The International Review of Multidisciplinary Research
Volume 1, Issue 9, July 2026, pp. 515-520
https://doi.org/10.67167/vertex.661

# Technological Pedagogical Content Knowledge of Public School Teachers: Bases for Learning and Development Plan

**[1]Arlene T. Dela Cruz, [2]Wilhelmina C. Bullecer**
[1]Department of Education, [1 2] Nueva Vizcaya State University
[1]arlene.tambag001@deped.gov.ph

**Article Details:**

Received: 10 July 2026
Revised: 15 July 2026
Accepted: 22 July 2026
Published: 31 July 2026
Corresponding Email:
arlene.tambag001@deped.gov.ph

**Recommended Citation:**

Dela Cruz, A. T., Bullecer, W. C. (2026). Technological Pedagogical Content Knowledge of Public School Teachers: Bases for Learning and Development Plan. The International Review of Multidisciplinary Research. 1 (9), 515-520. https://doi.org/10.67167/vertex.661

**Index Terms:**

content knowledge, learning and development plan, pedagogical knowledge, technological knowledge

**Abstract.** The study assessed the Technological Pedagogical Content Knowledge of Public School Teachers: Bases for the Development of Learning and Development Plan, school year 2025-2026. Quantitative research design and correlational procedures were used to look at any meaningful connections using questionnaires. Total enumeration was used because it ensures that the respondents were relevant and can provide accurate data aligned with the objectives of the study. The study found that respondents' level of TPACK has an over-all mean of 4.03 with SD of 0.461, qualitatively described as competent which indicates a strong basis for technology integration skills. The over-all mean comprises the following domains: Content Knowledge has a mean of 4.53 with SD of 0.488 which is described as highly competent and it demonstrates excellent subject mastery; Pedagogical Knowledge has a mean 4.24 with SD of 0.546 which is described as competent and it exhibits reliable teaching strategies that can be adjusted to suit diversity of learners; and Technological Knowledge has a mean of 3.32 with SD of 0.969, described as moderately competent and it suggests that targeted training is necessary to improve the TK of teachers. TK-PK and TK-CK showed a weak, non-significant positive correlation ($\rho = 0.108$, $p = 0.502$) and ($\rho = 0.021$, $p = 0.895$) respectively. Therefore, their null hypothesis was rejected. There is no significant relationship between TK-PK and TK-CK. CK-PK demonstrated a positive and statistically significant correlation. So, null hypothesis was accepted. There is a significant relationship between PK-CK. Since the study found that the level of respondents' TPACK is competent; and PK-CK are statistically correlated, a L&D Plan entitled: Seminar-Workshop on Enhancing Teachers' Technological Competence for Effective and Innovative Teaching is hereby proposed to assist educators in purposefully integrating technology, pedagogy, and subject matter such that technology use promotes deeper learning rather than merely gadget use.

## Introduction

At present, Filipino educators face issues in acquiring the technological skills necessary to successfully use ICT into their lessons. With rural educators frequently lacking access to devices, the internet, and continual professional development, there are significant gaps in training in digital learning resource creation, online classroom management, student digital competency assessment, and troubleshooting tools. As highlighted in DepEd initiatives and UNESCO recommendations, many teachers report having high self-assessed 21st-century digital skills, such as communication and collaboration. However, studies reveal deficiencies in advanced Technological Pedagogical Content Knowledge (TPACK), confidence in ethical tech use, and adapting tools for diverse learners. For students to be globally competitive and to develop higher-order thinking skills, it is essential to address these through focused seminars; ICT coordinator, Master Teachers, School Head assistance; and giving tech literacy top priority in professional planning.

The function and skills needed by teachers in the twenty-first century have changed due to the quick adoption of digital technologies in the classroom. The idea of TPACK, which describes teachers' capacity to successfully combine technology and instructional strategies in their particular subject areas, is fundamental to this shift.

A sophisticated paradigm that emphasizes the dynamic interaction of content, pedagogy, and technology in real classroom practice is called TPACK (Petko et al., 2025). Educators who possess a solid understanding of pedagogy and technology are better able to create engaging lessons, encourage student participation, and adjust to changing learning environments. It is becoming more widely acknowledged that teacher proficiency in this area is essential to improving student learning outcomes and the quality of education in digital and mixed learning environments. In order to guarantee long-term educational progress, it is crucial to evaluate and enhance teachers' TPACK as schools continue to adopt educational technology.

The increasing use of technology in education has caused a paradigm shift in pedagogical techniques, necessitating a greater understanding of how educators could employ technology to enhance learning. Mishra and Koehler (2006) which is cited by Siloterio and Cajandig (2025) developed the TPACK framework, as a crucial lens for examining the complex relationships of technology, pedagogy, and topic knowledge in instruction. This idea holds that in order to successfully integrate technology, teachers need to be tech-savvy and able to integrate it into their subject-matter knowledge and teaching strategies.

The intricate confluence of these three is represented by TPACK, which explains how educators can choose and use technology to enhance pedagogy and significantly enhance the delivery of content. In order to design successful courses that are suited to the needs of the students, it is necessary to understand not only how to use technology but also how it interacts with pedagogy and content. Crucially, TPACK highlights how adaptable and context-sensitive technology instruction is, necessitating that teachers modify their methods according to the subject matter, learner characteristics, and technical tools at their disposal. It is seen as essential for contemporary teachers navigating classrooms with digital enhancements (McLeod, 2025).

With academics investigating its various aspects and implications for teacher education and professional development, the debate surrounding TPACK has grown in popularity globally. A growing body of research highlights the challenges teachers face while developing and implementing TPACK, including limited technological access, a lack of training opportunities, and the ever-changing nature of digital technologies. Furthermore, cross-cultural research has shown how cultural contexts influence the creation and use of TPACK, emphasizing the need for technological integration strategies that are sensitive to cultural differences. After recognizing the significance of incorporating technology into the classroom, the Department of Education (DepEd) started initiatives like the Digital RISE Program to equip educators and learners with digital literacy skills. However, systemic problems persist, including the need for continuous professional development to enhance teachers' TPACK and unequal access to technology (DepEd, 2022).

In the Department of Education (2024), the Expanded Career Progression (ECP) System for public school teachers in the Philippines, established via Executive Order No. 174 s. 2022, defines clear career stages aligned with the Philippine Professional Standards for Teachers (PPST). It features two tracks - Classroom Teaching (CT) and School Administration (SA) - with merit-based advancement emphasizing performance, qualifications, and competencies rather than vacancies alone. ECP organizes progression into four PPST-aligned stages: Beginning (Teacher I–III), Proficient (Teacher IV–VII), Highly Proficient (Master Teacher I–II), and Distinguished (Master Teacher III–V).

Based from the consolidated development needs of the teachers in Bone North Integrated School, 85% of them lack Technological Pedagogical Content Knowledge. There is really a need to improve these areas in order for them to advance in their careers based on merit, qualifications, and performance. Further, these are most of the remarks of the teachers in the school, “Kasano ngay nagrigat met ti bumaket itattan puro computerize metten amin”; “Agretire-ak sa metten saanko met masursurutanen lalo ket nagrigat internet”; and “Hanak met makasursuruten kasano ngay nga ialign ti technology idyay diverse learning styles ti ubbing itatta, ayna sabali ugali ubing itattan.”

These factors inspired the researcher to carry out this investigation, which can enhance the teachers’ TPACK, identify gaps relative to PPST and ECP requirements particularly on ICT integration, and develop a TPACK-aligned L&D Plan responsive to DepEd’s policy mandates and research agenda. Through the findings of this study, it is also expected to inform relevant stakeholders, including school administrators and education policymakers, designing targeted L& D plan that address the identified gaps in teachers’ TPACK competencies.

*Research Question*

1. What is the level of the respondents’ TPACK in terms of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK)?
2. Are there significant correlations between and among the respondents’ TK, PK, and CK?
3.Based on the significant findings of the study, what learning and development plan could be proposed to improve the TPACK of the respondents?

*Assumptivns of the Study*

This study aimed to measure the Technological Pedagogical Content Knowledge of teachers in Bone North Integrated School for school year 2025-2026 to measure the level of teachers' TPACK in terms of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK); to assess if there are significant correlations between and among the respondents' TK, PK, and CK; and to develop Learning and Development plan to improve the TPACK of the respondents.

## Methodology

A quantitative research design, which uses computer, statistical, or mathematical approaches to systematically examine observable events, was used in this study. It is any numerical information, such as statistics and percentages.

Quantitative research is a methodical investigation that quantifies relationships, behaviors, and occurrences using statistical, mathematical, or computational techniques. It involves collecting numerical data that may be transformed into meaningful statistics in order to test ideas, identify patterns, or make predictions. Quantitative research places a high priority on objective measurement, systematic data collection (including surveys and experiments), statistical analysis, generalizability of outcomes, and hypothesis testing (Lim, 2025).

This study's descriptive and inferential questions demonstrate the quantitative nature of the inquiry. Teachers' TPACK were defined in this study, and correlational procedures were used to look at any meaningful connections between them. Questionnaires were used as the tool in this study to evaluate the teachers' ability using the descriptive and correlational research methods. The descriptive technique of research is generally acknowledged to be a fact-finding study that entails appropriate and accurate interpretation of data. This method's objective is to give the researcher a profile of the phenomena or to outline its pertinent features from an organizational, individual, or other point of view. The correlational method, on the other hand, looks at the relationship between two or more variables, according to Heppner (2018). Numerous research that aims to ascertain and evaluate consistency and predictions among variables employ it. Since this study aimed to evaluate the teachers' technology pedagogical content knowledge and correlational approaches are comparatively acceptable.

## Results and Discussion

These are the results of the study:

*Section 1. level of the respondents' Technological Pedagogical Content Knowledge (TPACK) in terms of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK)*

| Domain | Mean | SD | QD |
|---|---|---|---|
| Technological Knowledge | 3.32 | 0.969 | Moderately Competent |
| Pedagogical Knowledge | 4.24 | 0.546 | Competent |
| Content Knowledge | 4.53 | 0.488 | Highly Competent |
| **Overall Mean** | **4.03** | **0.461** | **Competent** |

*Table 2. Level of the Respondents' TPACK*

The findings implies that the respondents' level of TPACK has qualitatively description as competent. This indicates a strong basis for incorporating technology into instruction. The comptent TPACK levels were noted in a 2025 study on science teachers in the Philippines, indicating exceptional technological integration abilities that match this competency grade. Another 2026 analysis of pre-service teachers found sufficient TPACK across domains, suggesting that targeted training is necessary to raise baseline capability (EPRa International Journal of Multidisciplinary Research, 2025).

This further means that at Bone North Integrated School teachers exhibit great overall teaching competency especially in Content Knowledge indicating that they have a thorough understanding of the subject matter necessary to provide correct lessons. They have strong pedagogical knowledge demonstrating a thorough understanding of broad teaching techniques and concepts. Technology Knowledge, on the other hand, shows a significant deficiency with more variability, suggesting inconsistent skills in integrating digital technologies amid contemporary educational needs like TPACK frameworks. In order to improve instructional effectiveness, equality in student involvement, and alignment with DepEd's digital transformation goals, it is necessary to provide focused professional development in EdTech training. This will eventually improve teaching quality without undermining key strengths. The study of Sarmiento and Catulay (2025) conducted in the Philippines that assessed teachers' TPACK in connection to MATATAG curricular preparedness during the new normal,

corroborate the findings. A strong positive correlation was found between TPACK competency and curriculum implementation readiness, reflecting practical competence despite moderate gaps in advanced tech integration.

*Section 2. Significant relationship between and among the respondents' TK, PK, and CK*

| Domain | *rho* | p-value | Remark |
|---|---|---|---|
| Technological Knowledge (TK) and Pedagogical Knowledge (PK) | 0.108 | 0.502 | Not Significant |
| Technological Knowledge (TK) and Content Knowledge (CK) | 0.021 | 0.895 | Not Significant |
| Pedagogical Knowledge (PK) and Content Knowledge (CK) | 0.730 | <0.001 | Significant |

*Table 3. Correlations on the Domains of Technological Pedagogical Content Knowledge (TPACK)*

Based from the result in Table 3, TK and PK show a weak, non-significant positive correlation ($\rho = 0.108$, $p = 0.502$). Therefore, the null hypothesis is accepted. There is no significant relationship between TK and PK. The same with the result between TK and CK. It also showed a negligible, non-significant relationship ($\rho = 0.021$, $p = 0.895$). Therefore, the null hypothesis is accepted. There is no significant relationship between TK and CK.

Further, PK and CK demonstrate a strong, positive, and statistically significant correlation ($\rho = 0.730$, $p < 0.001$). A correlation of $\rho=0.730$ with $p<0.001$ indicates a strong, positive, and statistically significant relationship between PK and CK: as one increases, the other tends to increase as well, and this pattern is very unlikely to be due to chance alone. Higher PK scores are regularly linked to higher CK levels, as seen by the number $\rho=0.730$, which indicates a significant positive relationship. The strongest and most salient finding is the strong significant relationship between pedagogical and content knowledge.

The finding implies that the Pedagogical Knowledge has direct bearing to the respondents' Content Knowledge. Hence, the null hypothesis is rejected. It further implies that because pedagogical knowledge influences how teachers interpret, arrange, and present subject-matter concepts in ways that make them relevant and approachable for students, it directly affects the respondents' Content Knowledge. Strong pedagogical expertise enables teachers to recognize students' misunderstandings, choose relevant examples and representations, and modify explanations based on learners' prior knowledge—all of which enhance and improve their own understanding of the subject. To put it another way, teachers must continually reflect on and reorganize their topic knowledge as part of the teaching process, which includes preparing, asking questions, and reacting to students. This strengthens the relationship between what they know and how they teach it.

According to recent research in teacher education, content-related knowledge domains are typically positively and significantly correlated. Stronger disciplinary comprehension, for instance, facilitates richer pedagogical decision making, according to Li and Copur-Gencturk (2024), highlighting a close alignment between knowing the material and knowing how to teach it. Similarly, Güler and Çelik (2018) discovered that pre-service math teachers' pedagogical content knowledge is greatly aided by a strong content foundation, indicating that greater CK is frequently associated with more advanced pedagogical competence.

*Section 3. Learning and Development Plan may be proposed to improve the TPACK of the respondents*

Since the study found that among the three domains of the TPACK, the level of Technological Knowledge of the respondents is found to be moderately competent; and Pedagogical Knowledge and Content Knowledge are significantly related, a learning and development plan entitled Seminar-Workshop on Enhancing Teachers' Technological Competence for Effective and Innovative Teaching is hereby proposed.

The goal of the Seminar-Workshop is to assist educators in purposefully integrating technology, pedagogy, and subject matter such that technology use promotes deeper learning rather than merely gadget use.

## Conclusion and Recommendations

The results of the study led to the following conclusions:

1. Strong subject-matter knowledge and general teaching abilities are displayed by teachers, providing a strong basis for successful instruction. There is still a significant gap in technological integration, indicating the need for focused professional development to improve digital pedagogy in the classroom and raise TPACK expertise.
2. In conclusion, while Pedagogical Knowledge and Content Knowledge have weak, non-significant relationships with Technological Knowledge, PK and CK have a strong, significant correlation that emphasizes their essential interdependence in successful teaching methods. This implies that PK-CK synergy strengthening should take precedence over solitary TK enhancement in focused professional growth.
3. The study's confirmation of teachers' proficient TPACK levels and the importance of Pedagogical and Content Knowledge highlight the necessity of focused professional development. In order to ensure that technology improves meaningful learning and promotes student-centered outcomes in the classroom, the Seminar-Workshop on Enhancing Teachers' Technological Competence for Effective and Innovative Teaching provides a workable solution to improve teaching techniques.

- To address the identified gaps in technological integration and TPACK while building on teachers' strengths in subject knowledge and general pedagogy, the School Head with the help of Master Teachers and ICT experts may conduct a SLAC on enhancing teachers technological integration skills emphasizing basic technological tools suitable for the subject area taught and understanding error messages and how to respond.
- It is suggested that school may provide realistic integration with current curricula top priority; pair tech-savvy teachers with others in Learning Action Cells (LACs) for classroom demonstrations, fostering collaborative skill-sharing aligned with DepEd's professional development standards; and use simple pre/post surveys and classroom observations to track TPACK growth, linking results to performance evaluations for motivation.
- t is recommended that schools may prioritize professional development programs that integrate Pedagogical Knowledge and Content Knowledge, such as collaborative lesson design workshops or Learning Action Cells. These build on their proven synergy, fostering effective teaching without overemphasizing standalone technological knowledge (TK) training. For Philippine educators, align this with DepEd's PPST Domain 1 (Content Knowledge and Pedagogy) through School Learning Action Cells.
- It is suggested that the Seminar-Workshop on Integrating Technology in Teaching may be implemented during the School-based INSET in order to improve the respondents' level of TPACK. Local studies on TPACK in the Philippines recommend focused in-service training to boost teachers' technological confidence and enhance their ability to create technology-rich lessons for the Enhanced K to 12 curricula, which the proposed Seminar-Workshop on TPACK aims to deliver through practical, curriculum-aligned guidance on integrating technology, pedagogy, and content in lesson planning, teaching, and assessment, fulfilling DepEd's mandate for improved ICT skills.
- Future researchers may build on studies assessing TPACK levels among public school teachers by exploring intervention effectiveness and contextual factors in Philippine settings like DepEd and the Enhanced K to 12 curriculum. The future researchers may also conduct quantitative-qualitative design and/or documentary analysis particularly on PMES or PPST. Further, they may conduct study on the research gaps emanating from this present study particularly issues on the design expertise and managing real-time technical issues like troubleshooting or adjusting to infrastructure restrictions in resource-constrained contexts are examples of recurrent shortcomings in advanced technology integration. Effective TPACK implementation is further hampered by problems like insufficient professional development programs, language and cultural barriers in various contexts (such as multilingual or non-formal education), restricted access to discipline-specific digital resources, and low student technological literacy, especially in Philippine public schools as reference for future research.

## Acknowledgement

The authors would like to thank the colleagues from Bone North Integrated School-Aritao I District and the Nueva Vizcaya State University-Bambang Campus who provided guidance, feedback, and support throughout the conduct of this research and the preparation of this manuscript. Any remaining errors or omissions are the sole responsibility of the authors.

## Funding

This research received no external funding from any public, commercial, or not-for-profit funding agency, and no organization provided financial support for the conduct of the study, authorship, or publication of this article.

## Competing Interests Statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

## Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study; all data used were obtained from previously published sources as cited in the reference list.

## References

Department of Education. (2024). Implementing rules and regulations of Executive Order No. 174, s. 2022, re: "Establishing the Expanded Career Progression System for Public School Teachers" [PDF]. https://www.deped.gov.ph/wp-content/uploads/IRR-OF-EO-NO.-174-S.-2022.pdf

EPRa International Journal of Multidisciplinary Research. (2025). Technological pedagogical content knowledge (TPACK) and science teachers' perceptions. https://epratrustpublishing.com/IJMR/2025/March/technological-pedagogical-content-knowledge-tpack-and-science-teachers-perceptio

Güler, M. & Çelik, D. (2018). The relationship between pre-service elementary mathematics teachers' content knowledge and pedagogical content knowledge in algebra. *International Journal of Science and Mathematics Education,* 16(2), 377–396.

Li, Y., & Copur-Gencturk, Y. (2024). Teachers' pedagogical content knowledge in mathematics: Conceptualizations and empirical advances. In M. Star (Ed.), *Research on mathematics teacher knowledge.* Springer.

Lim, W. M. (2025). What is quantitative research? An overview and guidelines. *Australasian Marketing Journal*, 33(3). https://doi.org/10.1177/14413582241264622

McLeod, S. (2025). Vygotsky's sociocultural theory of cognitive development. Simply Psychology. https://www.simplypsychology.org/vygotsky.html

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

Petko, D., Mishra, P., & Koehler, M. J. (2025). TPACK in context: An updated model. Computers and Education Open, 8, Article 100244.

Sarmiento, P. J. D., & Catulay, G. A. (2025). Teachers' technological pedagogical content knowledge (TPACK) and readiness for MATATAG curriculum implementation in the new normal. *International Journal of Research and Innovation in Social Science,* 9(5), 123-135. https://rsisinternational.org/journals/ijriss/articles/teachers-technological-pedagogical-content-knowledge-tpack-and-readiness

Siloterio, K. T., & Cajandig, A. J. S. (2025). Teachers' technological pedagogical content knowledge (TPACK) and readiness for implementing the MATATAG curriculum: Context for developing TPACK-based intervention framework. *International Journal of Research and Innovation in Social Science,* 9(5), 1896–1910. https://dx.doi.org/10.47772/IJRISS.2025.90400143

## Appendices

Appendix A- Communications
Appendix B-Statistical certification
Appendix C-Editing Certification
Appendix D-Plagiarism Clearance