International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 2 (April-June 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I2.696

From Technology Literacy to Practice: The Relationship Between TPACK Proficiency and Teaching Learning Performance

Fatima Relado Fuentes[1], Hiede Bacus[2], Geramae Giljang[3]
[1]*Administrative Assistant III, Sibonga Community College, Sibonga, Cebu, Philippines*
[2]*Teacher I, Toong Integrated School, Toong, Cebu, Philippines*
[3]*Teacher I, Hipodromo Elementary School, Cebu, Philippines*

Publication history: Received: May 19, 2026; Revised: June 27, 2026; Accepted: June 29, 2026
Email of Corresponding Author: f.relado19@gmail.com

Abstract

This study examined the relationship between teachers' Technological Pedagogical Content Knowledge (TPACK) proficiency and classroom performance at Maximina V. Barangan Elementary School, Carcar City, Cebu, during School Year 2025–2026. Anchored on the TPACK Framework and the Technology Acceptance Model, the study used a quantitative descriptive-correlational research design. The respondents were 19 public elementary school teachers selected through purposive sampling. Data were gathered using a validated TPACK-based self-assessment questionnaire and official classroom observation records aligned with the Department of Education's Results-Based Performance Management System. Descriptive and inferential statistical tools, including frequency, percentage, mean, standard deviation, Pearson Product-Moment Correlation, and multiple linear regression, were used to analyze the data. Findings showed that teachers demonstrated high levels of TPACK proficiency across most domains, with Pedagogical Content Knowledge rated very strong. Their teaching–learning performance was rated Very Satisfactory. Significant positive relationships were found between teaching performance and the technology-driven TPACK domains, specifically Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge. However, Pedagogical Knowledge, Content Knowledge, Pedagogical Content Knowledge, and Technological Pedagogical Content Knowledge showed insignificant correlations with performance. The study concluded that teachers' ability to integrate technology with pedagogy and content is an important factor in enhancing classroom effectiveness. It recommended targeted professional development, peer coaching, and sustained investment in digital resources and infrastructure. The study supports SDG 4 on Quality Education and SDG 9 on Industry, Innovation and Infrastructure by promoting technology-integrated teaching and teacher development. Its sustainability impact lies in strengthening instructional quality, institutional capacity, and technology-responsive professional development in basic education.

Keywords: Classroom Performance; Elementary Teachers; Professional Development; Quantitative Descriptive-Correlational Research; Technology Integration; Technology Acceptance Model; Technological Pedagogical Content Knowledge; TPACK-Based Instruction Plan

1. Introduction

This study examined the relationship between teachers' Technological Pedagogical Content Knowledge (TPACK) proficiency and their classroom performance at Maximina V. Barangan Elementary School, Carcar City, Cebu, during School Year 2025–2026. It focused on how teachers integrate technology, pedagogy, and content knowledge in actual classroom instruction and how their demographic profile and technology-related training may influence their proficiency and performance. Anchored on the TPACK Framework and the Technology Acceptance Model (TAM), the study aimed to generate evidence-based insights for designing a TPACK-Based Instruction Plan for Teacher Development.

1.1 Technology Integration and TPACK Proficiency in Elementary Instruction

Technology integration has become a necessary component of contemporary classroom instruction. Teachers are expected to combine technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) through the Technological Pedagogical Content Knowledge or TPACK framework to respond to the demands of 21st-century education. Although global and national initiatives continue to promote digital literacy among educators, a gap remains between teachers' knowledge of technology and their ability to apply it effectively in daily classroom practice, particularly in elementary schools in the Philippines. Recent studies emphasize the role of TPACK in improving teaching practices. Wu et al. (2025) found that teachers with strong TPACK skills were able to use advanced tools such as virtual reality to create more engaging and effective lessons. Shambare and Simuja (2024) stressed that TPACK development must be responsive to school and teacher contexts, especially when integrated into professional development. Mafa and Govender

(2025) further showed that teachers' willingness and belief in the usefulness of technology, as explained by the Technology Acceptance Model, influence how effectively they implement TPACK in teaching. Relator (2022) also observed that teachers with higher TPACK levels delivered more student-centered and technology-integrated lessons.

1.2 TPACK Proficiency and Teachers' Classroom Performance

The literature shows that TPACK proficiency is linked to teachers' ability to use technology meaningfully in instruction. However, proficiency in separate domains of technology and pedagogy does not always guarantee effective integration. Santos and Castro (2021) found in a study in Bulacan that although many teachers felt confident in their technological and pedagogical knowledge, they still struggled to combine these areas effectively in actual classroom practice. This suggests that teachers' self-perceived competence may not always translate into observable instructional performance. Classroom-based evidence also supports the connection between TPACK proficiency and teaching behavior. Garrison (2023) found that teachers who scored high in TPACK assessments also performed better in classroom observations, particularly in specialized teaching settings. This indicates that TPACK self-assessments may reflect actual classroom practice when supported by objective performance measures. Aldalalah et al. (2025) likewise showed that students performed better when teachers used digital content designed according to TPACK principles.

1.3 Local, National, and Global Context of Technology-Integrated Teaching

In the global and national education context, technology integration remains a priority for improving instructional quality. However, the effective use of technology depends not only on teachers' individual skills but also on the school environment. Stephens-Himonides and Young (2025) proposed the inclusion of contextual knowledge (XK) in the TPACK model, emphasizing that access to resources, administrative support, and training opportunities can influence teachers' ability to implement technology in the classroom. In the Philippine public elementary school context, there remains limited research connecting teachers' TPACK proficiency with classroom observation scores, which are already used in schools to evaluate teaching performance. There is also limited understanding of how teachers' demographic characteristics, such as age, gender, civil status, highest educational attainment, years of teaching experience, and technology-related training, relate to their TPACK proficiency and classroom performance. This study addressed this gap by focusing on teachers at Maximina V. Barangan Elementary School in Carcar City, Cebu.

1.4 TPACK Framework and Technology Acceptance Model as Conceptual Bases

This study is anchored on two complementary theories: the Technological Pedagogical Content Knowledge (TPACK) Framework and the Technology Acceptance Model (TAM). The TPACK framework provides the basis for evaluating teachers' integrated knowledge of technology, pedagogy, and content in classroom instruction (Mishra & Koehler, 2006). The Technology Acceptance Model explains the cognitive beliefs that influence teachers' willingness and ability to use technology effectively (Venkatesh & Davis, 2000). Together, these theories provide a dual lens for understanding both the competencies and the attitudes needed for effective technology integration. The Technological Pedagogical Content Knowledge (TPACK) Framework, introduced by Mishra and Koehler (2006), explains that effective teaching with technology requires the balanced integration of Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). The framework supports this study by guiding the assessment of teachers' proficiency in using technology in classroom instruction through a validated TPACK-based instrument. It also provides the basis for examining whether teachers' TPACK proficiency is reflected in their actual classroom performance. The Technology Acceptance Model (TAM), developed by Davis (1989) and later expanded by Venkatesh and Davis (2000), explains users' acceptance and use of technology through perceived usefulness and perceived ease of use. This model supports the study by explaining why some teachers may be more willing and able to use technology in teaching than others. While TPACK focuses on the knowledge required for technology integration, TAM explains the attitudes and motivations that influence actual technology use. This study is anchored on two complementary theoretical models: the Technological Pedagogical Content Knowledge (TPACK) Framework by Mishra and Koehler (2006) and the Technology Acceptance Model (TAM) by Davis (1989). The conceptual basis also recognizes the relevance of the Philippine Professional Standards for Teachers (PPST), the UNESCO ICT Competency Framework for Teachers (ICT-CFT), National Adoption and DepEd Order No. 42, s. 2017 in supporting technology-integrated teaching and teacher development. These frameworks collectively inform the proposed TPACK-Based Action Plan for Teacher Development.

1.5 Research Gap on TPACK Proficiency, Teacher Profile, and Classroom Performance

Although previous studies have established the importance of TPACK in technology-integrated instruction, limited research has examined its relationship with actual classroom performance in Philippine public elementary schools. Existing findings show that teachers may possess technological and pedagogical knowledge but may still struggle to apply them effectively in real classroom settings. This study addressed that gap by assessing teachers' TPACK proficiency and determining its relationship with their teaching and learning performance at Maximina V. Barangan Elementary School. The study also examined whether teachers' demographic profile, including age, gender, civil status, highest educational attainment, years of teaching experience, and technology-related training attended, is related to their level of TPACK proficiency and classroom performance. Based on the findings, the study aimed to design a TPACK-Based Instruction Plan for Teacher Development that could support teachers in moving from technology literacy to effective technology practice.

1.6 Alignment of TPACK-Based Teacher Development with Relevant Sustainable Development Goals

This study aligns most directly with SDG 4 – Quality Education because it focuses on improving teachers' capacity to integrate technology, pedagogy, and content knowledge in classroom instruction. By examining the relationship between TPACK proficiency and classroom performance, the study supports efforts to strengthen teacher quality, improve instructional delivery, and enhance pupils' learning experiences. The study also relates to SDG 9 – Industry, Innovation and Infrastructure because it addresses the use of digital tools, ICT-related training, and technology-enhanced instruction in basic education. Its emphasis on technology integration and teacher development contributes to innovation in classroom practice within the elementary school context.

1.7 Multidisciplinary Sustainability Relevance of Technology-Integrated Teaching

The study contributes to educational sustainability by supporting continuous improvement in teacher professional development, instructional quality, and classroom performance. By identifying teachers' strengths and gaps in technology integration, the findings may guide targeted ICT training, coaching programs, and professional development activities that respond to teachers' actual needs. The study also supports technological and institutional sustainability by informing school leaders, curriculum developers, education planners, DepEd supervisors, and policymakers in designing more responsive programs, training modules, and evaluation tools related to technology-based instruction. For learners, the study promotes more engaging, relevant, and effective learning experiences through better-integrated technology use in the classroom. For future researchers, it contributes to the growing literature on TPACK, teacher proficiency, technology integration, and classroom performance in the Philippine elementary education context.

2. Material and methods

2.1 Research Design

The study utilized a quantitative, descriptive-correlational research design. The descriptive aspect determined the demographic profile of the teachers, their level of TPACK proficiency, and their classroom performance based on quarterly observation scores. The correlational aspect examined the relationship between teachers' TPACK proficiency and their actual teaching performance, as well as the influence of demographic factors on both variables. This design allowed the researcher to gather quantifiable data using standardized instruments and statistically analyze relationships among variables without manipulating them. The study followed an Input–Process–Output model, where teacher profile, TPACK proficiency, and classroom observation scores served as inputs; survey administration, retrieval of observation scores, statistical analysis, and interpretation served as processes; and the proposed TPACK-Based Instruction Plan served as the output.

2.2 Locale of the Study

The study was conducted at Maximina V. Barangan Elementary School, a public elementary institution under the Department of Education located in Carcar City, Cebu. The school serves learners from Kindergarten to Grade 6 from both urban and rural communities. It is staffed by licensed teachers who are evaluated through the Results-Based Performance Management System and encouraged to pursue professional development, including Information and Communication Technology integration. The school has basic digital tools such as computers, printers, and internet connectivity, which are gradually being integrated into the teaching-learning process in line with DepEd's digital transformation initiatives. Its implementation of quarterly classroom observations and emphasis on digital competence made it a suitable setting for the study.

2.3 Respondents of the Study

The respondents were selected public elementary school teachers currently teaching at Maximina V. Barangan Elementary School under the Department of Education. They were teachers who had undergone quarterly classroom observations for the current or most recent school year and were actively engaged in instructional delivery that potentially involved technology integration. Teachers from different grade levels and subject specializations were included to ensure representation across pedagogical and content areas. The respondents consisted of 19 teachers from Kindergarten to Grade 6.

2.4 Sample and Sampling Procedure

A purposive sampling technique was used to select the respondents. This method was appropriate because the study required teachers who had available classroom observation data and were willing to participate in the TPACK-based self-assessment. The anticipated number of respondents was based on the total teaching staff of the school who met the inclusion criteria. Participation was voluntary and guided by informed consent and confidentiality.

2.5 Research Instrument

The study used two main research instruments: a validated TPACK-based questionnaire and classroom observation records. The first instrument was a Technological Pedagogical Content Knowledge self-assessment questionnaire adapted from the original tool developed by Schmidt et al. (2009) and enhanced through item reformulations by Chai et al. (2020) and Valtonen et al. (2020). The questionnaire measured seven TPACK domains: Technological Knowledge, Pedagogical Knowledge, Content Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge, and Technological Pedagogical Content Knowledge. Each item was rated using a 5-point Likert scale ranging from Strongly Disagree to Strongly Agree. The tool has demonstrated strong internal reliability, with Cronbach's alpha greater than 0.80 across most subscales in multiple international studies. The questionnaire was administered in printed form with an accompanying consent letter. The second instrument consisted of teachers' classroom observation scores recorded through the school's official observation tools aligned with the Department of Education's Results-Based Performance Management System. These scores represented actual classroom performance and were used to determine the level of application of TPACK principles in real teaching situations. Before full implementation, the TPACK questionnaire was subjected to pilot testing with non-participating teachers to ensure clarity and reliability in the local context.

2.6 Data Gathering Procedure

After the approval of the research title by the Cebu Technological University Graduate School, the researcher secured an official endorsement letter from the Graduate Studies Office addressed to the school head, requesting permission to conduct the study. A formal request letter was then submitted to the school principal, explaining the purpose, scope, and ethical considerations of the study, together with the research instrument, informed consent form, and other relevant documents. Upon approval from the school administration, the researcher distributed the TPACK-based self-assessment questionnaire to the identified teacher-respondents who met the inclusion criteria. Before answering, participants were oriented on the purpose of the study, use of the data, voluntary nature of participation, and confidentiality of responses. Signed informed consent forms were collected. The researcher also requested permission to access classroom observation records from the current or most recent academic year. These records, gathered through the Department of Education's RPMS-based classroom observation tools, represented the teachers' actual teaching performance. After the questionnaires and observation scores were collected, the data were coded, organized, and prepared for statistical analysis. All data were securely stored and used solely for academic purposes, and results were presented in aggregate form to protect respondent anonymity.

2.7 Data Analysis Techniques

The study used descriptive and inferential statistical tools to analyze the data. Frequency and percentage distribution were used to describe the demographic profile of the teacher-respondents in terms of age, sex, educational attainment, years of teaching experience, and ICT-related trainings attended. Mean and standard deviation were used to determine the teachers' TPACK proficiency across the seven domains and to summarize classroom performance based on observation ratings. Pearson Product-Moment Correlation Coefficient was used to determine the significant relationship between teachers' TPACK proficiency and classroom performance. It was also used to assess the relationship between demographic variables and both TPACK proficiency and performance, where the data met normality assumptions. Multiple linear regression analysis was employed to identify which TPACK domains and demographic factors significantly predicted classroom performance. All inferential tests were measured at the 0.05 level of significance, where a p-value less than 0.05 indicated a statistically significant result. Data were encoded, tabulated, and analyzed using statistical software such as SPSS or Microsoft Excel. The scoring procedure involved two primary data sources: the TPACK self-assessment questionnaire and the classroom observation tool. The TPACK questionnaire used a 5-point Likert scale, with higher mean scores indicating greater perceived proficiency. The interpretation ranged from very low proficiency to very high proficiency. Classroom observation scores were based on official quarterly ratings using the Department of Education's RPMS-based observation tool. Each teacher's scores across the four quarters were compiled, and the mean score was computed to represent overall teaching performance. These scores were then correlated with TPACK domain scores to determine the extent to which technology integration proficiency aligned with actual classroom practice.

2.8 Ethical Considerations

The study observed ethical procedures by securing approval from the school administration, informing participants about the purpose and scope of the research, and obtaining signed informed consent. Participation was voluntary, and confidentiality of responses was maintained. All collected data were securely stored, used only for academic purposes, and presented in aggregate form to ensure anonymity.

3. Results and Discussion

3.1 Demographic Profile of the Teacher-Respondents

3.1.1 Age Profile of Teachers

The data showed that the largest group of teachers belonged to the 31–40 years old age bracket, comprising 36.8% of the respondents. This was followed by teachers aged 41–50 years old at 31.6%, teachers aged 51 and above at 26.3%, and teachers aged 21–30 years old at 5.3%. Overall, the teaching workforce was mostly composed of mid-career to older adults, with very few younger teachers represented. This age profile suggests that the school has a stable and experienced teaching workforce. A 2024 study by Justol and Potane found that demographics such as age significantly related to teachers' technology self-efficacy and teaching performance, while Bacus et al. (2024) identified years of service and grade level taught as significant predictors of teaching performance. Furthermore, a 2025 survey of Philippine public-school teachers found that many educators were in the 36–40 years age range, reinforcing the pattern of a predominantly mid-career teaching population.

3.1.2 Gender Profile of Teachers

The results showed that most respondents were female, representing 78.9% of the teachers, while male teachers accounted for 21.1%. This indicates that the teaching workforce in the school was predominantly female. This gender distribution reflects a common pattern in Philippine basic education, where women typically comprise the majority of teaching personnel. A 2024 study by Justol and Potane reported that Philippine teacher demographics in higher and basic education remain overwhelmingly female, while Bacus et al. (2024) found the same pattern in their nationwide dataset on teaching performance. In relation to technology integration, a 2022 study by Scherer et al. noted that gender does not significantly hinder TPACK development because both male and female teachers can achieve comparable technological competence when provided with adequate training.

3.1.3 Teaching Experience of Teachers

The data showed that the largest group of teachers had 6 to 10 years of teaching experience, representing 36.8% of the respondents. Teachers with 11 to 15 years and those with 16 years and above each accounted for 26.3%, while teachers with 1 to 5 years of experience represented 10.5%. These findings indicate that most respondents were mid-career or highly experienced teachers. The dominance of experienced teachers may support stronger instructional delivery and classroom management. In a 2024 nationwide Philippine study, Bacus et al. found that teaching experience was a significant predictor of instructional performance. Similarly, Justol and Potane (2024) demonstrated that teachers with mid-level to long teaching experience showed higher technology self-efficacy and skill confidence. A 2022 study by Scherer et al. also found that years of teaching experience positively influences teachers' readiness to integrate digital tools.

3.1.4 Technology-Related Trainings Attended by Teachers

The findings showed that 78.9% of the teachers had attended five or more technology-related trainings. Meanwhile, 10.5% attended around three to four trainings, 5.3% attended one or two trainings, and 5.3% gave no response. This indicates that most teachers had substantial exposure to ICT-related professional development. This high level of training exposure suggests strong institutional support for digital upskilling. A 2024 Frontiers in Education study by Bacus et al. found that teachers who attended more ICT-related trainings demonstrated significantly higher performance ratings and stronger digital pedagogical practices. Justol and Potane (2024) reported that digital skills training positively affected teachers' technology self-efficacy and competence, while Scherer and Siddiq (2023) found that structured professional development significantly predicted TPACK growth.

3.2 Teachers' Level of TPACK Proficiency

3.2.1 Technological Knowledge

The results showed that teachers generally demonstrated a high level of Technological Knowledge, with a grand mean of 3.88 interpreted as "Agree." The highest-rated indicator was teachers' awareness of different educational technologies and their purposes, followed by their comfort in using digital tools and their ability to troubleshoot basic technical problems. These results indicate that the teachers had a solid foundation in basic technology use. This finding suggests that teachers possess the technological foundation needed for meaningful technology integration. In a 2024 Philippine study, Bacus et al. found that higher technological competence significantly predicted better instructional performance. Justol and Potane (2024) also found that teachers' digital self-efficacy and familiarity with educational technologies were strongly associated with overall TPACK proficiency. Scherer & Siddiq (2023) emphasized that strong TK supports teachers' confidence in selecting and combining digital tools, while König et al. (2020) noted that the ability to learn new technologies quickly contributes to better instructional technology use.

3.2.2 Pedagogical Knowledge

The results showed that teachers reported a high level of Pedagogical Knowledge, with a grand mean of 3.83 interpreted as "Agree." The highest rating was on familiarity with a wide range of teaching strategies, followed by understanding how students learn and knowing how to assess student learning in various ways. The lowest, though still positive, rating was on adjusting teaching style to meet the needs of diverse learners. These findings indicate that teachers possessed strong pedagogical foundations that support effective instruction. Bacus et al. (2024) found that pedagogical competence was one of the strongest predictors of overall teaching performance. A 2022 international study by Scherer, Howard, & Tondeur also found that teachers with strong PK were more likely to integrate technology meaningfully because they could align digital tools with pedagogical intentions.

3.2.3 Content Knowledge

The findings showed that teachers had a strong level of Content Knowledge, with a grand mean of 3.90 interpreted as "Agree." Teachers rated themselves highest in answering students' questions about the subject matter and relating concepts to real-world applications. They also agreed that they had deep understanding of the content and awareness of current developments in their subject areas. This result indicates that teachers had adequate subject matter mastery to support effective instruction and technology integration. Manigbas et al. (2024) reported that elementary teachers demonstrated "Highly competent" levels of content knowledge and pedagogy, which correlated positively with effective classroom performance. Kholid (2023) emphasized that strong content knowledge underpins technology-pedagogy integration, while Elvianasti et al. (2023) found that content knowledge significantly influenced teachers' ability to integrate technology with pedagogical approaches.

3.2.4 Pedagogical Content Knowledge

The results showed that teachers demonstrated a very strong level of Pedagogical Content Knowledge, with a grand mean of 4.22 interpreted as "Strongly Agree." The highest-rated indicator was the ability to explain subject concepts clearly to students, followed by the ability to anticipate and address common student misconceptions. Teachers also agreed that they could choose appropriate strategies, organize lessons effectively, and modify teaching to help students understand difficult content. These findings show that teachers were capable of combining subject expertise with effective teaching strategies. Manigbas et al. (2024) found that teachers in the Philippines with strong PCK demonstrated significantly higher classroom performance ratings, especially in explaining concepts and addressing misconceptions. Kholid (2023) highlighted that PCK predicts effective instructional decisions, while Elvianasti et al. (2023) reported that teachers with strong PCK were better able to integrate pedagogical methods with subject-specific needs.

3.2.5 Technological Content Knowledge

The findings showed that teachers had an "Agree" level of Technological Content Knowledge, with a grand mean of 3.71. Teachers generally agreed that they could use technology to represent content, identify technologies that enhance student understanding, select appropriate tools for specific content, and use digital tools to help learners explore concepts. These findings indicate that teachers had a solid ability to connect technology with subject content. This result suggests that teachers were able to use technology in ways that support content delivery and student comprehension. A 2023 study by Elvianasti et al. (2023) found that teachers with strong TCK were better at choosing technological tools aligned with content needs. Kholid et al. (2023) emphasized that TCK plays a central role in TPACK development. Manigbas et al. (2024) also reported that teachers who effectively combined content with technology achieved higher teaching performance ratings, while Suhartono & Sumarni (2022) found that appropriate technology selection for subject-specific needs improved students' conceptual understanding and participation.

3.2.6 Technological Pedagogical Knowledge

The results showed that teachers demonstrated a high level of Technological Pedagogical Knowledge, with a grand mean of 3.92 interpreted as "Agree." The highest-rated indicator was the ability to choose technologies that support teaching strategies, followed by adapting teaching methods based on technology availability, managing the classroom when using technology, supporting different learning styles, and designing technology-supported activities to increase engagement. These findings indicate that teachers were able to align digital tools with sound pedagogy. Scherer et al. (2022) found that TPK strongly predicts teachers' ability to integrate technology meaningfully into instruction, particularly in activities that support engagement and differentiated learning. König et al. (2020) also highlighted that teachers who understand how technology supports pedagogy are more confident and flexible in designing learning activities in digitally supported environments.

3.2.7 Technological Pedagogical Content Knowledge

The findings showed that teachers generally demonstrated a high level of Technological Pedagogical Content Knowledge, with a grand mean of 3.78 interpreted as "Agree." Teachers rated themselves highest in evaluating whether technology enhances the teaching of specific content. They also agreed that they could teach lessons combining content, technology, and pedagogy, develop hands-on technology-supported tasks, and assess student understanding using technology-based approaches. However, their comfort in using technology to design instruction that enhances learning was rated "Neutral." This result indicates that teachers had a generally solid capacity to integrate technology, pedagogy, and content, although some areas still require strengthening. The neutral rating on designing technology-enhanced instruction suggests that teachers may still need support in transforming technology knowledge into fully integrated instructional design. Overall, the findings show that the teachers had developed important TPCK competencies but could benefit from further professional development focused on instructional design using technology.

3.3 Teaching–Learning Performance of Teachers

The results showed that teachers obtained a mean teaching–learning performance score of 4.38 with a standard deviation of 0.345. This was interpreted as "Very Satisfactory" based on the rating scale. The narrow spread of scores indicates that teachers' classroom performance was generally consistent and stable across respondents. This finding suggests that the teachers demonstrated effective classroom practices aligned with DepEd's RPMS standards. A 2024 Philippine study by Manigbas et al. reported that teachers showed high levels of mastery in content knowledge and pedagogy, which translated into strong classroom performance ratings. Overall, the very satisfactory performance of teachers in this study reflects a well-prepared and pedagogically competent teaching force capable of supporting diverse learners.

3.4 Relationship Between TPACK Domains and Teaching–Learning Performance

The results showed significant positive correlations between selected TPACK domains and teaching–learning performance. Technological Knowledge showed a moderate significant correlation with performance, indicating that teachers with stronger technology skills tended to perform better in classroom observations. Technological Content Knowledge also showed a significant positive correlation, suggesting that the ability to match technology with subject content was associated with instructional effectiveness. Technological Pedagogical Knowledge had the strongest significant correlation, indicating that teachers who could align technology with pedagogy demonstrated higher classroom performance. Meanwhile, Pedagogical Knowledge, Content Knowledge, Pedagogical Content Knowledge, and Technological Pedagogical Content Knowledge showed insignificant correlations with teaching–learning performance. These findings indicate that technology-integrated TPACK domains were more strongly associated with classroom performance than standalone content or pedagogy domains. A 2023 study by Elvianasti demonstrated that teachers with higher TCK and TPK were more effective in facilitating conceptual understanding, student engagement, and learning tasks using digital tools. A 2024 Philippine study by Bacus et al. similarly found that technological competencies, especially those that fuse pedagogy and content, were the strongest predictors of teachers' performance ratings during classroom observations. Kholid (2023) also highlighted that technology-mediated domains of TPACK have the greatest impact on teaching effectiveness, while a 2022 classroom study by Suhartono & Sumarni found that teachers who effectively combined technological tools with pedagogy achieved higher student engagement and smoother classroom management.

4. Conclusion & Recommendations

The study concluded that the teachers of Maximina V. Barangan Elementary School demonstrated strong competencies across the Technological Pedagogical and Content Knowledge framework, with high levels of knowledge in technology use, pedagogy, content mastery, and technology-integrated teaching. Their teaching–learning performance was rated Very Satisfactory, indicating effective instructional delivery and sound classroom practices. However, the findings showed that the technology-driven domains, specifically Technological Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge, had significant positive relationships with teaching performance, while Pedagogical Knowledge, Content Knowledge, and Pedagogical Content Knowledge did not significantly predict performance. This indicates that teachers' ability to integrate technology with pedagogy and content is a key factor in enhancing classroom effectiveness.

It is recommended that the school strengthen professional development initiatives focused on improving teachers' technological competencies, particularly in Technological Content Knowledge and Technological Pedagogical Knowledge. Targeted workshops may be conducted to help teachers meaningfully combine technology with pedagogy and content to address diverse learning needs. Administrators should also encourage teachers to explore and use digital tools that enhance instruction and student engagement. Mentoring or peer-coaching programs may be implemented for teachers who need further support in technology integration, while continued investment in digital resources and infrastructure should be sustained to improve technology-driven instructional practices and overall teaching–learning performance.

The study was limited to 19 teachers of Maximina V. Barangan Elementary School who were selected through purposive sampling. Its findings were based on teachers' TPACK questionnaire responses and official classroom observation ratings; therefore, the results reflect only the competencies and teaching–learning performance of the selected respondents within the specific school context. Because the study focused on one institution and a limited number of participants, the findings may not fully represent the conditions, experiences, or performance of teachers in other schools or educational settings.

Compliance with ethical standards

The study observed ethical procedures by securing approval from the school administration before data collection. Participants were informed about the purpose and scope of the study, the voluntary nature of their participation, the use of the collected data, and the confidentiality of their responses. All collected data were securely stored, used solely for academic purposes, and presented in aggregate form to protect respondent anonymity.

REFERENCES

Aldalalah, O. M. A., Wardat, Y., Al-Omari, A. A. H., & Khodair, R. M. (2025). The effectiveness of interactive digital content based on the TPACK model in developing the skills of educational aids production and improving cognitive achievement among early childhood university students. Contemporary Educational Technology, 17(2), Article ep572. https://doi.org/10.30935/cedtech/16046

Bacus, R. C., Picardal, M. T., Perez, N. B., & Balo, V. T. M. (2024). Predictors of beginning teachers' teaching performance. Frontiers in Education, 9, Article 1375726. https://doi.org/10.3389/feduc.2024.1375726

Chai, C. S., Deng, F., & Tsai, C.-C. (2020). A review of technological pedagogical content knowledge (TPACK) in science education (2010–2019): Levels, uses, and limitations. International Journal of Science Education, 42(7), 1107–1133. https://doi.org/10.1080/09500693.2020.1731712

Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2011). Exploring the factor structure of the constructs of technological, pedagogical, content knowledge (TPACK). The Asia-Pacific Education Researcher, 20(3), 595–603. https://repository.nie.edu.sg/server/api/core/bitstreams/7577ba8c-917c-4a7b-b22d-4869fd7e7b95/content

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Department of Education. (2017). DepEd Order No. 42, s. 2017: National adoption and implementation of the Philippine Professional Standards for Teachers (PPST). Department of Education, Philippines.

Elvianasti, M., Rahmadani, M., Meitiyani, & Sari, P. M. (2023). Technological pedagogical content knowledge (TPACK) prospective biology teachers in distance learning. Studies in Learning and Teaching, 4(2), 240–249. https://doi.org/10.46627/silet.v4i2.191

Garrison, B. R. (2023). Investigating the relationship between K–12 online special education teachers' TPACK and teacher level variables: A convergent design mixed-methods study [Doctoral dissertation, Boise State University]. Boise State University Theses and Dissertations. https://doi.org/10.18122/td.2104.boisestate

Justol, D. D. P., & Potane, J. D. (2024). Demographics and technology integration in teaching English on the relationship between teachers' technology self-efficacy and performance. American Journal of Educational Research, 12(3), 99–108. https://doi.org/10.12691/education-12-3-4

Kholid, M. N., Hendriyanto, A., Sahara, S., Muhaimin, L. H., Juandi, D., Sujadi, I., Kuncoro, K. S., & Adnan, M. (2023). A systematic literature review of technological, pedagogical and content knowledge (TPACK) in mathematics education: Future challenges for educational practice and research. Cogent Education, 10(2), Article 2269047. https://doi.org/10.1080/2331186X.2023.2269047

König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). Adapting to online teaching during COVID-19 school closure: Teacher education and teacher competence effects among early career teachers in Germany. European Journal of Teacher Education, 43(4), 608–622. https://doi.org/10.1080/02619768.2020.1809650

Mafa, R. K., & Govender, D. W. (2025). Exploring teachers' technology adoption: Linking TPACK knowledge and UTAUT-3 constructs. Discover Education, 4, Article 88. https://doi.org/10.1007/s44217-025-00480-z

Manigbas, J. P., III, Ollet, A. L., Noble, M. P. L., Angeles, J. R., Cayetano, N. M., & Fucio, M. P. (2024). Teachers' competency in content knowledge and pedagogy in Buhi South District, Philippines. International Education Trend Issues, 2(1), 21–30. https://doi.org/10.56442/ieti.v2i1.365

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054.

Relator, J. L. (2022). Technological pedagogical and content knowledge (TPACK) of teachers in relation to the context and their teaching performance, Loon, Bohol. ACADEME University of Bohol, Graduate School and Professional Studies, 20(1), 13–38. https://doi.org/10.15631/aubgsps.v20i1.177

Santos, J. M., & Castro, R. D. R. (2021). Technological pedagogical content knowledge (TPACK) in action: Application of learning in the classroom by pre-service teachers (PST). Social Sciences & Humanities Open, 3(1), Article 100110. https://doi.org/10.1016/j.ssaho.2021.100110

Scherer, R., Siddiq, F., Howard, S. K., & Tondeur, J. (2023). The more experienced, the better prepared? New evidence on the relation between teachers' experience and their readiness for online teaching and learning. Computers in Human Behavior, 139, Article 107530. https://doi.org/10.1016/j.chb.2022.107530

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. Journal of Research on Technology in Education, 42(2), 123–149. https://files.eric.ed.gov/fulltext/EJ868626.pdf

Shambare, B., & Simuja, C. (2024). Mapping TPACK competency among life sciences teachers in rural and marginalised secondary schools: A descriptive analysis. International Journal of Technology in Education and Science, 8(4), 522–541. https://doi.org/10.46328/ijtes.573

Stephens-Himonides, C., & Young, M. (2025). Adding to the knowledge of the TPACK framework: A case study of female identity in performance, education, and technology. Frontiers in Education, 10, Article 1522739. https://doi.org/10.3389/feduc.2025.1522739

Valtonen, T., Sointu, E., Kukkonen, J., Kontkanen, S., Lambert, M. C., & Mäkitalo-Siegl, K. (2020). TPACK updated to measure pre-service teachers' twenty-first century skills. Australasian Journal of Educational Technology, 36(3), 1–16. https://doi.org/10.14742/ajet.5619

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. Management Science, 46(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Wu, S. H., Jong, M. S. Y., & Tsai, C.-C. (2025). The impact of teachers' TK and TPACK in their composed SVVR on students' active learning and learning engagement: A multilevel structural equation modeling analysis. Journal of Research on Technology in Education. https://doi.org/10.1080/15391523.2025.2529200