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Techno-Pedagogical Competence and Technology Integration Self-Efficacy of Public Elementary Teachers

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Abstract
Aim: This study determined the teachers' techno-pedagogical competence and technology integration self-efficacy of public elementary teachers.
Methodology: This study used a descriptive, correlational design using surveys to determine the relationship between the variables. This study was conducted total enumeration in fifteen schools in Pili West District, Pili, Camarines Sur with 254 respondents.
Results: The influence of teaching on technology usage has a correlation coefficient (r) is 0.3301 and its coefficient of determinants (r2) is 0.01089 and interpreted as not significant. Also, the influence of teaching on technology application has a correlation coefficient of 0.8665 and coefficient determinants of 0.7508 which was interpreted as significant. Additionally, influence of teaching on technology infused learning has a correlation coefficient of 0.1235 and coefficient determinants of 0.0152 which was interpreted as not significant. Moreover, influence of teaching on technology literacy and digital citizenship has a correlation coefficient of 0.9635 and coefficient determinants of 0.9283 which was interpreted as significant. Lastly, influence of teaching on technology supported assessment has a correlation coefficient of 0.7341 and coefficient determinants of 0.5389 which was interpreted as significant.
Conclusion: This revealed that teaching has a significant influence to technology application, technology literacy and digital citizenship, and technology supported assessment, this implies that, teaching plays a crucial role in influencing technology application, technology literacy and digital citizenship, and technology-supported assessment.

Keywords: Techno-Pedagogical Competence, Technology Integration Self Efficacy, descriptive-correlational design

INTRODUCTION

The rapid evolution of Information and Communication Technology (ICT) has transformed communication in ways once deemed impossible. This transformation underscores the need for students to acquire not only knowledge but also the skills and attitudes necessary to navigate an increasingly interconnected world. With these shifts, educational systems are moving from traditional methods of instruction to digitalized pedagogical approaches that incorporate technological devices. This transition calls attention not only to how teaching occurs but also to the underlying pedagogical practices and their effectiveness.

Techno-pedagogy, a blend of pedagogical principles and technological tools, has emerged as a vital component of modern education. Its success depends on how teachers effectively integrate technology into their teaching practices. Teachers must possess the skills to use technology for more than just communication or presentation; they must harness it for creation, innovation, and problem-solving in the classroom. Technology to enhance learning, it must be engaging, efficient, pervasive, and rooted in real-world problem-solving (Fullan, 2019).

One such instructional approach is the hybrid teaching method, which blends ICT with traditional face-to-face learning. The effectiveness of this method hinges on teachers' ability to seamlessly integrate technology with pedagogy in the classroom. Educators proficient in this integration are better equipped to globalize the learning experience. Competent teachers are well-versed in using a variety of technologies, from Learning Management Systems (LMS) to collaborative tools like Google Docs, to enhance their teaching practices.

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Given the pivotal role of technology in education, organizations like UNESCO have actively worked to identify the technological capabilities of educators. In its 2019 survey, UNESCO focused on how teachers' technological competencies could improve their performance and influence the learning environment. These efforts are aligned with global trends emphasizing the development of digital competence in teaching. In the Philippines, the Department of Education (DepEd) has taken significant steps to promote ICT integration, including the launch of the Digital Rise Program. This initiative aims to enhance the quality of education by ensuring that educators are adequately trained to use ICT tools effectively in various teaching contexts.

In light of these developments, there is a growing recognition of the challenges educators face in acquiring the necessary technological competencies. Teachers' technology integration self-efficacy, or their confidence in their ability to use technology effectively in the classroom, plays a crucial role in the successful implementation of ICT in education. Studies have shown that while many teachers are familiar with basic computer use, their ability to integrate technology into their teaching practices often depends on continuous engagement and targeted professional development (Gallagher, 2018; Christensen et al., 2018). Building self-efficacy in technology integration is critical for teachers, as it directly impacts their effectiveness in creating an engaging and productive learning environment.

Teacher preparation programs must adapt to address the growing need for technology integration in the classroom. These programs should include opportunities for teachers to develop their technological and pedagogical skills, ensuring that future educators are well-equipped to teach in increasingly digital classrooms. The International Society for Technology in Education (ISTE, 2017) has developed standards that encourage teachers to integrate technology into their curriculum, fostering collaboration and reflection on their teaching practices. The ISTE Standards serve as a framework for teachers to enhance their competence in the use of technology, ultimately aiming to improve student learning outcomes.

However, despite these initiatives, challenges remain in enhancing teachers' self-efficacy in using technology. Educators often require support in developing their skills, as well as training and resources to build their confidence in integrating ICT into their teaching. Addressing these challenges is essential for ensuring that the benefits of technology are fully realized in the classroom. By focusing on professional development opportunities such as seminars, workshops, and courses that emphasize the practical application of ICT, the Department of Education can help teachers build the necessary confidence and competence to integrate technology into their teaching practices. Research consistently emphasizes the significance of techno-pedagogical skills for educators. Studies by Yildiz (2019), Ozdemir (2020), and Leema and Saleem (2020) indicate that while pre-service teachers demonstrate moderate levels of techno-pedagogical competency, further development is crucial.

Sathyaraj and Rajasekar (2020) highlights the impact of techno-pedagogical competence on teacher performance, emphasizing the need for teachers to possess skills in managing time, optimizing technology integration, and adapting interactive technologies to match the subject's nature. This competency empowers teachers to design engaging learning experiences and alleviate the pressure of traditional teaching methods. Research by Ebisa (2019), Etejere and Ogundele (2018) underscore the importance of computer literacy for teachers, emphasizing its role in fostering computer appreciation, computer-assisted instruction, data processing, and record-keeping. Ames (2019) and Kumar (2018) highlight the influence of administrative decisions and teacher feedback on the availability and integration of technology in classrooms.

Tinio (2018) emphasizes the shift from teacher-centered to learner-centered approaches facilitated by techno-pedagogical competency, fostering active, collaborative, and creative learning environments.

Several studies, including those by Buyukalan, et al. (2018), Yildiz (2018), Gokeearslan and Karademir (2019), Klein, et al. (2018), and Sathiyaraj and Singaravelu (2020), explore the development of TPACK (Technological Pedagogical Content Knowledge) among pre-service and in-service teachers. These studies reveal varying levels of TPACK competence and highlight the need for continuous professional development to enhance teacher skills.

The effective utilization of technology tools requires a positive attitude and strong self-efficacy beliefs (Milbrath & Kinzie, 2020). Beaudin and Hadden (2019) discovered that instructors' use of ICT contributes to students' ongoing development, achievement of learning outcomes, and the creation of classroom-based resources. Koehler (2019) emphasize that effective teaching goes beyond merely adding technology; it requires a growing awareness of the dynamic relationship among technology, pedagogy, content, and knowledge. Studies by Anand (2019), Beri and Sharma (2019), Bala and Tao (2018), Sibichen (2018), Prakash and Hooda (2018), and Gonzalo et. al., (2021) further explore the development of techno-pedagogical competencies in various contexts, including higher education, teacher training programs, and different school settings. Okojie et al. (2019), Gloria and Benjamin (2018), and Johnson (2021)

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all emphasize the importance of a holistic approach to technology integration, encompassing planning, selecting appropriate tools, aligning strategies with technology capabilities, and understanding the broader impact on learning.

Technology Integration Self-Efficacy, Cajilig (2020) discovered that Mathematics teachers in public secondary schools across Metro Manila display a highly favorable attitude towards integrating technology into their teaching practices. Bingcang (2019), and Masagca (2019) explored the utilization of technology in guidance counseling. Emerson (2019) investigated the effectiveness of teaching Science and Mathematics with technologically proficient educators, highlighting the influence of teacher attitudes, beliefs, and skills on technology integration. Pavit (2018) and Bell (2019) emphasize the importance of technological capability, which encompasses skills, knowledge, and the ability to adapt to technological advancements.

Educators are increasingly recognizing the importance of leveraging technology to connect with students in their digital realm (Hoveling, 2019; U.S. Department of Education, 2020). The use of technology for instructional purposes has the potential for widespread positive impacts on students (Shell et al., 2018). Numerous prior research, such as those conducted by Yildiz (2022), Sathiyaraj and Singaravelu (2020), and Beri and Sharma (2019), indicate that instructors' techno-pedagogical competencies typically reside within a moderate spectrum. These studies correspond with the current study, which similarly indicates that pre-service teachers' techno-pedagogical competencies are generally at an average or moderate level. Nevertheless, additional research, including that of Ozdemir (2020) and Anand (2019), revealed that particular cohorts of educators demonstrate elevated TPACK proficiency in designated learning domains. The studies predominantly assess teacher competency across several subject areas, but the current study additionally investigates the wider context of technology integration, specifically the integration self-efficacy of teachers, a critical variable not extensively analyzed in earlier studies.

A significant distinction between the analyzed studies and the current research is the breadth of inquiry. Prior research predominantly examines distinct cohorts of educators, such as those in private compared to public institutions (Prakash et al., 2018) or those inside higher education environments, discovered that educators in private institutions demonstrated elevated levels of TPC relative to those in public schools. Other studies have focused on pre-service instructors or faculty members in higher education (Gonzalo et al., 2021), emphasizing their readiness to use technology into their instruction. This study, however, differentiates itself by analyzing a wider array of educators, including all instructors in the Pili West District, regardless of grade level, school type, or subject matter. This broader scope allows for a more thorough evaluation of TPC and technology integration self-efficacy within a varied cohort of educators, providing significant insights into teachers' overall preparedness to effectively use technology in their classrooms.

The prior studies predominantly utilized survey methodologies, employing questionnaires or scales to assess instructors' TPC and self-efficacy. For instance, research conducted by Etejere and Ogundele (2018), Gokeearslan and Karademir (2019), and Emerson (2019) employed questionnaires to assess educators' technological competencies and their perspectives on using technology into their instructional methodologies. This study includes surveys to evaluate teachers' abilities and incorporates a district-wide examination that examines the obstacles and preparedness of teachers shifting from blended to in-person learning. This is a crucial element that numerous prior research overlooked. This study investigates how teachers' readiness for technology integration corresponds with the specific obstacles they encounter in the post-pandemic educational context.

The studied literature frequently underscores the significance of professional development programs in improving teachers' technology skills and self-efficacy. Numerous studies indicate that instructors' abilities may be enhanced by specialized training, seminars, and workshops (Ebisa, 2019; Bell, 2019). This study distinctly analyzes the impact of current professional development initiatives in the Pili West District on teachers' self-efficacy and preparedness to incorporate technology in the classroom, particularly during the shift from blended to in-person learning. The emphasis on self-efficacy and its direct relationship with technology integration in educational settings has received growing attention in the literature (Milbrath et al., 2020; Koehler 2019), however the post-pandemic environment is still inadequately examined.

This study addresses the gap in understanding techno-pedagogical competences and technology integration self-efficacy at the district level, particularly with the transition from blended learning settings to traditional face-to-face classrooms. While prior research has thoroughly examined the incorporation of technology in educational settings, especially for pre-service educators or certain disciplines, little studies have concentrated on the holistic evaluation of these competencies directly after the pandemic. The shift from emergency remote instruction to in-person learning presents additional obstacles, especially as educators must implement their techno-pedagogical skills in conventional classroom environments.

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Objectives

This study aimed to determine the techno-pedagogical competence and technology integration self-efficacy of public elementary teachers. Specifically, it sought to answer the following research questions.

Specifically, it sought to answer the following research questions:

1. What is the level of techno-pedagogical competence of the respondents in terms of
   1.1. Teaching;
   1.2. Providing Learning Experiences;
   1.3. Presentation; and
   1.4. Lesson Preparation?
2. What is the level of teachers' technology integration self-efficacy along
   2.1. Usage;
   2.2. Application;
   2.3. Technology-infused Learning;
   2.4. Literacy & Digital Citizenship; and
   2.5. Technology-supported Assessment?
3. Does techno-pedagogical competence significantly influence the teachers' technology integration self-efficacy?
4. Are there significant differences among the aspects of techno-pedagogical competence and teachers' technology integration self-efficacy across aspects and grade level groups?
5. What sustainability plan may be proposed based on the results of the study?

Hypothesis

Given the stated research problem, the following hypotheses were tested on 0.05 level of significance:
Hypothesis 1: Techno-pedagogical competence significantly influences teachers' technology integration self-efficacy.
Hypothesis 2: There are significant differences in the aspects of techno-pedagogical competence and technology integration self-efficacy across different grade level groups and locations.

METHODS

Research Design

This study used a descriptive-correlational design using surveys to determine the techno-pedagogical competence and technology-integration self- efficacy of public-school teachers. The descriptive component assessed the level of techno-pedagogical competence in terms of teaching, providing learning experiences, presentation, and lesson preparation. Additionally, it evaluated the teachers' technology integration self-efficacy across areas such as usage, application, infused learning, literacy and digital citizenship, and supported assessment. The correlational method was applied to explore the influence of techno-pedagogical competence on teachers' technology integration self-efficacy and to identify significant differences across grade level groups and locations.

Population and Sampling

The respondents of the study are the teachers of the 15 Elementary Schools in Pili West District composed of 254 Public Elementary School teachers. Data in the study will be collected in total enumeration of respondents from Public Elementary Schools in Pili West District. The researcher obtained the data from the Pili West District's Office records section for the School Year 2023-2024.

Instrument

The data gathering instruments used in this study were questionnaires designed to accurately measure the responses necessary for the study's validity. The first part of the questionnaire focused on the demographic profile of the respondents, including details such as name, school, age, sex, length of service, and grade level taught. The second part measured the techno-pedagogical competence of the respondents using the Techno-Pedagogical Competence Scale developed and standardized by Sathyaraj and Rajasekar (2013). The third part of the questionnaire assessed the

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teachers' technology integration self-efficacy using the Technology Integration Confidence Scale V3 developed by Gomez (2020).

Data Collection

The researcher began the data gathering process by obtaining formal permission from the Dean of the Graduate School for the conduct of the research and the distribution of the instruments. Once this approval was granted, the researcher proceeded to secure additional consent from key stakeholders, including the Office of the School Division Superintendent, the Public Schools District Supervisor, the principals of the participating schools, and the teachers. These permissions ensured the study was conducted within the appropriate guidelines.

Before the distribution of the questionnaires, the researcher adhered to ethical principles by ensuring that the participants were fully informed about the nature of the study, their role in it, and their right to voluntary participation. Informed consent was obtained from all participants, making it clear that they could withdraw from the study at any time without any consequences. The participants were assured of the confidentiality of their responses, and no identifying marks or codes were placed on the survey instruments to preserve anonymity. This process helped ensure compliance with ethical standards and protected the privacy of the respondents.

Once consent was obtained, the questionnaires were distributed to the respondents. The researcher personally retrieved the completed questionnaires to ensure accurate data collection. After collecting all the responses, the data was collated, tabulated, and analyzed, keeping the ethical principles of confidentiality and integrity in mind throughout the process.

Treatment of Data

Statistical analysis was used to analyze the techno-pedagogical competence and technology-integration self-efficacy of public-school teachers. The relationship between techno-pedagogical competence and technology integration self-efficacy, Pearson's product-moment correlation coefficient (Pearson r) was computed. This statistical method helped determine the degree of correlation between the two variables, providing insights into how one might influence the other.

Ethical Considerations

The researcher ensured that all research protocols involving ethics in research were complied with for the protection of all people and institutions involved in the conduct of the study.

RESULTS and DISCUSSION

The findings and conclusions pertaining to the issues mentioned are presented in this chapter in textual and tabular formats. The information was presented, analyzed, and interpreted in the following order; the level of techno-pedagogical competence of teachers; the level of teachers' technology integration self-efficacy; the influence of techno-pedagogical competence on the teachers' technology integration self-efficacy; the differences among the aspects of techno-pedagogical competence and teachers' technology integration self-efficacy among grade level groups and across locations; and the factors that contribute to the techno-pedagogical competence and teachers' technology integration self-efficacy.

Techno-Pedagogical Competence of Teachers

Techno-pedagogical competence of teachers encompasses their ability to effectively integrate technology into their teaching practices, demonstrating a deep understanding of both educational theory and technology, and using this knowledge to create engaging and effective learning experiences for their students.

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Table 1
Summary of Techno-Pedagogical Competence of Teachers

Aspects	Grade Level		Mean	Interpretation
	Key Stage 1	Key Stage 2		
Teaching		4.06	4.06	High
Providing Learning Experiences	3.63	4.15	3.89	High
Lesson Preparation	3.61	3.6	3.61	High
Presentation	3.4	3.31	3.36	Fair
Mean	3.67	3.78	3.73	High

Legend: *4.21-5.0 - Very High, 3.41-4.20 - High, 2.61-3.40 - Fair, 1.81-2.60 - Low, 1.0-1.80 - Very Low*

The results indicated the mean in key stage 1 of 3.67 interpreted as high. The parameter, "teaching" garnered the highest mean of 4.05 interpreted as high. Although, the parameter "presentation" garnered the lowest mean of 3.4 interpreted as fair.

Teachers in key stage 1 are generally comfortable with using technology in their teaching, particularly for delivering instruction. However, they are less confident in using technology for presentations, indicating a potential need for further development in this area. This suggests a focus on professional development that empowers teachers to effectively utilize technology for both delivering instruction and creating engaging presentations. Key stage 1 teachers are comfortable using technology for instruction, their lower scores for technology use in presentations highlight a need for targeted professional development. By equipping teachers with the skills and knowledge to effectively integrate technology into presentations, schools can empower them to create more engaging and visually stimulating learning experiences. This will not only enhance the effectiveness of their presentations but also foster a more dynamic and technology-rich learning environment for their students.

The integration of technology in today's classrooms is no longer a suggestion but a necessity (Agustini et al., 2019). Teachers are increasingly expected to leverage a diverse range of digital tools to create dynamic and engaging learning environments that cater to diverse learning styles and promote deeper understanding. This integration fosters a more interactive and collaborative learning experience, empowering students to become active participants in their own education and prepare them for a future where technology plays an increasingly central role in all aspects of life.

Research indicates that teachers are generally comfortable using technology to provide learning experiences for their students, but they may need additional support in utilizing technology for presentations (Agustini et al., 2019). This highlights a potential need for targeted professional development to equip teachers with the skills and knowledge to effectively integrate technology into presentations, creating more engaging and visually stimulating learning experiences.

Overall, the research suggests that teachers demonstrate a high level of techno-pedagogical competence (Flores & Roig, 2019). This high level of competence is influenced by several key factors, including the effective integration of technology, innovative teaching strategies, personalized learning experiences, continuous professional development, collaboration, assessment practices, adaptability, and a commitment to enhancing student learning through digital tools and resources.

However, the research also highlights specific areas where teachers may need additional support. For example, the focus on providing learning experiences suggests that teachers need to move beyond traditional instruction and prioritize impactful learning opportunities that engage students actively, promote collaboration, and connect classroom content to real-world applications. Additionally, while lesson preparation is recognized as a crucial aspect of techno-pedagogical competence, presentation skills are often ranked last in the hierarchy, highlighting the need for further development in this area.

Ultimately, the successful integration of technology in education requires a multi-faceted approach that encompasses both technical skills and a deep understanding of pedagogical principles. By fostering techno-pedagogical competence among teachers, we can empower them to create innovative and engaging learning environments that prepare students for success in the 21st century.

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Technology Integration Self-Efficacy

Technology Integration Self-Efficacy (TISE) is a teacher's belief in their ability to effectively use technology to enhance their teaching practices and improve student learning, reflecting their confidence and conviction in their skills and knowledge to integrate technology in a meaningful and impactful way.

Table 2
Summary of Technology Integration Self-Efficacy of Teachers

Indicators	Grade Level		Mean	Interpretation
	Key Stage 1	Key Stage 2		
Usage	4.03	3.77	3.9	High
Application	3.87	3.72	3.8	High
Literacy and Digital Citizenship	3.8	3.66	3.73	High
Technology-Infused Learning	3.82	3.62	3.72	High
Technology-Supported Assessment	3.66	3.72	3.69	High
Mean	3.84	3.70	3.77	High

Legend: 4.21-5.0 - Very High, 3.41-4.20 - High, 2.61-3.40 - Fair, 1.81-2.60 - Low, 1.0-1.80 - Very Low

The results indicated the mean in key stage 1 of 3.84 interpreted as high. The parameter, "usage" garnered the highest mean of 4.03 interpreted as high. Although, the parameter "technology supported assessment" garnered the lowest mean of 3.66 interpreted as high. The key stage 1 teachers are generally comfortable using digital tools in their classrooms, as indicated by the high overall mean score. However, while they feel confident in their general "usage" of technology, their scores are slightly lower when it comes to "technology-supported assessment." This indicates a potential gap between teachers' overall comfort with technology and their understanding of how to effectively use digital tools for assessment purposes. It implies that teachers are comfortable using digital tools, their lower scores in technology-supported assessment suggest a need for more focused professional development in this area. Schools should prioritize training programs that equip teachers with the skills and knowledge to effectively integrate digital tools into their assessment practices, ensuring they can leverage technology to provide meaningful and timely feedback to students. Technology can facilitate more authentic assessments that mirror real-world scenarios, providing a more accurate representation of students' abilities, as demonstrated by Doheny-Farina and Bower (2019), who found that simulation software can effectively assess students' skills through engagement in simulated scenarios that closely resemble real-world situations.

The results indicated the mean in key stage 2 of 3.70 interpreted as high. The parameter, "usage" garnered the highest mean of 3.77 interpreted as high. Although, the parameter "technology-infused learning" garnered the lowest mean of 3.62 interpreted as high. This means that key stage 2 teachers are generally comfortable using digital tools in their classrooms, as indicated by the high overall mean score. However, while they feel confident in their general "usage" of technology, their scores are slightly lower when it comes to "technology-infused learning." This indicates a potential gap between teachers' overall comfort with technology and their understanding of how to effectively integrate technology into their teaching practices to create engaging and effective learning experiences.

The key state 2 teachers are comfortable using digital tools, their lower scores in technology-infused learning suggest a need for more focused professional development in this area. Schools should prioritize training programs that equip teachers with the skills and knowledge to effectively integrate digital tools into their teaching practices, ensuring they can leverage technology to create engaging and effective learning experiences for their students. Information and communications technology (ICT) literacy has profound implications for social capital, shaping the very fabric of our interconnected world. This literacy, encompassing the ability to effectively access, utilize, and create information using digital tools, extends beyond individual skills to impact the dynamics of educational institutions, relationships within society, and global communication. As Mignone and Henley (2020) highlight, ICT literacy serves as a catalyst for building social capital by empowering educational institutions, strengthening interpersonal relationships, and facilitating global communication.

Overall mean across both Key Stages is 3.77 interpreted as high. The parameter "usage" garnered the highest mean of 3.9 interpreted as high. Although, the parameter "technology-supported assessment" garnered the lowest mean of 3.69 interpreted as high.

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Based on the findings, the top aspects of the technology integration self-efficacy of teachers are technology usage this finding implies that, technology usage is a crucial aspect of technology integration self-efficacy for teachers due to several reasons. It reflects teachers' familiarity and comfort with using technology, enhances the efficiency and effectiveness of teaching practices, promotes innovation and creativity, boosts student engagement and motivation, enables differentiation and personalization, facilitates data analysis and assessment, and supports ongoing professional development. Teachers who are proficient in technology usage can effectively integrate technology into their lessons, engage students, personalize learning experiences, analyze data, and stay current with educational trends. Overall, technology usage plays a vital role in enhancing teaching practices, promoting student engagement, and fostering continuous professional growth.

The second in rank is the aspect technology application, this implies that technology application is second in rank as an important aspect of technology integration self-efficacy for teachers due to its role in translating technology knowledge and skills into practical classroom applications. It involves the implementation of technology tools, integration into the curriculum, adaptation to teaching practices, differentiation and personalization, fostering innovation and creativity, problem-solving skills, and promoting continuous learning and growth. By effectively applying technology in their teaching, teachers can enhance instruction, engage students, differentiate learning experiences, foster innovation, and support continuous professional development. Overall, technology application plays a crucial role in creating dynamic and effective learning environments that promote student success and digital literacy.

Then technology literacy and digital citizenship was in third rank and it implies that technology literacy and digital citizenship play a vital role in the technology integration self-efficacy of teachers as they prepare students to navigate the digital world responsibly and effectively. These aspects involve foundational skills, developing digital skills, critical thinking, ethical behavior, safety, empowerment, and future readiness. By prioritizing technology literacy and digital citizenship, educators provide students with the necessary knowledge, skills, and values to use technology responsibly and confidently. This preparation equips students for success in a digital society, promotes responsible digital citizenship, and empowers them to navigate the challenges of the digital age with integrity.

The next aspect is technology infused-learning that implies, technology-infused learning represents the fourth rank of technology integration self-efficacy for teachers, emphasizing the incorporation of technology tools and resources into instructional practices. This involves navigating complexities, adapting pedagogical approaches, fostering innovation, enhancing student engagement, utilizing data for instruction, promoting differentiation, and fostering collaboration. Teachers are tasked with effectively integrating technology, adjusting instruction, and crafting engaging learning experiences. Technology-infused learning aims to enhance student engagement, inform instruction through data, personalize learning experiences, foster collaboration, and encourage innovation. Prioritizing technology-infused learning enables educators to enhance student outcomes and equip students with the skills needed for success in the digital age.

Last in rank is technology supported assessment, this implies that, technology-supported assessment is sometimes ranked last in technology integration self-efficacy for teachers due to factors such as complexity of implementation, resource constraints, training needs, alignment challenges, data privacy concerns, interpretation of data, and time constraints. While technology-supported assessment has the potential to enhance assessment practices and inform instruction, these challenges may contribute to its lower ranking. Educators may perceive technology-supported assessment as more complex to implement, requiring additional resources, training, and time. Ensuring alignment with curriculum standards and addressing data privacy concerns can also pose challenges. Despite these factors, technology-supported assessment remains a valuable aspect of technology integration self-efficacy that can provide valuable insights into student learning and support data-driven instruction.

From the data gathered it can be inferred that the technology integration self-efficacy of teachers was high level. According to Kay (2020), it is crucial to explore teachers' technology self-efficacy to understand their ability and confidence in effectively using and integrating technology in their instructional practices. This examination involves assessing teachers' beliefs about their competence in utilizing digital technology for specific instructional tasks that are interconnected and supported by technology.

Therefore, teachers possess a high level of technology integration self-efficacy, it has significant implications for teaching practices, student engagement, data-informed decision-making, personalized learning, professional development, global connectivity, and student preparation for the digital future. High technology integration self-efficacy also encourages teachers to engage in continuous professional development, fostering their growth and enhancing their teaching practices. Additionally, teachers can leverage technology for global connectivity and collaboration, preparing students for success in a digital world. Overall, a high level of technology integration self-

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efficacy creates a dynamic and innovative educational environment that promotes student success, critical thinking, and digital literacy skills necessary for the 21st century.

Influence of Techno-Pedagogical Competence on the Teachers' Technology Integration Self-Efficacy

The influence of techno-pedagogical competence on the teachers' technology integration self-efficacy. As gleaned on the table, the influence of teaching on technology usage has a correlation coefficient (r) is 0.3301 and its coefficient of determinants (r2) is 0.01089 and interpreted as not significant. Also, the influence of teaching on technology application has a correlation coefficient of 0.8665 and coefficient determinants of 0.7508 which was interpreted as significant. Additionally, influence of teaching on technology infused learning has a correlation coefficient of 0.1235 and coefficient determinants of 0.0152 which was interpreted as not significant. Moreover, influence of teaching on technology literacy and digital citizenship has a correlation coefficient of 0.9635 and coefficient determinants of 0.9283 which was interpreted as significant. Lastly, influence of teaching on technology supported assessment has a correlation coefficient of 0.7341 and coefficient determinants of 0.5389 which was interpreted as significant.

This finding revealed that teaching has a significant influence to technology application, technology literacy and digital citizenship, and technology supported assessment, this implies that, teaching plays a crucial role in influencing technology application, technology literacy and digital citizenship, and technology-supported assessment.

Educators integrate technology into instructional strategies, model its use, and teach digital skills to enhance technology literacy. They also model ethical behavior and responsible use of technology to promote digital citizenship. In addition, teachers design assessments that leverage technology, teach data analysis skills, and guide students in interpreting assessment data. Through effective teaching practices, educators empower students to become proficient in using technology, navigate the digital world responsibly, and leverage technology for assessment and learning purposes effectively. While teaching has no significant influence to technology usage and technology infused-learning, this implies that, teaching has a significant influence on technology usage and technology-infused learning. Educators determine instructional design, select pedagogical approaches, undergo professional development, model responsible technology use, design assessments, and facilitate collaboration and communication. Through these actions, teachers shape how technology is integrated into educational practices and enhance student learning experiences in a digital age.

According to Brown (2020) different teaching strategies influence the technology integration self-efficacy of K-12 educators, exploring the relationship between instructional practices and educators' confidence in using technology. Therefore, different teaching strategies significantly impact the technology integration self-efficacy of K-12 educators. Instructional practices that actively incorporate technology enhance educators' confidence and competence in using technology, while traditional teaching methods without technology integration may limit their self-efficacy.

As gleaned on the table, the influence of providing learning experiences on technology usage has a correlation coefficient (r) is 0.8471 and its coefficient of determinants (r2) is 0.7176 and interpreted as significant. Also, the influence of providing learning experiences on technology application has a correlation coefficient of 0.9420 and coefficient determinants of 0.8887 which was interpreted as significant. Additionally, influence of providing learning experiences on technology infused learning has a correlation coefficient of 0.846 and coefficient determinants of 0.7157 which was interpreted as significant. Moreover, influence of providing learning experiences on technology literacy and digital citizenship has a correlation coefficient of 0.5662 and coefficient determinants of 0.3205 which was interpreted as significant. Lastly, influence of providing learning experiences on technology supported assessment has a correlation coefficient of 0.8549 and coefficient determinants of 0.7308 which was interpreted as significant.

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Table 3
Influence of Techno-Pedagogical Competence on the Teachers Technology Integration Self-Efficacy

Independent Variables	Dependent Variable	Correlation Coefficient (r)	Coefficient of Determinants (r^2)	Sig
Teaching	Technology Usage	0.3301	0.01089	Not significant
	Technology Application	0.8665	0.7508	Significant
	Technology Infused-Learning	0.1235	0.0152	Not significant
	Technology Literacy and Digital Citizenship	0.9635	0.9283	Significant
	Technology Supported Assessment	0.7341	0.5389	Significant
Providing Learning Experiences	Technology Usage	0.8471	0.7176	Significant
	Technology Application	0.9420	0.8887	Significant
	Technology Infused-Learning	0.846	0.7157	Significant
	Technology Literacy and Digital Citizenship	0.5662	0.3205	Significant
	Technology Supported Assessment	0.8549	0.7308	Significant
Presentation	Technology Usage	0.9843	0.9688	Significant
	Technology Application	0.5578	0.3111	Significant
	Technology Infused-Learning	0.5042	0.2542	Significant
	Technology Literacy and Digital Citizenship	0.5987	0.3584	Significant
	Technology Supported Assessment	0.8517	0.7322	Significant
Lesson Preparation	Technology Usage	0.9917	0.9845	Significant
	Technology Application	0.6428	0.4132	Significant
	Technology Infused-Learning	0.8937	0.7986	Significant
	Technology Literacy and Digital Citizenship	0.3038	0.0922	Significant
	Technology Supported Assessment	0.8169	0.6673	Significant

r_{05}= 0.1

This finding revealed that providing learning experiences has a significant influence to technology usage, technology application, technology infused-learning, technology literacy and digital citizenship, and technology supported assessment. This finding implies that, providing learning experiences that incorporate technology usage, application, infused learning, literacy, digital citizenship, and supported assessment significantly influences education. Hands-on experiences, application of technology, integration of technology into instruction, development of digital skills, enhanced assessment practices, data-driven instruction, and fostering innovation and creativity all contribute to the impact of these learning experiences. By incorporating technology effectively, educators empower students to develop proficiency in using digital tools, apply technology skills in real-world contexts, enhance engagement and critical thinking, promote responsible digital behavior, improve assessment practices, personalize instruction, and foster creativity and innovation. In summary, providing technology-integrated learning experiences prepares students for success in a technology-driven world and enhances educational outcomes.

It was supported by the study of Garcia et al. (2022), which examined the impacts of digital technologies on education, including how ICTs support student-centered learning, self-directed learning, creative learning

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environments, critical thinking skills, and collaborative learning experiences. Therefore, providing learning experiences that incorporate technology usage, application, infused learning, literacy, digital citizenship, and supported assessment significantly influences education. Hands-on experiences, application of technology, integration of technology into instruction, development of digital skills, enhanced assessment practices, data-driven instruction, and fostering innovation and creativity all contribute to the impact of these learning experiences. By incorporating technology effectively, educators empower students to develop proficiency in using digital tools, apply technology skills in real-world contexts, enhance engagement and critical thinking, promote responsible digital behavior, improve assessment practices, personalize instruction, and foster creativity and innovation. In summary, providing technology-integrated learning experiences prepares students for success in a technology-driven world and enhances educational outcomes.

As gleaned on the table, the influence of presentation on technology usage has a correlation coefficient (r) is 0.9843 and its coefficient of determinants (r2) is 0.9688 and interpreted as significant. Also, the influence of presentation on technology application has a correlation coefficient of 0.5578 and coefficient determinants of 0.3111 which was interpreted as significant. Additionally, influence of presentation on technology infused learning has a correlation coefficient of 0.5042 and coefficient determinants of 0.2542 which was interpreted as significant. Moreover, influence of presentation on technology literacy and digital citizenship has a correlation coefficient of 0.5987 and coefficient determinants of 0.3584 which was interpreted as significant. Lastly, influence of presentation on technology supported assessment has a correlation coefficient of 0.8517 and coefficient determinants of 0.7322 which was interpreted as significant.

This finding revealed that presentation has a significant influence on technology usage, technology application, technology infused-learning, technology literacy and digital citizenship, and technology supported assessment. This finding implies that, presentations play a significant role in influencing technology usage, application, infused learning, literacy, digital citizenship, and supported assessment. They showcase technology tools, demonstrate practical applications, facilitate technology-infused learning experiences, promote digital literacy and citizenship, incorporate technology in assessment, visualize data, and provide opportunities for professional development. By incorporating technology demonstrations, multimedia elements, interactive features, and digital resources into presentations, educators inspire interest in technology, enhance communication and engagement, promote responsible technology use, assess student learning, visualize data, and enhance professional development. In summary, presentations serve as a powerful platform for integrating technology into educational practices and fostering digital skills and knowledge among students and educators.

According to Fullan (2019), teachers must have the ability to integrate technology seamlessly into their teaching practices, going beyond basic presentation and communication. The integration of technology and pedagogy should meet four criteria: being irresistibly engaging, elegantly efficient, technologically pervasive, and deeply rooted in real-life problem-solving. This means that technology integration should promote active student engagement, be challenging yet user-friendly, be widely accessible, and connect to authentic problem-solving in real-world contexts. Therefore, the influence of presentations on technology integration self-efficacy has significant implications for educators, students, and the learning environment. Presentations enhance educators' technology skills, inspire innovation, support professional development, model effective technology use, promote digital literacy and citizenship, facilitate data-driven decision-making, and create engaging and collaborative learning experiences. By showcasing technology tools and applications, presentations empower educators to integrate technology effectively, leading to professional growth and improved student outcomes. Presentations also raise awareness of responsible technology use and promote a culture of digital citizenship. Overall, presentations play a vital role in fostering technology integration and digital fluency in educational settings.

As gleaned on the table, the influence of lesson preparation on technology usage has a correlation coefficient (r) is 0.9917 and its coefficient of determinants (r2) is 0.9845 and interpreted as significant. Also, the influence of lesson preparation on technology application has a correlation coefficient of 0.6428 and coefficient determinants of 0.4132 which was interpreted as significant. Additionally, influence of lesson preparation on technology infused learning has a correlation coefficient of 0.8937 and coefficient determinants of 0.7986 which was interpreted as significant. Moreover, influence of lesson preparation on technology literacy and digital citizenship has a correlation coefficient of 0.3038 and coefficient determinants of 0.0922 which was interpreted as significant. Lastly, influence of lesson preparation on technology supported assessment has a correlation coefficient of 0.8169 and coefficient determinants of 0.6673 which was interpreted as significant. This finding revealed that lesson preparation has a significant influence to technology usage, technology application, technology infused-learning, technology literacy and digital citizenship, and technology supported assessment.

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This finding implies that, lesson preparation is pivotal in influencing technology utilization, application, infused learning, literacy, digital citizenship, and supported assessment. It involves aligning technology with objectives, selecting tools, promoting active learning, fostering digital skills, enhancing assessment, enabling data-driven instruction, and facilitating professional development. Effective lesson preparation integrates technology to create engaging learning experiences, empower students, and cultivate digital fluency. It is essential for successful technology integration and supporting educators in leveraging technology effectively. According to Johnson (2021), teachers need to be aware of different tools available for specific tasks, select appropriate tools, align strategies with the capabilities of the chosen tools, and possess pedagogical knowledge to effectively apply these technologies. The integration of technology with pedagogy is essential for facilitating learning, addressing learning gaps and difficulties, assessing outcomes, and evaluating the overall learning process.

Therefore, the influence of lesson preparation on technology integration self-efficacy has significant implications for educators, students, and the learning environment. It enhances educators' technology skills, promotes strategic technology integration, encourages innovative teaching practices, fosters digital literacy and citizenship, enables data-informed decision-making, supports professional growth, and creates student-centered learning environments. By engaging in thorough lesson planning that incorporates technology, educators develop confidence in using technology effectively, promote student engagement, foster creativity, and enhance critical thinking skills. Lesson preparation also cultivates digital literacy, responsible technology use, and data-driven instructional practices. Overall, lesson preparation plays a crucial role in empowering educators to leverage technology for effective teaching and learning experiences.

Significant Differences (Analysis of Variance) Among Aspects of Techno-Pedagogical Competency Among Grade Levels

The test of significant differences (analysis of variance) among aspects of techno-pedagogical competency among grade levels. As gleaned from the table, the source of variation is grade level with the sum of square and mean square are both 0.0001, it is found out that the f-value is 0.0003, using 5% level of significance when the degree of freedom of grade level is 1 and its error is 3, the F- tabular value is 10.15. Since the F-value is less than the F-tabular, therefore it was interpreted as not significant. Based on the data, the aspects of techno-pedagogical competency have a sum of squares of 0.4426 and mean squares of 0.1475, it is found out that the f-value is 0.5245, using 5% level of significance when the degree of freedom of aspects of techno-pedagogical competency is 3 and its error is 3, the F-tabular value is 9.20. Since the F-value is less than the F-tabular, therefore it was interpreted as not significant.

Table 4
Test of Significant Differences Among Aspects of Techno-Pedagogical Competency Among Aspects and Grade Level Groups

Sources of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F-Value	Interpretation
Grade Level	1	0.0001	0.0001	0.0003	Not significant
Aspects of Techno-Pedagogical Competency	3	0.4426	0.1475	0.5245	Not significant
Error	3	0.8437	0.2812		
Total	7	1.2868			

$F_{05}(1,3)=10.15$ $F_{05}(3,3)=9.20$

These findings imply that several factors might contribute to the lack of significant differences in techno-pedagogical competency across grade levels. First, uniform curriculum standards across grade levels may ensure that technology integration is similarly prioritized, leading to comparable levels of competency among educators. Professional development opportunities might also be consistent across grades, helping to maintain similar levels of technological proficiency among teachers. Additionally, common technology integration practices, such as using the same tools and platforms across grade levels, may lead to a consistent application of techno-pedagogical strategies. Collaborative learning environments where educators share practices, along with equitable support and resources, could further standardize technology integration across grades. Finally, a shared commitment to continuous learning

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and growth among educators may ensure that teachers at all grade levels stay updated on effective methods for integrating technology into their teaching.

According to Demirtaş and Mumcu (2021), studied about "Teachers' Techno-Pedagogical Competencies in Social and Professional Contexts" reveals significant differences in techno-pedagogy competency among teachers based on social context, particularly gender, and no significant differences among different grade levels. The implications of this study include the need for gender-specific training programs, targeted professional development initiatives, promotion of inclusive teaching practices, collaborative learning opportunities, continuous evaluation and feedback, and research-based policy formulation. To address these implications, key strategies can be implemented, including gender-specific training programs, targeted professional development initiatives, promotion of inclusive teaching practices, collaborative learning opportunities, continuous evaluation and feedback, and research-based policy formulation. These strategies support teachers in enhancing their technology integration skills and create a more inclusive and technologically proficient teaching environment.

Significant Differences (Analysis of Variance) Among Aspects of Technology Integration Self-Efficacy Among Grade Levels

The test of significant differences (analysis of variance) among aspects of technology integration self-efficacy among grade levels. As gleaned from the table, the source of variation is grade level with the sum of square and mean square are both 0.0063, it is found out that the f-value is 0.1014, using 5% level of significance when the degree of freedom of grade level is 1 and its error is 4, the F- tabular value is 7.71. Since the F-value is less than the F-tabular, therefore it was interpreted as not significant. The absence of significant differences in technology integration self-efficacy across grade levels can be explained by several factors. One possible reason is the uniformity in training and professional development opportunities available to teachers across grade levels.

Educational institutions often provide similar workshops, courses, and training sessions to all teachers, ensuring that teachers at all levels are equipped with comparable knowledge and skills regarding technology integration. Furthermore, educators in different grade levels may share common educational objectives, emphasizing the importance of technology integration in enhancing learning outcomes. This shared focus could contribute to similar levels of self-efficacy in using technology effectively in the classroom. Another contributing factor could be the collaboration and knowledge exchange among educators across grade levels.

Table 5
Test of Significant Differences (Analysis of Variance) Among Aspects of Technology Integration Self-Efficacy Among Aspects and Grade Level Groups

Sources of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F-Value	Sig
Grade Level	1	0.0063	0.0063	0.1014	Not significant
Aspects of Self-Efficacy	4	0.3217	0.0804	1.2947	Not Significant
Error	4	0.2485	0.0621		
Total	9				

$F_{05}(1,4)=7.71$ $F_{05}(4,4)=6.39$

Teachers frequently collaborate on various projects, share best practices, and exchange ideas about integrating technology into their teaching. This exchange of knowledge helps to standardize technology use and self-efficacy across different grade levels. Equitable access to resources, such as technological tools and platforms, is also crucial. If all educators, regardless of grade level, have access to the same resources, this could result in similar levels of confidence and competence in technology integration. Additionally, a focus on student-centered learning practices may contribute to uniform self-efficacy levels. Since student-centered approaches often encourage the use of technology to support personalized learning, educators across grade levels may be equally motivated and confident in their ability to integrate technology into their classrooms.

Findings revealed that there is no significant difference among aspects of technology integration self-efficacy among grade levels. This is supported by the study of Serkan Aslan (2021), research results revealed that the pre-service teachers' digital literacy self-efficacy levels significantly differed across their gender, department, the presence

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of computer and internet at home; whereas, no significant difference was identified across the pre-service teachers' digital literacy self-efficacy levels in terms of their class level, university entrance score type and the purposes of using technology.

Conclusions

Teachers have a high techno-pedagogical competence in teaching, providing learning experiences and lesson preparation and fair in presentation. Therefore, to effectively enhance teachers' technological skills and empower them to leverage technology for engaging and impactful student learning, a multi-faceted approach is crucial. This involves focusing on developing their presentation abilities through targeted training, fostering peer learning opportunities, providing consistent access to relevant technology, and offering ongoing feedback. The respondents have a high in technology usage, technology application, technology-infused learning, technology literacy and digital citizenship and technology-supported assessment. Therefore, teachers who demonstrate strong confidence in their technology integration skills are a valuable asset to any educational institution. To further enhance their abilities and foster a culture of continuous learning and innovation, it is essential to provide them with a range of opportunities for professional growth. The findings indicate a strong positive correlation between teachers' techno-pedagogical competence and their self-efficacy in using technology for teaching, particularly in areas like technology application, technology-infused learning, and technology-supported assessment. This suggests that improving teachers' techno-pedagogical skills can significantly enhance their confidence and effectiveness in integrating technology into their classrooms. To empower teachers to effectively use technology in the classroom, focus on developing their techno-pedagogical skills.

Recommendations

Training programs can equip teachers with the specific skills and knowledge necessary to effectively utilize various digital tools and platforms for presentations, while peer learning encourages collaboration and knowledge sharing, allowing teachers to learn from one another's experiences and best practices. Providing teachers with consistent access to the latest technology ensures they are familiar with the tools they need to create dynamic and engaging presentations, while ongoing feedback mechanisms, such as peer reviews, expert guidance, and student feedback, provide valuable insights for continuous improvement and refinement of presentation skills. By implementing this comprehensive approach, educational institutions can foster a culture of continuous learning and development, empowering teachers to confidently utilize technology to enhance student engagement and learning outcomes. Encouraging the sharing of best practices through peer-to-peer workshops and collaborative learning sessions allows teachers to learn from one another's experiences and refine their approaches to technology integration. Exploring new technologies through hands-on workshops, demonstrations, and access to cutting-edge tools empowers teachers to stay ahead of the curve and embrace the latest advancements in digital education. Addressing specific needs through targeted training programs, tailored to individual skill gaps and areas for improvement, provides teachers with the focused support they need to develop their expertise in specific technologies or pedagogical approaches. Finally, offering ongoing professional development opportunities, such as online courses, webinars, and conferences, ensures that teachers remain informed about the latest trends, best practices, and emerging technologies in education. By providing these comprehensive support mechanisms, educational institutions can cultivate a dynamic and innovative teaching force that effectively utilizes technology to enhance student learning and create a more engaging and effective learning environment. Helping them learn how to choose the right technology for their teaching goals, create engaging tech-infused lessons, and use technology for assessment. By equipping teachers with these skills, we can transform classrooms into dynamic learning environments where technology enhances student learning. There is no significant difference among aspects of techno-pedagogical competency among grade levels. As recommendation, the Department of Education should address, key strategies can be implemented, including gender-specific training programs, targeted professional development initiatives, promotion of inclusive teaching practices, collaborative learning opportunities, continuous evaluation and feedback, and research-based policy formulation.

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