionnaire rooted in the Technological Pedagogical Content Knowledge (TPACK) Framework and the National ICT Competency Standards for School Heads. The analytical symphony included frequency, percentage, weighted mean, standard deviation, Pearson Product-Moment Correlation, and Multiple Linear Regression. The findings revealed that school leaders harbored positive perceptions of their roles and embraced leadership strategies that championed digital teaching and learning. However, challenges such as internet connectivity, technical support, funding, and teacher workload loomed large. The study uncovered significant positive connections among educational leadership, leadership practices, leadership support, technology integration, and teaching and learning outcomes, while challenges cast a shadow on educational leadership. Vision setting, professional development support, fostering a school culture of innovation, and resource allocation emerged as significant predictors of technology integration. The study concludes that effective educational leadership is the linchpin for cultivating sustainable technology integration and elevating teaching and learning in public secondary schools.

1 INTRODUCTION

Digital technologies and the Fourth Industrial Revolution, or Industry 4.0, are changing the way education works. They are reshaping how teachers teach, how students get involved, and what they learn. On a global scale, initiatives like the UNESCO ICT Competency Framework and Sustainable Development Goal 4 highlight the importance of digital education in ensuring that everyone gets a fair shot at quality education. In the Philippines, the Department of Education is pushing this change forward with programs like the DepEd Computerization Program, the MATATAG Agenda, and the National ICT Competency Standards, all aimed at bringing technology into public

secondary schools. However, how well technology is used in these schools really depends on factors such as infrastructure, teachers' ICT skills, and the support they receive from their schools (Caratquit & Javier, 2025; Morales et al., 2021). In Isabela Province, there is a clear effort to create tech-friendly learning environments, although schools still face hurdles with resources and training (Biñas et al., 2023). School leaders play a crucial role here. They drive improvements in teaching, spark innovation, manage resources, foster professional growth, and encourage teamwork. All of this is key to improving schools, integrating technology, and transforming education (Biñas et al., 2023; Riski et al., 2023).

Technology integration in education refers to the effective use of information and communication

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technology (ICT) tools and digital resources to improve teaching and learning. Frameworks such as the **Technological Pedagogical Content Knowledge (TPACK)** and the **Substitution, Augmentation, Modification, and Redefinition (SAMR)** model guide teachers in integrating technology with pedagogy and subject content. The use of technology enhances instructional delivery, increases student engagement, promotes collaboration and critical thinking, and supports personalized learning (Caratiquit & Javier, 2025; Morales et al., 2021). Furthermore, **Anselmo et al. (2025)** emphasized that continuous professional development, institutional support, and educators' readiness are essential for the successful integration of emerging technologies in teaching. Consequently, effective educational leadership plays a crucial role in fostering technology integration and improving educational outcomes. Several factors influence the successful integration of educational leadership and technology, including the digital leadership competencies of school leaders, the availability of ICT infrastructure and internet connectivity, teachers' digital skills and readiness, and continuous professional development. Institutional support, a positive school culture, and supportive educational policies also encourage teachers to adopt technology more effectively (Anselmo et al., 2025). In addition, differences in school location and socioeconomic conditions affect access to technology and digital readiness, highlighting the need for targeted interventions to ensure equitable and sustainable technology integration across schools (Biñas et al., 2023; Caratiquit & Javier, 2025; Riski et al., 2023; Valdez & Mendoza, 2024).

Previous studies have examined educational leadership by emphasizing the role of school heads in instructional leadership, decision-making, and organizational development (Banua et al., 2022; Biñas et al., 2023). Similarly, research has demonstrated that technology integration enhances instructional delivery, student engagement, and learning outcomes (Jupakkal, 2024; Torrado et al., 2021). However, limited studies have investigated how educational leadership and technology integration collectively influence teaching and learning, particularly in public secondary schools in the Philippine context. In Isabela Province, empirical evidence remains limited regarding leadership practices, technology integration challenges, and their combined influence on instructional effectiveness (Biñas et al., 2023). Moreover, few studies have examined which leadership dimensions significantly predict successful technology integration and improved teaching and learning outcomes (Ang et al., 2025; Tanucan et al., 2023). Addressing this gap, the present study examined the convergence of educational leadership and technology integration in enhancing teaching and learning among public secondary schools in Isabela, Philippines. Specifically, it described the respondents' demographic and professional profile, assessed school leaders' self-perceptions and leadership practices, identified technology integration challenges, examined

teachers' perceptions of leadership support and the impact of technology integration on teaching and learning, and determined the relationships and predictors of technology integration outcomes. The findings are expected to provide evidence that can guide school leaders, policymakers, and educators in strengthening technology integration and promoting sustainable digital transformation in public secondary schools.

2 RESEARCH QUESTIONS

This study aimed to examine the convergence of educational leadership and technology integration in enhancing teaching and learning in public secondary schools in Isabela, Philippines. Specifically, this study sought to answer the following questions:

1. What is the demographic and professional profile of the respondents in terms of age, sex, civil status, highest educational attainment, present position, latest performance rating (IPCRF), years of teaching experience, and technology-or leadership-related trainings attended?
2. What is the level of school leaders' self-perception of their role in technology integration?
3. What leadership practices are implemented to support technology integration in public secondary schools?
4. What challenges are encountered in the technology integration in public secondary schools?
5. What are teachers' perceptions of leadership support and the impact of technology integration on teaching and learning?
6. Is there a significant relationship between educational leadership and technology integration outcomes?
7. Which dimensions of educational leadership significantly predict technology integration in public secondary schools?

3 METHODOLOGY

3.1 Research Design

In this study, a quantitative descriptive survey research design was utilized to explore how educational leadership and technology integration converge to improve teaching and learning in public secondary schools in Isabela, Philippines. This design was suitable as it allowed for a systematic description of the respondents' demographic profiles, evaluation of school leaders' views on their role in technology integration, identification of leadership practices and challenges, and assessment of teachers' views on leadership support and the effects of technology integration. Additionally, the design enabled the gathering of quantitative data, which were analyzed using descriptive and inferential statistics to objectively comprehend the study variables.

3.2 Research Locale

This study was conducted in selected public secondary schools in the Province of Isabela, Philippines. The province was chosen because of its diverse educational settings, which include both urban and rural schools implementing various Department of Education (DepEd) technology initiatives. This setting provided an appropriate context for examining how educational leadership influences technology integration across different school environments.

3.3 Respondents of the Study

The respondents consisted of 123 public secondary school teachers and school heads from selected schools in Isabela Province, Philippines. Teachers served as the primary respondents because they directly implement technology integration in classroom instruction, while school heads provided information on leadership practices and support for technology integration. Respondents were selected using purposive random sampling to ensure that they had relevant experience in educational leadership and technology integration.

3.4 Research Instrument

Data were collected using a researcher-adapted structured questionnaire based on the Technological Pedagogical Content Knowledge (TPACK) Framework and the National ICT Competency Standards for School Heads. The instrument consisted of two sections: the first gathered the respondents' demographic and professional profiles, while the second measured school leaders' perceptions, leadership practices, technology integration challenges, leadership support, and the perceived impact of technology integration using a four-point Likert scale. Prior to data collection, the questionnaire was subjected to expert validation and pilot testing to ensure content validity and reliability.

3.5 Data Gathering Procedure

After securing approval from the Schools Division Office of Isabela and the administrators of the participating schools, the researcher distributed the questionnaires to respondents. The purpose of the study was explained, informed consent was obtained, and confidentiality and anonymity were ensured in all cases. Completed questionnaires were retrieved after the agreed period, and the responses were checked for completeness before coding and statistical analysis.

3.6 Statistical Treatment of Data

The collected data were organized, coded, tabulated, and analyzed using appropriate statistical tools. Frequency and percentage were used to describe the demographic and professional profiles of the respondents. Weighted mean and standard deviation were employed to determine the respondents' perceptions of educational leadership, leadership practices, technology integration challenges, leadership support, and the perceived impact of technology integration. Pearson's product-moment correlation was

utilized to examine the relationships among the major study variables, while multiple linear regression analysis was performed to identify leadership factors that significantly predict technology integration. All statistical analyses were conducted at a 0.05 level of significance.

4 RESULT AND DISCUSSION

Figure 1 Demographic and Professional Profile of the Respondents in terms of Age, Sex, Civil Status, Educational Attainment and Present Position

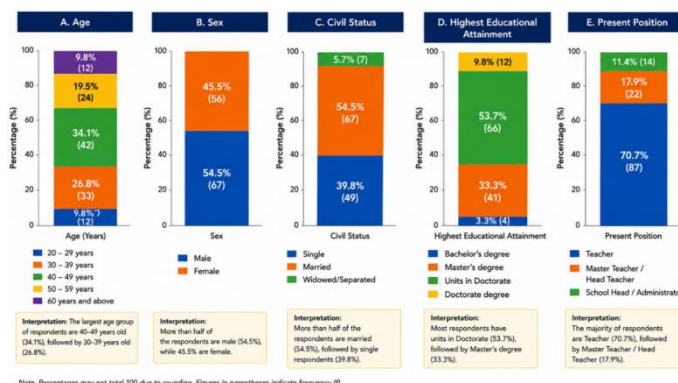


Figure 1 illustrates the demographic characteristics of the respondents, categorized by age, gender, marital status, highest level of education, and current job role. The data reveal that the largest age group among respondents was 30–39 years (34.1%), followed by those aged 40–49 years (26.8%), with only a small fraction being 60 years or older (9.8%). In terms of gender, males constituted the majority (54.5%), while females made up 45.5%. Regarding marital status, married individuals (54.5%) were more prevalent than those who were single (39.8%) or widowed/separated (5.7%). A significant portion of respondents held a doctorate (53.7%), with a master's degree being the next most common (33.3%), highlighting a group of well-qualified educational professional. Concerning current roles, most were teachers (70.7%), followed by Master Teachers or Head Teachers (17.9%) and School Heads or Administrators (11.4%). These results indicate that the respondents have considerable professional experience and academic qualifications, which are crucial for implementing educational innovations and integrating technology. The dominance of teachers suggests that the study mainly captures the views of classroom practitioners who are directly involved in technology-enhanced teaching. Additionally, the high percentage of respondents with graduate and postgraduate degrees suggests that they likely possess advanced teaching skills and leadership abilities that facilitate digital transformation efforts. Previous research has highlighted that teachers' professional credentials, leadership skills, and demographic factors play a significant role in technology adoption and educational innovation in schools.

Figure 2 Demographic Profile of respondents in terms of IPCRF Rating, Years of teaching Experience and Number of trainings Attended in Technology

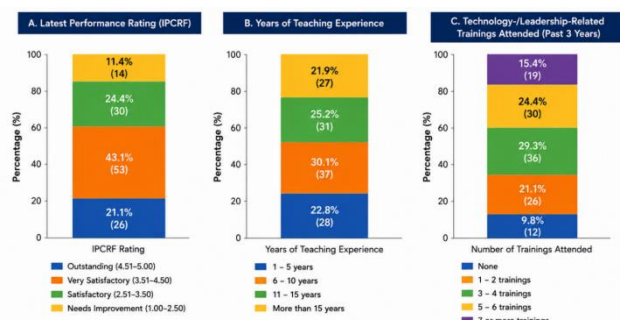


Figure 2 depicts the professional characteristics of the respondents, categorized by their most recent performance evaluation, duration of their teaching careers, and number of technology- or leadership-focused training sessions completed. The data show that a majority of the respondents achieved a very satisfactory performance rating, have been teaching for 6–10 years, and have participated in three to four training sessions related to technology or leadership. These findings suggest that the respondents have sufficient professional experience and have engaged in ongoing capacity-building efforts, potentially enhancing their preparedness to implement technology integration and support digital teaching and learning initiatives within their schools.

Table 2 and Figure 3 School Leaders' Self-Perception of Their Role in Technology Integration

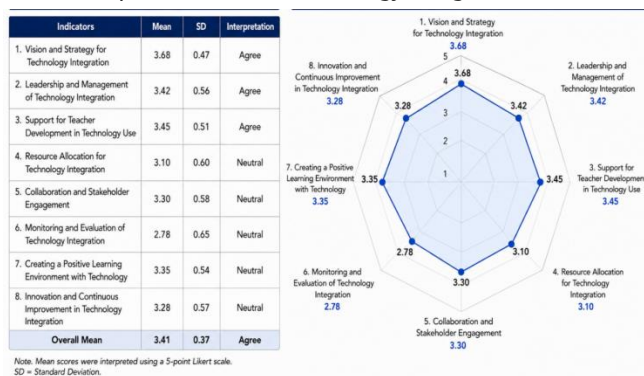


Table 2 and Figure 3 illustrate how school leaders perceive their involvement in integrating technology. The results showed an average of 3.41 (SD = 0.37), categorized as Agree, which implies that school leaders generally view themselves as proactive in supporting technology integration within their institutions. Among the various indicators, Vision and Strategy for Technology Integration had the highest average (M = 3.68, SD = 0.47), followed by Support for Teacher Development in Technology Use (M = 3.45, SD = 0.51) and Leadership and Management of Technology Integration (M = 3.42, SD = 0.56). Conversely, Monitoring and Evaluation of Technology Integration had the lowest average (M = 2.78, SD = 0.65), indicating that although school leaders acknowledge their role in fostering digital transformation, there is a need to focus more on monitoring and evaluating

technology implementation. The radar chart shows a fairly balanced distribution across all leadership dimensions, indicating a generally positive view of their duties in supporting technology integration. These results imply that effective leadership, strategic planning, and ongoing professional support are crucial for successful technology integration and enhancing educational outcomes, aligning with previous research that emphasizes the significance of digital leadership in educational innovation (Hasanah & Mohd Yusoff, 2024; Olaniyan & Uzorka, 2024; Ayasrah et al., 2025).

Table 3. Leadership Practices Supporting Technology Integration

Statement	Mean	SD	Interpretation
I have established a clear written vision for ICT use in the school.	3.55	0.56	Strongly Agree
I allocate a specific portion of the school budget (MOOE) for the maintenance and improvement of technology.	3.10	0.68	Agree
I actively seek external partnerships (LGUs, NGOs, and private organizations) to acquire additional ICT resources.	3.68	0.51	Strongly Agree
I organize school-based Learning Action Cell (LAC) sessions focused on enhancing teachers' digital competencies.	3.42	0.59	Strongly Agree
I foster a school culture in which digital innovation is encouraged, recognized, and shared among teachers.	3.35	0.62	Strongly Agree
I provide teachers with sufficient time during the workday to explore and learn about new educational technologies.	2.65	0.73	Agree
I ensure that every department has access to functional ICT equipment and digital learning resources.	2.90	0.70	Agree
I implemented a monitoring and evaluation system to assess the	2.75	0.71	Agree

effectiveness of technology integration in teaching.			
Grand Mean	3.18	0.64	Agree (Practiced)

Table 3 outlines the leadership strategies that facilitate technology integration in public secondary schools. The overall grand mean of 3.18 (SD = 0.64), interpreted as Agree (Practiced), suggests that school leaders generally adopt practices that encourage the use of technology in education. Among the indicators, the pursuit of external partnerships for ICT resources achieved the highest mean (M = 3.68, SD = 0.51), indicating that school leaders prioritize collaboration to enhance technology resources, as noted by Abedi and Ametepey (2024). Similarly, establishing a clear ICT vision (M = 3.55, SD = 0.56), organizing LAC sessions (M = 3.42, SD = 0.59), and fostering a culture of digital innovation (M = 3.35, SD = 0.62) were rated as Strongly Agree, reflecting that school leaders actively motivate teachers to enhance their digital skills, aligning with the findings of Rasdiana et al. (2024). Conversely, providing teachers with adequate time to explore new technologies (M = 2.65, SD = 0.73) and overseeing technology integration (M = 2.75, SD = 0.71) received the lowest scores, indicating that these areas require further attention. Overall, the results suggest that school leaders are crucial in supporting technology integration; however, there is a need to focus more on providing sufficient resources, time, and ongoing monitoring to ensure effective technology use in schools, as highlighted by Baharuddin et al. (2024).

Table 4. Challenges in Technology Integration in Public Secondary Schools

Challenge	Mean	SD	Interpretation
Internet Connectivity	3.85	0.46	Strongly Agree
Funding Constraints	3.45	0.59	Strongly Agree
Resistance to Change	2.30	0.81	Disagree
Power Interruptions	3.70	0.50	Strongly Agree
Technical Support	3.55	0.57	Strongly Agree
Teacher Workload	3.62	0.54	Strongly Agree
Digital Learning Resources	2.85	0.69	Agree
Student Device Availability	3.52	0.56	Strongly Agree
Grand Mean	3.36	0.59	Agree (High Challenge)

Table 4 outlines the obstacles faced in integrating technology in public secondary schools. The overall grand mean of 3.36 (SD = 0.59), categorized as Agree (High Challenge), suggests that respondents generally

encountered significant difficulties in adopting technology-enhanced teaching and learning methods. Among the challenges identified, Internet Connectivity had the highest mean score (M = 3.85, SD = 0.46), indicating that unstable and limited Internet access is the most prominent barrier to effective technology integration. This aligns with the findings of Muyambi and Ramorola (2025) and Toma et al. (2024), who stressed the importance of reliable digital infrastructure for successful technology-supported education. Power Interruptions (M = 3.70, SD = 0.50) and Teacher Workload (M = 3.62, SD = 0.54) also received high scores, implying that inconsistent electricity supply and increased teaching responsibilities restrict teachers' ability to fully utilize digital learning tools. This supports the observations of Panakaje et al. (2024) that excessive workload limits teachers' participation in technology-enhanced instruction. Similarly, Technical Support (M = 3.55, SD = 0.57), Student Device Availability (M = 3.52, SD = 0.56), and Funding Constraints (M = 3.45, SD = 0.59) suggest that inadequate institutional resources continue to impede sustainable technology implementation. This corroborates the findings of Cheruiyot (2024) and Woldemariam et al. (2025), who found that sufficient funding, technical support, and access to digital devices are crucial for effective technology integration. In contrast, Digital Learning Resources (M = 2.85, SD = 0.69) and Resistance to Change (M = 2.30, SD = 0.81) received relatively lower scores, indicating that while these issues persist, they are less impactful than infrastructure- and resource-related challenges. Overall, the results highlight that enhancing ICT infrastructure, expanding technical support, ensuring adequate funding, and minimizing implementation barriers are vital for achieving sustainable technology integration in public secondary schools, as emphasized by Riyanda et al. (2025) in their discussion on digital skills and technology integration challenges.

Table 5. Figure 4 Teachers' Perceptions of Leadership Support and the Impact of Technology Integration on Teaching and Learning

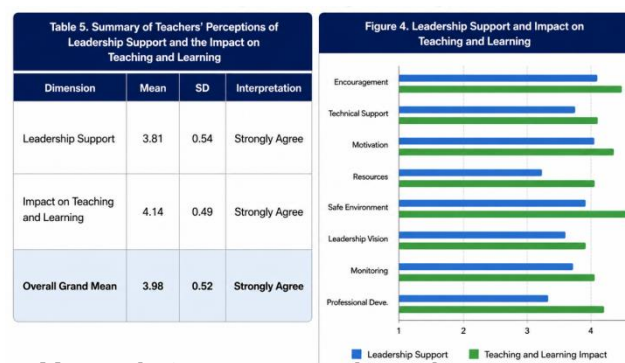


Table 5 and **Figure 4** present the teachers' perceptions of leadership support and the impact of technology integration on teaching and learning. The findings revealed that both dimensions were rated **Strongly Agree**, indicating that respondents perceived educational leadership and technology integration as

highly effective in improving classroom instruction and student learning. This finding is consistent with **Baharuddin et al. (2024)**, who emphasized the importance of strategic leadership in promoting digital learning environments. Specifically, the **Impact on Teaching and Learning** obtained the highest mean (**M = 4.14, SD = 0.49**), suggesting that technology integration enhances instructional delivery, student engagement, collaboration, and learning effectiveness. This supports the findings of **Alzakwani et al. (2025)** and **Anselmo et al. (2025b)**, who reported that educational technologies, including portable augmented reality, improve students' learning experiences, engagement, and overall instructional effectiveness. Meanwhile, **Leadership Support** obtained a mean of **3.81 (SD = 0.54)**, indicating that teachers strongly perceived school leaders as providing the vision, encouragement, resources, and professional support necessary for successful technology integration. This finding agrees with **Olaniyan and Uzorka (2024)** and **Abedi and Ametepey (2024)**, who emphasized that leadership support strengthens teachers' digital competence and technology adoption. The overall grand mean of **3.98 (SD = 0.52)** further demonstrates that educational leadership and technology integration collectively contribute to improving teaching and learning. Likewise, the clustered bar chart shows that teachers consistently perceived the impact of technology integration to be slightly higher than the level of leadership support, suggesting that leadership initiatives have translated into meaningful improvements in classroom practice. This finding is supported by **Rasdiana et al. (2024)**, who highlighted the role of digital leadership in sustaining technology integration, and by **Zhang and Chen (2025)**, who concluded that leadership-driven technology initiatives significantly improve technology-enhanced teaching practices.

Table 6. Figure 5 Correlation Analysis between Leadership Support and Technology Integration Outcomes

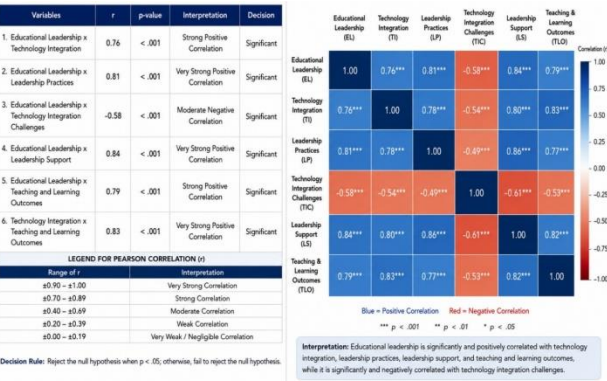


Table 6 and Figure 5 illustrate the relationship between educational leadership and the outcomes of technology integration. The analysis showed a strong and positive correlation between educational leadership and technology integration ($r = 0.76, p < .001$), suggesting that more robust leadership is linked to more effective

technology implementation in education. This aligns with **Zhang and Chen (2025)**, who found that strong leadership improves teachers' use of technology in their teaching methods. Similarly, educational leadership was found to have a very strong positive correlation with leadership practices ($r = 0.81, p < .001$) and leadership support ($r = 0.84, p < .001$). This indicates that school leaders who exhibit effective leadership behaviors also offer more substantial support for technology integration, consistent with the findings of **Abedi and Ametepey (2024)** and **Olaniyan and Uzorka (2024)**. Conversely, there was a moderate negative correlation between educational leadership and technology integration challenges ($r = -0.58, p < .001$), suggesting that effective leadership can help mitigate obstacles to technology implementation, as noted by **Riyanda et al. (2025)**. Additionally, educational leadership was strongly linked to teaching and learning outcomes ($r = 0.79, p < .001$), while technology integration showed a very strong positive relationship with these outcomes ($r = 0.83, p < .001$). These findings suggest that effective school leadership enhances technology integration, which subsequently leads to better instructional practices and student learning experiences, supporting the conclusions of **Núñez-Naranjo et al. (2024)** and **Rasdiana et al. (2024)**.

Table 7. Multiple Regression Analysis Predicting Technology Integration (Sample Only)

Predictor Variable	β	t	p-value	Decision
Vision Setting	0.34	4.82	< .001	Significant
Resource Allocation	0.21	3.14	0.002	Significant
Professional Development Support	0.39	5.47	< .001	Significant
School Culture for Innovation	0.27	3.88	< .001	Significant
Model Summary	$R^2 = 0.69$	$F = 65.42$	< .001	Significant Model

Table 7 presents the results of a multiple regression analysis predicting technology integration, highlighting four significant predictor variables: vision setting, resource allocation, professional development support, and school culture for innovation. Each predictor had a statistically significant positive influence on technology integration. Vision setting has a beta coefficient (β) of 0.34 with a t-value of 4.82 ($p < .001$), indicating that clearly articulating a vision for technology use strongly facilitates integration (**Vlachou & Tsirantonaki, 2023**). Resource allocation also had a significant positive effect ($\beta = 0.21, t = 3.14, p = 0.002$), underscoring the importance of providing adequate financial and material resources to support technology initiatives (**Vlachou & Tsirantonaki, 2023**). The strongest predictor is professional development support ($\beta = 0.39, t = 5.47, p$

<.001), which emphasizes the critical role of ongoing training and skill development for educators to effectively integrate technology into instruction (Li, 2023). Additionally, fostering a school culture that promotes innovation positively influences technology integration ($\beta = 0.27$, $t = 3.88$, $p < .001$), reflecting the need for an organizational environment that encourages experimentation, collaboration, and openness to new technologies (Vlachou & Tsirantonaki, 2023). The model's overall explanatory power was strong, with an R^2 of 0.69 and a highly significant F-statistic ($F = 65.42$, $p < .001$), indicating that these four factors collectively explained 69% of the variance in technology integration outcomes. This aligns with broader educational research suggesting that leadership vision, strategic resource deployment, supportive professional development, and an innovative culture are critical for effective technology adoption in educational settings (Li, 2023; Vlachou & Tsirantonaki, 2023).

5 CONCLUSION

This research determined that educational leadership is crucial in advancing technology integration within public secondary schools in Isabela, Philippines. Participants generally viewed school leaders as proactive in supporting technology integration through strategic leadership, professional development, and collaboration, despite ongoing challenges with internet connectivity, resource availability, technical support, and monitoring. Teachers strongly concurred that leadership support positively impacts technology integration, thereby enhancing teaching and learning. Additionally, correlation analysis identified significant positive associations between educational leadership, leadership practices, technology integration, leadership

support, and teaching and learning outcomes, while challenges in technology integration were significantly negatively associated with educational leadership. Regression analysis further indicated that vision setting, professional development support, fostering a school culture of innovation, and resource allocation are significant predictors of successful technology integration. In summary, the findings highlight that effective educational leadership is essential for bolstering technology integration and enhancing instructional practices in public secondary schools.

6 RECOMMENDATION

According to the study's results, school leaders should persist in enhancing their leadership strategies by articulating a clear vision for integrating technology, maintaining ongoing professional development initiatives, and setting up robust monitoring and evaluation systems. The Department of Education should bolster ICT infrastructure by enhancing Internet access, boosting financial backing for digital tools, and offering adequate technical support to schools. Teachers should engage in ongoing technology-focused training to improve their digital skills and fully utilize technology in teaching. Schools should also fortify their collaboration with government bodies, private entities, and community stakeholders to ensure the sustainability of technology integration efforts. Lastly, future researchers could broaden this study by including larger sample sizes, exploring diverse educational environments, and examining additional factors related to digital skills, organizational preparedness, and student learning outcomes to further substantiate and expand these findings.

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