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Technological Pedagogical Content Knowledge (TPACK) and Teaching Readiness of Pre-service Teachers

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Abstract. Although Technological Pedagogical Content Knowledge (TPACK) is widely recognized as an important component of teacher preparation, limited localized evidence explains how TPACK is associated with the teaching readiness of pre-service teachers, particularly within Bachelor of Elementary Education programs. This study determined the level of TPACK and teaching readiness and examined the relationship between these two constructs among 233 Bachelor of Elementary Education pre-service teachers at Don Carlos Polytechnic College during School Year 2025–2026. A quantitative descriptive-correlational research design was employed, using a validated researcher-made questionnaire to gather the data. Weighted mean was used to determine the levels of TPACK and teaching readiness, while the Pearson Product-Moment Correlation Coefficient was used to examine their relationship. The findings revealed that the respondents demonstrated a high level of TPACK with an overall mean of 4.22, with Integration of Technology in Teaching obtaining the highest mean among the TPACK dimensions. The respondents also demonstrated a high level of teaching readiness, with an overall mean of 4.29, with Lesson Planning and Instructional Delivery obtaining the highest mean among the identified dimensions. Furthermore, the analysis revealed a very strong, positive, and statistically significant relationship between TPACK and teaching readiness (r = .820, p < .001). This indicates that higher levels of TPACK were associated with higher levels of teaching readiness among the respondents. The findings suggest that TPACK constitutes an important dimension of pre-service teacher preparation, particularly in developing technological competence alongside pedagogical and content knowledge. The study contributes localized evidence on the relationship between TPACK and teaching readiness and provides a basis for teacher education institutions to strengthen technology-integrated coursework, practice-based learning, and professional development initiatives that prepare future teachers for technology-enriched and diverse classroom environments.

***Keywords*:** Descriptive-Correlational Design; Pre-Service Teachers; Teaching Readiness; Technology Integration; TPACK

Introduction

Technology had become increasingly embedded in education, transforming lesson planning, instructional delivery, classroom management, assessment, and responses to diverse learner needs. Consequently, effective teaching required not only subject and pedagogical knowledge but also the ability to select and integrate technology appropriately. This was particularly important in teacher education, where pre-service teachers needed to translate theoretical preparation into effective classroom practice.

Technological Pedagogical Content Knowledge (TPACK) provided an integrative framework for understanding technology-supported teaching. It emphasized the interaction of technological, pedagogical, and content knowledge rather than technological proficiency alone. Recent studies showed that TPACK developed more effectively through authentic and collaborative learning experiences. Chen et al. (2026) found that collaborative lesson planning supported the integration of technology with pedagogical and content considerations, while Antonio and Prudente (2026) demonstrated the value of structured technology-integrated learning experiences in developing TPACK and instructional confidence.

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Recent research also linked TPACK with teachers' readiness to use emerging technologies. Studies on AI integration indicated that technological, pedagogical, content, and ethical knowledge, together with self-efficacy and interest, influenced pre-service teachers' readiness to use technology effectively. Öztürk, Mihci Türker, and Kerse (2024) further found a significant relationship between TPACK and blended teaching readiness, suggesting that stronger technology-related knowledge was associated with greater preparedness for technology-supported instruction.

However, teaching readiness was broader than technological readiness. It encompassed the ability to plan and deliver instruction, manage classrooms, assess learning, and adapt to diverse learning environments. Thus, possessing TPACK did not necessarily indicate overall readiness to perform classroom responsibilities. Philippine studies likewise demonstrated the relevance of TPACK to teacher preparation. Aziez et al. (2025) reported improvements in TPACK, technology-use confidence, and attitudes following technology-integration training, while Soncio, Bairoy, and Repollo (2024) examined TPACK in relation to 21st-century teaching skills among Philippine pre-service teachers. Nevertheless, existing studies commonly focused on specific programs, technologies, or forms of readiness, such as online or blended teaching.

This gap was particularly relevant to BEED pre-service teachers, who were prepared to teach across multiple subject areas and respond to learners with diverse developmental and educational needs. Accordingly, there was a need for context-specific evidence examining whether TPACK was associated with broader teaching readiness among BEED pre-service teachers in a local Philippine setting.

Therefore, the study determined the levels of TPACK and teaching readiness among BEED pre-service teachers at Don Carlos Polytechnic College during the second semester of Academic Year 2025–2026. TPACK was examined in terms of Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Integration of Technology in Teaching, while teaching readiness was assessed through Lesson Planning and Instructional Delivery, Classroom Management, Assessment and Evaluation, and Adaptability to Diverse Learning Environments. The study also determined whether a significant relationship existed between the two constructs.

Research Questions

The primary purpose of the study was to determine the relationship between Technological Pedagogical Content Knowledge (TPACK) and teaching readiness among pre-service teachers.
Specifically, the study aimed to address the following questions;

1. What is the level of technological pedagogical content knowledge of BEED students in terms of the following:
   1.1 Technological Knowledge,
   1.2 Pedagogical Knowledge,
   1.3 Content Knowledge, and
   1.4 Integration of Technology in Teaching
2. What is the level of teaching readiness of pre-service teachers in terms of:
   2.1 Lesson Planning and Instructional Delivery
   2.2 Classroom Management
   2.3 Assessment and Evaluation
   2.4 Adaptability to Diverse Learning Environments
3. Is there a significant relationship between TPACK and teaching readiness of pre-service teachers?

Scope and Delimitation of the Study

The study was limited to 233 BEED pre-service teachers from Don Carlos Polytechnic College, selected through simple random sampling using a sample size determined by Slovin's formula. As the respondents were drawn exclusively from the BEED program, the findings primarily reflected this specific population and institutional context and therefore could not be generalized to all students of Don Carlos Polytechnic College or to pre-service teachers from other institutions without further evidence. The study also relied on self-reported data obtained through a structured questionnaire. Although the instrument underwent content validation and reliability testing, responses may have been influenced by participants' perceptions, confidence, or social desirability. Thus, the findings represented the respondents' perceived TPACK and teaching readiness rather than their objectively observed classroom performance. These limitations suggest the need for future studies involving larger and more diverse samples, other teacher education programs and institutions, and multiple data sources such as classroom observations, teaching demonstrations, interviews, and performance-based assessments. Such approaches may provide a more comprehensive assessment of TPACK and its relationship with actual teaching readiness.

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Literature Review

Technological Pedagogical Content Knowledge (TPACK)

Ersanli and Yangin (2016), Canbazoglu Bilici et al. (2016), and Su (2022) found that teacher education and targeted interventions improved pre-service teachers' confidence and competence in integrating technology with pedagogy and content. McKnight et al. (2016), Ritzhaupt et al. (2016), and Padmavathi (2017) likewise emphasized that technological competence supports effective technology integration, although familiarity with digital tools does not necessarily translate into deeper skills in evaluating, adapting, and troubleshooting technology. Overall, previous studies consistently showed that TPACK develops through technological competence combined with pedagogical and content knowledge. However, less is known about how these competencies relate to the broader teaching readiness of BEED pre-service teachers in a local Philippine context. The present study addressed this gap by examining TPACK alongside multidimensional teaching readiness among BEED pre-service teachers at Don Carlos Polytechnic College.

Technological Knowledge (TK)

Ersanli and Yangin (2016), Canbazoglu Bilici et al. (2016), and Su (2022) reported that teacher education experiences improved teachers' confidence and competence in using technology for instruction. McKnight et al. (2016), Ritzhaupt et al. (2016), and Padmavathi (2017) further established that technological familiarity supports technology-supported teaching, although some teachers may have limited skills in troubleshooting, evaluating, and adapting digital tools. These studies consistently demonstrated that TK provides an important foundation for technology integration, but they also showed that technological familiarity alone may be insufficient for effective classroom application. The extent to which TK is associated with broader teaching readiness among BEED pre-service teachers remained less examined. The present study addressed this gap by assessing TK and its relationship with teaching readiness in the local teacher education context.

Pedagogical Knowledge (PK)

Absolor (2023) found that pre-service teachers demonstrated acceptable knowledge of teaching approaches and classroom management but showed gaps in curriculum-related knowledge. Milewski (2020) emphasized that PK encompasses teaching methods, learner development, psychology, and learning processes, while Disonglo and Limpot (2023) reported high pedagogical knowledge and digital literacy among Filipino teachers. Hollenstein (2024) further demonstrated that pedagogical-psychological knowledge influences perceptions of instructional quality, while Herda et al. (2025) showed that pedagogical beliefs and practices vary across contexts. Overall, previous studies consistently indicated that PK is central to effective teaching but may develop unevenly across pedagogical domains and contexts. However, its relationship with the broader teaching readiness of BEED pre-service teachers remained insufficiently established. The present study addressed this gap by examining PK as a component of TPACK and relating it to teaching readiness.

Content Knowledge (CK)

Muñoz and Ramirez (2018) found that teachers' subject knowledge influenced their selection of instructional materials and strategies, while Ofodu and Jimola (2024) reported that mastery of subject matter predicted students' achievement and attitudes. Anderson et al. (2016) likewise showed that content knowledge influenced teachers' ability to recognize learning opportunities. In the Philippine context, Merino (2025) and Almojano (2025) emphasized that strong content knowledge must be effectively integrated with pedagogy, technology, and contextual considerations. These studies consistently established that CK is essential for accurate content delivery and sound instructional decision-making. However, content knowledge alone does not explain whether pre-service teachers are prepared to perform broader classroom responsibilities, and evidence on its relationship with teaching readiness remained limited. The present study addressed this gap by examining CK as part of TPACK and determining its association with teaching readiness among BEED pre-service teachers.

Integration of Technology in Teaching

Cabalbag (2025) found that effective ICT integration improved student engagement and academic performance, while Carcosia et al. (2025) reported associations between technology use and students' cognitive, emotional, and social engagement. Turbanada et al. (2025) likewise found high levels of technology integration influenced by access to digital resources and professional training. However, Yani et al. (2026) and Wulandari et al. (2025) noted that gaps in digital competence and technological infrastructure can constrain effective integration. Previous studies consistently showed that meaningful technology integration can support learning and engagement but depends on teacher competence, training, and contextual support. However,

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limited evidence has examined whether technology integration is associated with the broader teaching readiness of BEED pre-service teachers. The present study addressed this gap by examining integration of technology in teaching as a TPACK dimension and relating it to teaching readiness.

Teaching Readiness

Heretape (2023) found that BEED students generally demonstrated high readiness for practice teaching, particularly in lesson planning and classroom management, although some competencies required improvement. Çemçem et al. (2024) emphasized that readiness includes confidence, attitudes, and technical skills, while Entrampas et al. (2024) found that pre-service teachers could demonstrate teaching confidence despite gaps in inclusive practices. Girgin and Akcanca (2022) similarly reported moderate readiness, particularly in classroom management and selecting strategies for diverse learners. De Guia and Solomon (2024) highlighted adaptability and ICT readiness as important for responding to online teaching demands. Overall, previous studies showed that teaching readiness is multidimensional and may vary across specific competencies and contexts. However, the relationship between teaching readiness and TPACK among BEED pre-service teachers remained insufficiently examined. The present study addressed this gap by examining teaching readiness alongside four TPACK dimensions.

Lesson Planning and Instructional Delivery

Sanchez (2024), Ponce (2024), and Sanchez et al. (2024) identified challenges in developing SMART objectives, aligning activities with learning outcomes, and designing contextually appropriate lessons, often due to limited practical exposure and feedback. Nazareno and Montañez (2025) reported high competence in planning and instruction but noted that digital limitations and workload could hinder implementation. Padillo (2021) emphasized continuous professional development as important for strengthening instructional planning and delivery. These studies consistently indicated that lesson planning and instructional delivery depend on pedagogical preparation, practical experience, feedback, and professional development. However, the extent to which these competencies were associated with TPACK among BEED pre-service teachers remained unclear. The present study addressed this gap by examining lesson planning and instructional delivery as a dimension of teaching readiness in relation to TPACK.

Classroom Management

Jones and Jones (2021) and Egeberg et al. (2016) emphasized proactive strategies, clear expectations, structured routines, and systematic planning as essential to effective classroom management. In the Philippine context, Heretape (2024) reported that BEED students experienced challenges in classroom management during practice teaching, often because of inadequate preparation. Jayme and Tantiado (2025) and Angelista (2021) further demonstrated that structured planning, effective instructional strategies, and theory-based management approaches could improve learner behavior and engagement. The literature consistently showed that classroom management requires proactive preparation, practical experience, and appropriate instructional strategies. However, limited evidence has established whether TPACK contributes to pre-service teachers' readiness to manage actual classroom environments. The present study addressed this gap by examining classroom management as a distinct dimension of teaching readiness in relation to TPACK.

Assessment and Evaluation

Mohd Sheik and Manap (2024) found that teachers continued to rely heavily on traditional assessment approaches, potentially limiting opportunities for deeper learning and meaningful feedback. Tomlinson et al. (2022) demonstrated that formative assessment can improve learning when assessment evidence is used to adjust instruction and engage learners. Pan and Zhang (2022) and Cohen and Goldhaber (2016) identified challenges in teacher evaluation related to contextual conditions and the interpretation of evaluation results, while Areekkuzhiyil (2021) cautioned against excessive reliance on traditional tests. Previous studies consistently emphasized the importance of varied, formative, and instructionally responsive assessment practices, while also identifying challenges in their implementation. However, the relationship between TPACK and pre-service teachers' readiness to conduct effective assessment remained insufficiently explored. The present study addressed this gap by examining assessment and evaluation as a dimension of teaching readiness in relation to TPACK.

Adaptability to Diverse Learning Environments

El-Sabagh (2021) found that adaptive learning approaches improved engagement and achievement by adjusting instruction to learners' needs. Hardy et al. (2022) similarly showed that diagnostic strategies, scaffolding, and responsive support enhanced learning outcomes. Kankam (2025) emphasized the importance of adaptability in linguistically and culturally diverse classrooms, while Mokhampanyane (2024) identified

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gaps in teacher preparation and support for inclusive and differentiated instruction. Schipper et al. (2023) further demonstrated that collaborative professional development strengthened teachers' capacity to recognize learner diversity and adapt instruction. These studies consistently established that adaptability is essential for responding to diverse learner needs and requires appropriate preparation, support, and professional development. However, limited research has examined its relationship with TPACK among BEED pre-service teachers in a local Philippine context. The present study addressed this gap by examining adaptability to diverse learning environments as a dimension of teaching readiness and determining its relationship with TPACK.

Methodology

Research Design

The study employed a quantitative descriptive-correlational research design to determine the levels of Technological Pedagogical Content Knowledge (TPACK) and teaching readiness among BEED pre-service teachers and to examine the relationship between the two variables. The descriptive component determined the respondents' levels of TPACK in terms of Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Integration of Technology in Teaching, as well as their teaching readiness in terms of Lesson Planning and Instructional Delivery, Classroom Management, Assessment and Evaluation, and Adaptability to Diverse Learning Environments. The correlational component examined the strength and direction of the relationship between TPACK and teaching readiness using the Pearson product-moment correlation coefficient (Pearson's r). Statistical analyses were conducted using IBM SPSS Statistics. Prior to conducting Pearson's correlation analysis, the assumptions of linearity, normality, and absence of significant outliers were assessed to determine the appropriateness of the test. This design was appropriate because the study sought to describe existing conditions and determine statistical associations between variables without manipulating or establishing causal relationships.

Research Locale

The study was conducted at Don Carlos Polytechnic College (DCPC), a local government-run higher education institution located in Don Carlos, Bukidnon, Philippines. The institution offers several academic programs, including the Bachelor of Elementary Education (BEED) program under the College of Teacher Education. The locale was selected because it provided an appropriate context for examining the TPACK and teaching readiness of BEED pre-service teachers. The study was conducted within DCPC because there was limited localized empirical evidence concerning the relationship between technological-pedagogical-content competencies and teaching readiness among BEED pre-service teachers in the institution. Examining these variables within the local teacher education context provided institution-specific evidence that could inform the enhancement of technology-integrated instruction and practice-based teacher preparation.

Research Participants

The participants were 233 BEED pre-service teachers enrolled at Don Carlos Polytechnic College during the second semester of Academic Year 2025–2026. They were selected from the identified population through simple random sampling and were included based on the established criteria of the study. As BEED students undergoing professional teacher preparation, they were considered appropriate respondents for assessing perceived TPACK and teaching readiness. The participants provided data regarding their TPACK in terms of Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Integration of Technology in Teaching, as well as their teaching readiness in terms of Lesson Planning and Instructional Delivery, Classroom Management, Assessment and Evaluation, and Adaptability to Diverse Learning Environments. Participation was voluntary, and respondents were informed of the purpose and nature of the study before completing the questionnaire.

Research Instrument

The study utilized a researcher-made structured questionnaire developed based on the research objectives, research questions, operational definitions of the variables, and relevant literature. The instrument consisted of two major sections. The first section measured TPACK across four dimensions: Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Integration of Technology in Teaching. The second section measured teaching readiness across four dimensions: Lesson Planning and Instructional Delivery, Classroom Management, Assessment and Evaluation, and Adaptability to Diverse Learning Environments. The items were rated using a five-point Likert scale, where 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, and 1 = Strongly Disagree. Mean scores were interpreted using the following ranges: 4.21–5.00 (Strongly Agree), 3.41–4.20 (Agree), 2.61–3.40 (Neither Agree nor Disagree),

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1.81–2.60 (Disagree), and 1.00–1.80 (Strongly Disagree). Prior to administration, the researcher-made questionnaire underwent content validation by four experts in the field. The validators assessed the items based on their relevance, clarity, appropriateness, and alignment with the constructs and dimensions of the study. Their comments and recommendations were consolidated and used to revise, clarify, or remove items that required improvement before the questionnaire was pilot-tested. Following content validation and revision, the questionnaire was pilot-tested among 30 respondents who possessed characteristics similar to the target participants but were not included in the actual study. The pilot-test data were subjected to reliability analysis using Cronbach's alpha. The TPACK scale obtained a coefficient of α = .955, while the Teaching Readiness scale obtained α = .954, both indicating excellent internal consistency. These results demonstrated that the items within each scale consistently measured their respective constructs.

Data Gathering Procedure

Prior to data collection, the researchers secured permission from the Office of the Dean of the College of Teacher Education and other appropriate institutional authorities. After approval was obtained, the validated and reliability-tested questionnaire was converted into an electronic format using Google Forms. An informed consent statement was placed at the beginning of the online questionnaire. It explained the purpose of the study, the nature of participation, the procedures involved, the voluntary nature of participation, and the respondents' rights. Only respondents who agreed to participate proceeded to the questionnaire. The Google Form was distributed to the selected BEED pre-service teachers through appropriate communication channels, with the assistance of their field study advisers where necessary. Clear instructions were provided to ensure that respondents understood how to accomplish the instrument. Respondents were given sufficient time to complete the questionnaire, and appropriate reminders were provided during the data-collection period. After the data-gathering period, the responses were retrieved and screened for completeness. The completed responses were encoded, organized, and stored in a secure digital file accessible only to the researchers. The finalized dataset was then prepared for statistical analysis.

Results and Discussions

Research Question 1: What is the level of pre-service teachers TPACK in terms of technological knowledge, pedagogical knowledge, content knowledge and integration of technology in teaching?

Table 1. Level of Technological Pedagogical Content Knowledge (TPACK) among BEED Pre-service Teachers in Terms of Technological Knowledge

Statements	Mean	Verbal Description	Interpretation
1. I can use mobile devices effectively for learning tasks.	4.31	Agree	High
2. I can feel comfortable using technology in an academic setting.	4.30	Agree	High
3. I can use presentation tools effectively during lessons.	4.30	Agree	High
4. I can use the Internet responsibly for teaching and learning.	4.27	Agree	High
5. I am confident in using computers for academic purposes.	4.19	Agree	High
6. I keep myself updated on new digital tools for education.	4.18	Agree	High
7. I can manage digital files and learning resources efficiently.	4.14	Agree	High
8. I can learn to use new technologies easily.	4.14	Agree	High
9. I can independently solve common technical problems.	4.12	Agree	High
10. I can use online platforms for communication and collaboration.	4.03	Agree	High
11. I am familiar with different educational software and applications.	4.01	Agree	High
12. I can troubleshoot minor hardware or software issues.	3.92	Agree	High
Over-all Mean	**4.16**	**Agree**	**High**

Table 1 presents the level of Technological Knowledge (TK) among BEED pre-service teachers. The overall mean of 4.16, interpreted as High, indicates that respondents generally possessed strong technological competence for academic and prospective instructional purposes. The results suggest that their competence

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was strongest in using familiar and accessible digital technologies, while comparatively less developed in technical troubleshooting and specialized educational applications.

The relatively high ratings for mobile devices, presentation tools, and Internet resources suggest that respondents were comfortable using commonly encountered technologies for academic activities. However, their lower confidence in troubleshooting minor hardware or software problems indicates that functional technology use does not necessarily translate into technical problem-solving skills. Similarly, the comparatively lower ratings for educational software and online platforms suggest opportunities to strengthen their use of specialized technologies for teaching, assessment, communication, and collaboration.

Within the TPACK framework, TK represents an important foundation for technology integration but does not, by itself, guarantee effective technology-supported teaching. Pre-service teachers must also learn to select and apply technologies according to instructional objectives, content, pedagogy, and learner needs. Thus, the high TK demonstrated by the respondents reflects a favorable technological foundation rather than complete readiness for technology-integrated instruction.

The findings are consistent with Bautista et al. (2024), who emphasized the growing importance of technological competence in preparing pre-service teachers for technology-supported education. Similarly, Aziez et al. (2025) found that structured technology-integration training can strengthen TPACK competencies, confidence, and attitudes toward educational technology. These findings support the view that technological competence can be further developed through purposeful teacher preparation.

The results have practical implications for the BEED curriculum. Since respondents already demonstrated high technological knowledge, teacher preparation may focus beyond basic digital literacy toward troubleshooting, educational software, learning management systems, digital resource management, and purposeful technology integration in lesson planning and instruction. These competencies may be developed through microteaching, demonstration teaching, field-study activities, and supervised teaching experiences.

Overall, BEED pre-service teachers demonstrated a high level of Technological Knowledge, providing a strong foundation for technology-supported teaching. However, strengthening technical problem-solving, specialized educational technology use, and purposeful classroom application may help transform their functional digital competence into more meaningful and effective technology integration.

Table 2. Level of Technological Pedagogical Content Knowledge (TPACK) among BEED Pre-service Teachers in Terms of Pedagogical Knowledge

Statements	Mean	Verbal Description	Interpretation
1. I can address learners' misconceptions during instruction.	4.31	Agree	High
2. I am familiar with learner-centered teaching approaches.	4.29	Agree	High
3. I can implement cooperative learning strategies.	4.28	Agree	High
4. I can plan activities that promote critical thinking.	4.27	Agree	High
5. I can motivate learners to participate actively in class.	4.27	Agree	High
6. I can apply various teaching strategies to support learner learning.	4.26	Agree	High
7. I can facilitate class discussion effectively.	4.23	Agree	High
8. I can adjust my teaching methods based on learners' needs.	4.22	Agree	High
9. I can manage classroom activities efficiently.	4.19	Agree	High
10. I can manage time effectively during lessons.	4.19	Agree	High
11. I can explain lessons clearly and systematically.	4.17	Agree	High
12. I can maintain an orderly learning environment.	4.16	Agree	High
Over-all Mean	**4.24**	**Agree**	**High**

Table 2 presents the level of Pedagogical Knowledge (PK) among BEED pre-service teachers. The overall mean of 4.24, interpreted as High, indicates that respondents generally possessed strong knowledge of teaching approaches, learner needs, classroom activities, and instructional processes.

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The highest-rated indicator was "I can address learners' misconceptions during instruction" (M = 4.31), suggesting that respondents were confident in recognizing and responding to learners' misunderstandings. This indicates their perceived ability to provide appropriate explanations and instructional adjustments when learners experience difficulties. In contrast, "I can maintain an orderly learning environment" obtained the lowest mean (M = 4.16). Although still interpreted as High, the result suggests that classroom organization may be a comparatively less developed aspect of their pedagogical knowledge.

The consistently high ratings across the indicators demonstrate that respondents were generally confident in applying learner-centered approaches, cooperative learning, critical-thinking activities, classroom discussions, and varied teaching strategies. However, the slightly lower ratings for classroom organization, time management, and maintaining an orderly learning environment suggest areas that may benefit from further practical experience and supervised teaching.

The findings are consistent with Absolor (2023), who emphasized the development of pre-service teachers' knowledge of teaching approaches and classroom management. Milewski (2020) likewise described pedagogical knowledge as encompassing learners, teaching methods, and learning processes. Similarly, Disonglo and Limpot (2023) reported high pedagogical knowledge and digital literacy among Filipino teachers, while Hollenstein (2024) highlighted the influence of pedagogical-psychological knowledge on perceived instructional quality. Herda et al. (2025) further demonstrated that pedagogical beliefs and practices may vary across educational contexts.

Overall, the findings indicate that BEED pre-service teachers possessed a high level of Pedagogical Knowledge, particularly in addressing learner misconceptions and applying learner-centered teaching approaches. Nevertheless, strengthening classroom organization, time management, and practical classroom management skills through microteaching, demonstration teaching, and supervised field experiences may further enhance their pedagogical competence and readiness for actual classroom practice.

Table 3. Level of Technological Pedagogical Content Knowledge (TPACK) among BEED Pre-service Teachers in Terms of Content Knowledge

Statements	Mean	Verbal Description	Interpretation
1. I can relate lesson content to real-life situations.	4.36	Agree	High
2. I can answer learners' questions related to lesson content.	4.31	Agree	High
3. I can explain subject matter accurately to learners.	4.28	Agree	High
4. I can understand key concepts in the elementary curriculum.	4.21	Agree	High
5. I am confident in my mastery of elementary-level content.	4.20	Agree	High
6. I can identify essential topics in each subject area	4.20	Agree	High
7. I can apply subject-specific ways of thinking	4.19	Agree	High
8. I have sufficient knowledge of elementary Science content.	4.18	Agree	High
9. I have sufficient knowledge of elementary Math content	4.17	Agree	High
10. I can connect concepts across different subject areas	4.16	Agree	High
11. I have sufficient knowledge of Literary and Language content	4.11	Agree	High
12. I have sufficient knowledge of elementary Social Studies content	4.05	Agree	High
Over-all Mean	**4.20**	**Agree**	**High**

Table 3 presents the level of Content Knowledge (CK) among BEED pre-service teachers. The overall mean of 4.20, interpreted as High, indicates that respondents generally possessed strong knowledge of elementary-level subject matter and were confident in applying content knowledge to instruction.

The highest-rated indicator was "I can relate lesson content to real-life situations" (M = 4.36), suggesting that respondents were particularly confident in connecting academic concepts with learners' everyday experiences. This ability is important in elementary education because contextualizing lessons can make learning more meaningful and relevant. In contrast, "I have sufficient knowledge of elementary Social Studies content" obtained the lowest mean (M = 4.05). Although still interpreted as High, this suggests that Social Studies content knowledge was a comparatively less developed area among the respondents.

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The consistently high ratings indicate that respondents were generally confident in explaining subject matter, answering learners' questions, identifying essential topics, and applying subject-specific knowledge. However, the relatively lower ratings in Social Studies, language and literature, and cross-disciplinary connections suggest opportunities to further strengthen content knowledge across subject areas. This is particularly relevant to BEED pre-service teachers who are expected to teach multiple elementary subjects.

The findings are consistent with Muñoz and Ramirez (2018), who emphasized that teachers' content knowledge influences their selection of instructional materials and strategies. Ofodu and Jimola (2024) likewise highlighted the importance of subject mastery in promoting positive learning outcomes, while Anderson et al. (2016) demonstrated that content knowledge enables teachers to recognize and respond to learning opportunities. In the Philippine context, Merino (2025) and Almojano (2025) emphasized that strong content knowledge contributes to quality instruction when effectively integrated with pedagogy, technology, and contextual considerations.

Overall, the findings indicate that BEED pre-service teachers possessed a high level of Content Knowledge, particularly in connecting lessons with real-life situations. Nevertheless, strengthening knowledge across less confident subject areas and developing stronger connections among different disciplines may further enhance their content competence and support more effective elementary instruction.

Table 4. Level of Technological Pedagogical Content Knowledge (TPACK) among BEED Pre-service Teachers in Terms of Integration of Technology in Teaching

Statements	Mean	Verbal Description	Interpretation
1. I can integrate technology into my lesson plans.	4.36	Agree	High
2. I can manage technology use during classroom instruction.	4.34	Agree	High
3. I can evaluate the effectiveness of technology used in teaching	4.33	Agree	High
4. I can use technology to support collaborative learning.	4.31	Agree	High
5. I can use technology to enhance learners' understanding of lessons..	4.30	Agree	High
6. I can select appropriate technology to support lesson objectives.	4.30	Agree	High
7. I can use digital tools to engage learners in learning.	4.27	Agree	High
8. I can integrate multimedia resources into instruction.	4.25	Agree	High
9. I can use technology to explain difficult concepts.	4.24	Agree	High
10. I can design lessons that combine content, pedagogy, and technology.	4.22	Agree	High
Over-all Mean	**4.29**	**Agree**	**High**

Table 4 presents the level of Integration of Technology in Teaching among BEED pre-service teachers. The overall mean of 4.29, interpreted as High, indicates that respondents generally perceived themselves as capable of integrating technology into instructional planning and classroom activities.

The highest-rated indicator was "I can integrate technology into my lesson plans" (M = 4.36), suggesting strong confidence in incorporating digital tools during lesson preparation. In contrast, "I can design lessons that combine content, pedagogy, and technology" obtained the lowest mean (M = 4.22). Although still High, this suggests that the simultaneous integration of content, pedagogy, and technology was a comparatively less developed competency.

The high ratings across the indicators indicate that respondents were generally confident in managing technology during instruction, evaluating its effectiveness, supporting collaborative learning, and enhancing learners' understanding. However, the lower rating for designing fully integrated lessons suggests the need to move beyond the operational use of technology toward more deliberate alignment of technology with content and pedagogical objectives, which is central to the TPACK framework.

The findings are consistent with Cabalbag (2025), who found that effective ICT integration can enhance student engagement and academic performance. Carcosia et al. (2025) likewise reported a strong association between technology use and learners' cognitive, emotional, and social engagement. Turbanada et al. (2025) further identified access to digital resources and professional training as factors associated with technology integration. However, Yani et al. (2026) and Wulandari et al. (2025) noted that gaps in digital competence and technological infrastructure may constrain effective technology use.

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Overall, the findings indicate that BEED pre-service teachers possessed a high level of technology integration competence, particularly in incorporating technology into lesson plans. Nevertheless, strengthening their ability to systematically integrate technology, pedagogy, and content through lesson-design activities, microteaching, and authentic classroom experiences may further develop their TPACK competence.

Table 5. Summary of the Level of Technological Pedagogical Content Knowledge (TPACK) among BEED Pre-service Teachers

Indicators	Mean	Interpretation
1. Integration of Technology in Teaching	4.29	High
2. Pedagogical Knowledge	4.24	High
3. Content Knowledge	4..20	High
4. Technological Knowledge	4.16	High
Over-All Mean	**4.22**	**High**

Table 5 presents the summary of the level of Technological Pedagogical Content Knowledge (TPACK) among BEED pre-service teachers. The overall mean of 4.22, interpreted as High, indicates that respondents generally possessed a strong level of TPACK across the four dimensions examined.

Among the dimensions, Integration of Technology in Teaching obtained the highest mean (M = 4.29), followed by Pedagogical Knowledge (M = 4.24) and Content Knowledge (M = 4.20). Technological Knowledge obtained the lowest mean (M = 4.16), although it remained within the High interpretation. This pattern suggests that respondents were particularly confident in applying technology to teaching, while basic technological knowledge was comparatively less developed. Nevertheless, the consistently high ratings indicate a generally strong foundation in coordinating technology, pedagogy, and content for instructional purposes.

The findings are consistent with Ersanli and Yangin (2016) and Canbazoglu Bilici et al. (2016), who found that teacher education and targeted interventions can strengthen pre-service teachers' competence and confidence in integrating technology with pedagogy and content. Su (2022) likewise emphasized the development of technological competencies for lesson planning and instruction. McKnight et al. (2016) highlighted the importance of technological familiarity and confidence, while Ritzhaupt et al. (2016) established Technological Knowledge as a distinct component of teacher competence. Padmavathi (2017) further noted that technology training can improve teachers' ability to select and manage digital tools while identifying the need for continued development of advanced technological skills.

Overall, the findings demonstrate that BEED pre-service teachers possessed a high level of TPACK, with technology integration emerging as their strongest dimension. However, the comparatively lower rating for Technological Knowledge suggests the need for continued development of advanced digital competencies. Teacher education programs may therefore strengthen TPACK through technology-integrated lesson planning, microteaching, hands-on digital activities, and authentic classroom experiences that further connect technological, pedagogical, and content knowledge.

Research Question 2*:* What is the level of teaching readiness of pre-service teachers in terms of lesson planning and instructional delivery, classroom management, assessment and evaluation and adaptability to diverse learning environments?

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Table 6. Level of Teaching Readiness among BEED Pre-service Teachers in Terms of Lesson Planning and Instructional Delivery

Statements	Mean	Verbal Description	Interpretation
1. I can align lesson objectives with learning activities.	4.41	Agree	High teaching readiness
2. I can explain lessons clearly to the learners.	4.35	Agree	High teaching readiness
3. I can use questioning techniques effectively.	4.33	Agree	High teaching readiness
4. I can adjust instruction based on learners' responses.	4.32	Agree	High teaching readiness
5. I can reflect on my lesson delivery for improvement.	4.32	Agree	High teaching readiness
6. I can deliver lessons confidently.	4.31	Agree	High teaching readiness
7. I can use instructional materials effectively.	4.31	Agree	High teaching readiness
8. I can engage learners during lesson delivery.	4.31	Agree	High teaching readiness
9. I can select appropriate teaching strategies for a lesson.	4.30	Agree	High teaching readiness
10. I can prepare clear and well-structured lesson plans.	4.30	Agree	High teaching readiness
11. I can organize lesson content logically.	4.23	Agree	High teaching readiness
12. I can manage lesson flow smoothly.	4.22	Agree	High teaching readiness
Over-all Mean	**4.31**	**Agree**	**High teaching readiness**

Table 6 presents the level of Teaching Readiness in terms of Lesson Planning and Instructional Delivery among BEED pre-service teachers. The overall mean of 4.31, interpreted as High Teaching Readiness, indicates that respondents generally perceived themselves as well prepared to plan and deliver lessons effectively.

The highest-rated indicator was "I can align lesson objectives with learning activities" (M = 4.41), suggesting strong competence in connecting intended learning outcomes with appropriate instructional activities. In contrast, "I can manage lesson flow smoothly" obtained the lowest mean (M = 4.22). Although still interpreted as High Teaching Readiness, this suggests that maintaining a smooth and organized progression of instruction was a comparatively less developed area.

The consistently high ratings across the indicators indicate that respondents were generally confident in explaining lessons, using questioning techniques, adjusting instruction based on learners' responses, selecting teaching strategies, and preparing structured lesson plans. However, the relatively lower ratings for lesson flow and content organization suggest that continued practice may help strengthen their ability to manage instructional transitions and maintain lesson coherence.

The findings are consistent with Sanchez (2024), Ponce (2024), and Sanchez et al. (2024), who emphasized the importance of practical exposure, feedback, and guidance in developing lesson-planning and instructional competencies. Nazareno and Montañez (2025) likewise reported high competence in planning and instruction while identifying factors such as limited digital skills and workload as potential challenges. Padillo (2021) further emphasized continuous professional development as an important means of strengthening teachers' planning and instructional delivery skills.

Overall, the findings indicate that BEED pre-service teachers demonstrated a high level of readiness in lesson planning and instructional delivery. Nevertheless, further opportunities for microteaching, supervised practice, lesson reflection, and constructive feedback may strengthen their ability to manage lesson flow and translate well-designed plans into smooth and effective classroom instruction.

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Table 7. Level of Teaching Readiness among BEED Pre-service Teachers in Terms of Classroom Management

Statements	Mean	Verbal Description	Interpretation
1. I can maintain discipline in the classroom.	4.37	Agree	High teaching readiness
2. I can promote a safe and supportive learning environment.	4.36	Agree	High teaching readiness
3. I can monitor learners' participation during activities.	4.35	Agree	High teaching readiness
4. I can create a positive classroom environment.	4.30	Agree	High teaching readiness
5. I can encourage respectful behavior among learners.	4.29	Agree	High teaching readiness
6. I can maintain learners' attention during lessons.	4.24	Agree	High teaching readiness
7. I can address conflicts among learners appropriately.	4.23	Agree	High teaching readiness
8. I can manage group activities efficiently.	4.22	Agree	High teaching readiness
9. I can establish classroom rules and routines.	4.21	Agree	High teaching readiness
10. I can manage learner behavior effectively.	4.21	Agree	High teaching readiness
11. I can manage transitions between activities smoothly.	4.20	Agree	High teaching readiness
12. I can handle disruptive behavior appropriately	4.16	Agree	High teaching readiness
Over-all Mean	**4.26**	**Agree**	**High teaching readiness**

Table 7 presents the level of Teaching Readiness in terms of Classroom Management among BEED pre-service teachers. The overall mean of 4.26, interpreted as High Teaching Readiness, indicates that respondents generally perceived themselves as well prepared to establish and maintain positive, orderly, and supportive classroom environments.

The highest-rated indicator was "I can maintain discipline in the classroom" (M = 4.37), suggesting strong confidence in maintaining appropriate classroom behavior. In contrast, "I can handle disruptive behavior appropriately" obtained the lowest mean (M = 4.16). Although still interpreted as High Teaching Readiness, this suggests that responding appropriately to disruptive behavior was a comparatively less developed classroom management skill.

The consistently high ratings indicate that respondents were generally confident in promoting supportive learning environments, monitoring participation, encouraging respectful behavior, and managing classroom activities. However, the comparatively lower ratings for handling disruptive behavior, transitions, and establishing routines suggest areas that may benefit from additional practical experience and supervised classroom exposure.

The findings are consistent with Jones and Jones (2021) and Egeberg et al. (2016), who emphasized proactive strategies, clear expectations, structured routines, and effective planning as important components of classroom management. In the Philippine context, Heretape (2024) reported that inadequate preparation may contribute to classroom management difficulties among BEED students during practice teaching. Jayme and Tantiado (2025) likewise found that structured planning and effective instructional strategies can positively influence learner behavior, while Angelista (2021) demonstrated the value of theory-based classroom management strategies in improving student engagement and achievement.

Overall, the findings indicate that BEED pre-service teachers demonstrated a high level of classroom management readiness. Nevertheless, additional classroom simulations, microteaching, behavior-management training, and supervised teaching experiences may further strengthen their ability to manage disruptive behavior, transitions, and classroom routines effectively.

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Table 8. Level of Teaching Readiness among BEED Pre-service Teachers in Terms of Assessment and Evaluation

Statements	Mean	Verbal Description	Interpretation
1. I can assess learners' performance fairly.	4.37	Agree	High teaching readiness
2. I can monitor learners' learning progress.	4.34	Agree	High teaching readiness
3. I can interpret assessment results accurately.	4.31	Agree	High teaching readiness
4. I can use assessment to support learner learning.	4.30	Agree	High teaching readiness
5. I can assess both knowledge and skills of learners.	4.30	Agree	High teaching readiness
6. I can provide constructive feedback to learners.	4.27	Agree	High teaching readiness
7. I can use different assessment methods to evaluate learning.	4.26	Agree	High teaching readiness
8. I can provide constructive feedback to learners.	4.25	Agree	High teaching readiness
9. I can keep accurate records of learners' performance.	4.23	Agree	High teaching readiness
10. I can identify learners' learning strengths and weaknesses.	4.21	Agree	High teaching readiness
11. I can use assessment results to improve instruction.	4.21	Agree	High teaching readiness
12. I can evaluate learners' outputs objectively.	4.19	Agree	High teaching readiness
Over-all Mean	**4.27**	**Agree**	**High teaching readiness**

Table 8 presents the level of Teaching Readiness in terms of Assessment and Evaluation among BEED pre-service teachers. The overall mean of 4.27, interpreted as High Teaching Readiness, indicates that respondents generally perceived themselves as well prepared to assess learners' performance and monitor their learning progress.

The highest-rated indicator was "I can assess learners' performance fairly" (M = 4.37), suggesting strong confidence in conducting fair assessments. In contrast, "I can evaluate learners' outputs objectively" obtained the lowest mean (M = 4.19). Although still interpreted as High Teaching Readiness, this suggests that objective evaluation of learners' outputs was a comparatively less developed competency.

The consistently high ratings indicate that respondents were generally confident in monitoring learning progress, interpreting assessment results, providing feedback, using varied assessment methods, and applying assessment information to support learning. However, the comparatively lower ratings for objective evaluation, identifying learning strengths and weaknesses, and using assessment results to improve instruction suggest areas that may benefit from additional practice and training.

The findings are consistent with Mohd Sheik and Manap (2024), who emphasized the limitations of relying heavily on traditional assessment methods and the need for more meaningful assessment practices. Tomlinson et al. (2022) likewise highlighted the value of formative assessment in improving learning when assessment results are used to adjust instruction. Pan and Zhang (2022) and Cohen and Goldhaber (2016) identified challenges in teacher evaluation and the interpretation of evaluation results, while Areekkuzhiyil (2021) noted that excessive reliance on traditional tests may limit assessment effectiveness.

Overall, the findings indicate that BEED pre-service teachers demonstrated a high level of readiness in assessment and evaluation. Nevertheless, further training in objective assessment, formative assessment, interpreting assessment evidence, and using results to improve instruction may strengthen their assessment competence and overall teaching readiness.

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Table 9. Level of Teaching Readiness among BEED Pre-service Teachers in Terms of Adaptability to Diverse Learning Environments

Statements	Mean	Verbal Description	Interpretation
1. I can adjust my teaching to meet diverse learning needs.	4.32	Agree	High teaching readiness
2. I can modify lessons for learners with different abilities.	4.29	Agree	High teaching readiness
3. I can adjust my teaching style to different learning contexts.	4.28	Agree	High teaching readiness
4. I can teach effectively in different classroom settings.	4.26	Agree	High teaching readiness
5. I can adapt instruction based on available resources.	4.26	Agree	High teaching readiness
6. I can respond flexibly to learners' learning difficulties.	4.24	Agree	High teaching readiness
7. I can work effectively with diverse groups of learners.	4.21	Agree	High teaching readiness
8. I can handle unexpected classroom situations effectively.	4.20	Agree	High teaching readiness
9. I can adapt to changes during teaching practice.	4.19	Agree	High teaching readiness
10. I can teach effectively in both face-to-face and online settings.	4.16	Agree	High teaching readiness
11. I can remain effective under challenging teaching conditions.	4.15	Agree	High teaching readiness
12. I can adjust strategies when lessons do not go as planned.	4.16	Agree	High teaching readiness
Over-all Mean	**4.23**	**Agree**	**High teaching readiness**

Table 9 presents the level of Teaching Readiness in terms of Adaptability to Diverse Learning Environments among BEED pre-service teachers. The overall mean of 4.23, interpreted as High Teaching Readiness, indicates that respondents generally perceived themselves as capable of adjusting their teaching to varied learner needs and classroom contexts.

The highest-rated indicator was "I can adjust my teaching to meet diverse learning needs" (M = 4.32), suggesting strong confidence in adapting instruction to learners' differences. In contrast, "I can remain effective under challenging teaching conditions" obtained the lowest mean (M = 4.15). Although still interpreted as High Teaching Readiness, this suggests that maintaining effectiveness under difficult teaching conditions was a comparatively less developed competency.

The consistently high ratings indicate that respondents were generally confident in modifying lessons, adjusting teaching styles, responding to learning difficulties, and working with diverse groups of learners. However, the comparatively lower ratings for challenging conditions, adapting to changes, and teaching across face-to-face and online settings suggest areas that may benefit from additional practical exposure and varied teaching experiences.

The findings are consistent with El-Sabagh (2021), who emphasized that adaptive instruction can enhance learner engagement and achievement. Hardy et al. (2022) likewise highlighted diagnostic strategies, scaffolding, and responsive support in addressing diverse learning needs. Kankam (2025) identified adaptability as important in linguistically and culturally diverse classrooms, while Mokhampanyane (2024) emphasized the need for stronger preparation for inclusive and differentiated instruction. Schipper et al. (2023) further demonstrated that collaborative professional development can strengthen teachers' ability to recognize learner diversity and adapt instructional strategies.

Overall, the findings indicate that BEED pre-service teachers demonstrated a high level of readiness for adapting to diverse learning environments. Nevertheless, further opportunities for inclusive teaching practice, differentiated instruction, simulation of challenging classroom situations, and exposure to varied instructional settings may strengthen their adaptability and preparedness for actual teaching.

Table 10. Summary of the Level of Teaching Readiness among BEED Pre-service Teachers

Indicators	Mean	Interpretation
1. Lesson planning and Instructional Delivery	4.31	High teaching readiness
2. Assessment and Evaluation	4.27	High teaching readiness
3. Classroom Management	4.26	High teaching readiness
4. Adaptability to diverse learning environments	4.23	High teaching readiness
Over-All Mean	**4.29**	**High teaching readiness**

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Table 10 presents the summary of Teaching Readiness among BEED pre-service teachers across the four dimensions. The overall mean of 4.29, interpreted as High Teaching Readiness, indicates that respondents generally perceived themselves as well prepared to undertake essential teaching responsibilities.

Among the four dimensions, Lesson Planning and Instructional Delivery obtained the highest mean (M = 4.31), followed by Assessment and Evaluation (M = 4.27), Classroom Management (M = 4.26), and Adaptability to Diverse Learning Environments (M = 4.23). Although the differences were small, the results suggest that respondents were relatively strongest in planning and delivering instruction, while adaptability was comparatively less developed.

The consistently high ratings across all dimensions indicate that respondents generally possessed the competencies needed for instructional planning, assessment, classroom management, and adapting to different learning contexts. However, the comparatively lower rating for adaptability suggests that additional exposure to varied classroom situations, learner needs, and instructional conditions may further strengthen their teaching readiness.

The findings are consistent with Heretape (2023), who found high readiness among BEED students, particularly in lesson planning and classroom management. Çemçem et al. (2024) emphasized that teaching readiness involves confidence, attitudes, and technical competencies, while Entrampas et al. (2024) noted that pre-service teachers may demonstrate confidence while still requiring further preparation for inclusive practices. Girgin and Akcanca (2021) identified challenges in classroom management and selecting strategies for diverse learners, while De Guia and Solomon (2024) highlighted the importance of adaptability and ICT readiness in responding to changing teaching contexts.

Overall, the findings indicate that BEED pre-service teachers demonstrated a high level of teaching readiness across all four dimensions, with Lesson Planning and Instructional Delivery emerging as the strongest area. Continued supervised teaching, classroom simulations, inclusive education activities, and exposure to diverse learning environments may further strengthen their preparedness for actual classroom practice.

Research Question 3: Is there a significant relationship between TPACK and teaching readiness of pre-service teachers?

Table 11. Significant Relationship between Technological Pedagogical Content Knowledge (TPACK) and Teaching Readiness among BEED Pre-service Teachers

Variable	r-value	p-value	Interpretation
TPACK and Teaching Readiness	.820**	.000	Significant

Table 11 presents the relationship between Technological Pedagogical Content Knowledge (TPACK) and Teaching Readiness among BEED pre-service teachers. The analysis yielded a Pearson correlation coefficient of $r = .820$ with $p < .001$, indicating a very strong, positive, and statistically significant relationship between the two variables. Since the p-value is below the 0.05 level of significance, the null hypothesis is rejected. This finding provides strong empirical evidence that TPACK and teaching readiness are closely associated among the respondents.

The result indicates that pre-service teachers who reported higher levels of TPACK also tended to report higher levels of teaching readiness. The practical significance of this relationship is particularly important in teacher education because TPACK represents the ability to integrate technological, pedagogical, and content knowledge, while teaching readiness reflects preparedness to plan and deliver instruction, manage classrooms, assess learning, and respond to diverse learning environments. The strong correlation suggests that these competencies do not operate independently in the preparation of future teachers. Rather, the development of technological, pedagogical, and content-related competencies may be closely linked to how prepared pre-service teachers perceive themselves to be for actual teaching responsibilities.

This finding has important practical implications for BEED teacher preparation programs. Given the strength of the observed relationship, teacher education programs may benefit from providing learning experiences that intentionally develop TPACK alongside broader teaching-readiness competencies rather than treating technology integration as a separate skill. For example, technology-enhanced lesson planning, technology-integrated microteaching, collaborative instructional design, classroom simulations, digital assessment activities, and supervised teaching experiences can provide opportunities for pre-service teachers to apply technological knowledge in conjunction with pedagogical strategies and content knowledge. Such activities may help students translate what they know about technology into actual instructional decisions and classroom practices.

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The significance of the correlation also suggests that strengthening TPACK should be considered an important component of preparing pre-service teachers for the demands of contemporary classrooms. With an overall mean of 4.22 for TPACK and 4.29 for teaching readiness, the respondents already demonstrated high levels of both constructs. However, the very strong correlation (r = .820) indicates that improvements in one area are closely associated with differences in the other. Thus, teacher educators may consider designing integrated professional learning activities in which pre-service teachers are required not only to demonstrate technological skills but also to explain when, why, and how technology should be used to support particular content, teaching strategies, assessment approaches, and learner needs.

The finding is consistent with the TPACK framework of Mishra and Koehler, which emphasizes the integration of technology, pedagogy, and content as essential to effective technology-supported teaching. It also aligns with studies of Öztürk et al. (2024) found a significant positive relationship between TPACK and blended teaching readiness among pre-service teachers. The findings suggest that stronger technological, pedagogical, and content knowledge contributes to greater teaching readiness.

Nevertheless, the result should be interpreted as an association rather than a causal effect. Although the very strong correlation demonstrates that higher TPACK scores are associated with higher teaching-readiness scores, the descriptive-correlational design does not establish that TPACK directly causes greater teaching readiness. Other factors not examined in the present study, such as teaching experience, self-efficacy, mentoring, prior technology exposure, and quality of field experiences, may also contribute to teaching readiness.

Overall, the findings demonstrate a very strong, positive, and statistically significant relationship between TPACK and teaching readiness among BEED pre-service teachers (r = .820, p < .001). Beyond its statistical significance, the finding has practical relevance for teacher education by highlighting the importance of integrating technological, pedagogical, and content competencies into authentic teaching-preparation experiences. Teacher education programs may use this evidence to strengthen technology-integrated coursework, practice teaching, assessment activities, and field-based experiences that help pre-service teachers develop the competencies needed for effective and confident classroom practice.

Ethical Considerations

The study followed the ethical standards and research protocols of Don Carlos Polytechnic College. Before data collection, the research protocol was reviewed and approved by the Office of Research and Development (ORDO) through the Office of the Vice President for Research and Development. The study received research clearance under Reference No. DCPC-ORDO-ERC-2026-02-001, dated February 20, 2026. Before answering the questionnaire, all respondents were informed about the purpose of the study, the procedures involved, and their rights as participants. Participation was voluntary, and only those who gave informed consent were allowed to proceed. The confidentiality and anonymity of the respondents were maintained throughout the study. No names or student numbers were collected. The responses were used only for academic and research purposes and were reported in aggregate form. The data were stored securely and were accessible only to the researchers. The researchers ensured that participation was voluntary and that respondents were not exposed to unnecessary risks or harm. The study followed the principles of respect for persons, beneficence, and non-maleficence.

Conclusion

Based on the findings of the study, the following conclusions were drawn: BEED pre-service teachers demonstrated a high level of Technological Pedagogical Content Knowledge (TPACK) across Technological Knowledge, Pedagogical Knowledge, Content Knowledge, and Integration of Technology in Teaching. This indicates that the respondents generally possessed strong competencies in integrating technology, pedagogy, and content in preparation for teaching. BEED pre-service teachers demonstrated a high level of teaching readiness across Lesson Planning and Instructional Delivery, Classroom Management, Assessment and Evaluation, and Adaptability to Diverse Learning Environments. This suggests that the respondents generally perceived themselves as well prepared to perform essential teaching responsibilities. A very strong, positive, and statistically significant relationship existed between TPACK and teaching readiness among BEED pre-service teachers. This indicates that higher levels of TPACK were associated with higher levels of teaching readiness. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. However, the finding represents an association rather than a causal effect, as the study employed a descriptive-correlational research design.

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Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed: For Teacher Education Institutions, they may strengthen TPACK development through seminars, workshops, technology-integrated activities, microteaching, and practice-based learning experiences. These initiatives may further enhance pre-service teachers' ability to integrate technology, pedagogy, and content in actual teaching contexts. For Curriculum Developers, they may further integrate TPACK competencies into teacher education courses by incorporating technology-supported lesson planning, digital instructional resources, technology-enhanced assessment, and authentic teaching activities. Emphasis may also be placed on developing advanced technological skills and meaningful integration of technology with pedagogical and content knowledge. For School Administrators, they may provide pre-service teachers with opportunities for classroom observation, supervised teaching, mentoring, and exposure to diverse learning environments. Access to appropriate technological resources and supportive instructional environments may also help strengthen their teaching readiness and facilitate the practical application of TPACK. For Future Researchers they may conduct similar studies using larger and more diverse samples, different teacher education programs, and other institutional contexts to further examine the relationship between TPACK and teaching readiness. Longitudinal, mixed-method, or performance-based studies may also be conducted to complement self-reported data and provide deeper evidence of how TPACK relates to actual teaching performance.

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