

Assessing the competencies of future early childhood educators

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Received: 19 May 2026

Revised: 01 June 2026; 15 June 2026; 20 June 2026; 26 June 2026

Accepted: 27 June 2026

Available Online: 28 June 2026

Volume 1 (2026), Issue 2, P-ISSN – 3116-3769; E-ISSN - 3116-3777

<https://doi.org/10.63498/injelps86>

Abstract

Aim: This study assessed the competencies of future early childhood educators by examining their levels of Content, Pedagogical, and Technological Knowledge (TPACK) and their perceived achievement in General, Professional, and Specialization Education courses. It also determined the relationship between TPACK competencies and perceived academic achievement to provide a basis for competency enhancement initiatives in teacher education.

Methodology: The study employed a descriptive-correlational quantitative research design. Data were gathered from 111 Bachelor of Early Childhood Education students from first to fourth year levels at the College of Teacher Education, Batangas State University, The National Engineering University, using a validated researcher-made questionnaire and a standardized TPACK instrument with a Cronbach's alpha reliability coefficient of .984. Stratified random sampling was utilized, and data were analyzed using weighted mean, standard deviation, and Pearson's r.

Results: The findings revealed that pre-service early childhood educators demonstrated high levels of content, pedagogical, and technological knowledge. Strengths were evident in literacy instruction, inclusive teaching practices, adaptability to learners' needs, collaboration, creativity, professionalism, and technology integration. Respondents also reported high levels of perceived achievement in General, Professional, and Specialization Education courses. However, areas requiring further improvement included Mathematics and Science content mastery, classroom management, addressing learner misconceptions, practical technology application, educational philosophy, and higher-order critical thinking. Significant positive relationships were found between TPACK competencies and perceived achievement across all educational domains, indicating that stronger content, pedagogical, and technological knowledge is associated with higher academic confidence and preparedness.

Conclusion: The study concludes that integrated TPACK competencies play a significant role in enhancing the academic readiness and professional preparation of future early childhood educators. The findings underscore the importance of strengthening teacher education curricula through competency-based training programs that promote content mastery, effective pedagogy, technology integration, reflective practice, and lifelong learning to improve educational outcomes and teaching effectiveness.

Keywords: *Early Childhood Education, Technological Pedagogical Content Knowledge (TPACK), Teacher Competencies, Teacher Education, Pre-Service Teachers*

INTRODUCTION

The preparation of competent early childhood educators has become increasingly important amid rapid technological advancement, evolving learner needs, and the demand for inclusive and equitable education. As key contributors to the attainment of Sustainable Development Goal 4 (SDG 4), teachers are expected to demonstrate strong pedagogical and digital competencies to support 21st-century learning effectively (Méndez et al., 2022). In response, teacher education institutions have strengthened initiatives to prepare educators who can integrate technology meaningfully into instruction. The Technological Pedagogical and Content Knowledge (TPACK) framework has become a widely accepted model for understanding the knowledge required for effective technology-integrated teaching.

Recent studies highlight the importance of developing integrated technological, pedagogical, and content knowledge, particularly in response to emerging technologies such as generative artificial intelligence (Mishra et al., 2023). These competencies have been associated with improved teaching effectiveness and professional performance



(Suebssing et al., 2023). However, research on TPACK in early childhood teacher education remains limited, particularly in developing contexts undergoing simultaneous digital transformation and curricular reform. Moreover, few studies have examined the relationship between TPACK competencies and academic achievement.

In the Philippines, persistent challenges in teacher readiness and institutional support continue to affect the implementation of educational reforms, including the MATATAG Curriculum (Kilag et al., 2024). Despite increasing attention to teacher competencies, empirical evidence on the relationship between TPACK and the academic achievement of Bachelor of Early Childhood Education (BECEd) students remains scarce. This study addressed this gap by examining the TPACK competencies and perceived academic achievement of BECEd students at Batangas State University, The National Engineering University, as the basis for developing a competency-driven intervention program. Unlike conventional professional development approaches, the proposed intervention employs evidence-based competency mapping and targeted support aligned with identified needs. The findings provide context-specific evidence to inform curriculum enhancement, strengthen technology-integrated teacher preparation, and support evidence-based institutional decision-making.

Review of Related Literature and Studies

Competencies of Early Childhood Education Students

The competencies of Bachelor of Early Childhood Education (BECEd) students are essential for preparing future educators to meet the developmental, pedagogical, and technological demands of 21st-century education. Early childhood educators are expected to foster children's holistic development through play-based, learner-centered, and inclusive approaches while promoting critical thinking, creativity, communication, and digital literacy (Bustos-Orosa, 2022). Pre-service teachers must also develop professional competence, reflective practice, relational skills, and collaborative abilities to strengthen their readiness for child-centered educational settings (Kapstad & Øvrum, 2024).

As digital technologies become increasingly integral to education, teacher preparation programs should strengthen competencies in technology integration, pedagogical content knowledge, and lifelong learning. The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that effective technology integration depends on the seamless integration of technological, pedagogical, and content knowledge rather than technology use alone (Deng & Zhang, 2023). Likewise, strong pedagogical content knowledge and continuous professional development are critical for preparing competent, innovative, and reflective early childhood educators capable of responding to evolving educational and societal demands (Thwe & Kálmán, 2023).

Curriculum

The Bachelor of Early Childhood Education (BECEd) curriculum plays a vital role in preparing future educators for the demands of 21st-century teaching. A well-designed curriculum promotes the holistic development of young learners while strengthening pre-service teachers' pedagogical, technological, and professional competencies. It should align with educational reforms, Developmentally Appropriate Practices (DAP), and the Philippine Professional Standards for Teachers (PPST) to support learner-centered, inclusive, and evidence-based instruction (Tatto, 2021). The curriculum integrates general, professional, and specialization courses that foster essential competencies, including communication, digital literacy, creativity, and lifelong learning. Contemporary research emphasizes that effective educators must possess strong professional competence, engage in reflective practice, and integrate technology meaningfully to improve learning outcomes (Ulferts, 2021; González-Fernández et al., 2023). Moreover, continuous professional development and evidence-based instructional practices are essential for preparing competent, ethical, innovative, and adaptable early childhood educators capable of addressing diverse learner needs and the evolving demands of education (Duraku et al., 2022).

Preparation of Intervention Training Program

Intervention training programs are essential for strengthening the pedagogical, technological, and instructional competencies of Bachelor of Early Childhood Education (BECEd) students. Targeted professional development has been shown to improve instructional effectiveness, classroom practice, and teaching competence, contributing to better early childhood education outcomes (Alhothali, 2021; Chinyere, 2023). Such initiatives also support the attainment of Sustainable Development Goal 4 (SDG 4) by promoting inclusive and quality education (Rad et al., 2022). To address the demands of 21st-century education, intervention programs should integrate digital competence, technology-enhanced instruction, and innovative pedagogical approaches. Research emphasizes the need to strengthen pre-service teachers' competencies in technology integration, pedagogical content knowledge, and digital literacy (Çebi et al., 2022; Papavlasopoulou et al., 2024). Moreover, the use of digital tools, artificial intelligence, and play-based technologies enhances creativity, engagement, and problem-solving skills. Consequently, continuous

competency-based training is essential for developing teachers' self-efficacy, innovation, and readiness to deliver high-quality early childhood education (Naida et al., 2024; Kulaksız & Toran, 2022; Pozo-Rico et al., 2023).

Synthesis and Research Gap

The reviewed literature underscores the importance of teacher competencies, curriculum design, and training interventions in preparing Bachelor of Early Childhood Education (BECEd) students. However, gaps remain in the conceptualization and assessment of teacher competencies, as studies vary in their emphasis on TPACK, pedagogical competence, and the technological and ethical dimensions of teaching (Deng & Zhang, 2023; Çebi et al., 2022). Likewise, although curriculum research highlights alignment with professional standards (Tatto, 2021), it provides limited evidence on its contribution to competency development. Findings on training interventions are similarly inconclusive, with most studies reporting improvements in digital competence and professional growth (Alhothali, 2021; Pozo-Rico et al., 2023) but offering little evidence of their long-term effects on classroom readiness and teaching practice. These gaps highlight the need for a more integrated framework that examines how curriculum design, competency assessment, and targeted interventions collectively enhance the preparedness of future early childhood educators for 21st-century teaching.

Theoretical Framework

This study was anchored on the Technological Pedagogical Content Knowledge (TPACK) framework and Connectivism. Developed by Punya Mishra and Matthew Koehler, TPACK emphasizes the integration of content, pedagogy, and technology as essential components of effective teaching and technology integration (González & Bravo, 2024). Guided by this framework, the study examined the technological, pedagogical, and content knowledge competencies of pre-service early childhood educators.

The study also drew on Connectivism, proposed by George Siemens and Stephen Downes, which views learning as a networked and technology-driven process in the digital age (Feyisa et al., 2024). This framework supported the examination of the relationship between TPACK competencies and perceived achievement in General, Professional, and Specialization Education courses. Together, these frameworks provided the basis for developing a competency-based intervention program to enhance the professional preparation of future early childhood educators.

Conceptual Framework

The conceptual framework of the study is anchored on the integration of Technological Pedagogical Content Knowledge (TPACK) and Connectivism to examine pre-service early childhood educators' knowledge levels, perceived academic achievement, and the relationships among these variables. TPACK provides the basis for understanding the integration of technology, pedagogy, and content knowledge, while Connectivism emphasizes learning as an interconnected and networked process that influences teacher preparation and development. Guided by these frameworks, the study utilized researcher-made and standardized instruments (Schmidt et al., 2009) to assess respondents' competencies in General, Professional, and Specialization Education courses. The results served as the basis for proposing a competency-based intervention training program aimed at addressing identified gaps and enhancing the quality of teacher preparation in early childhood education.

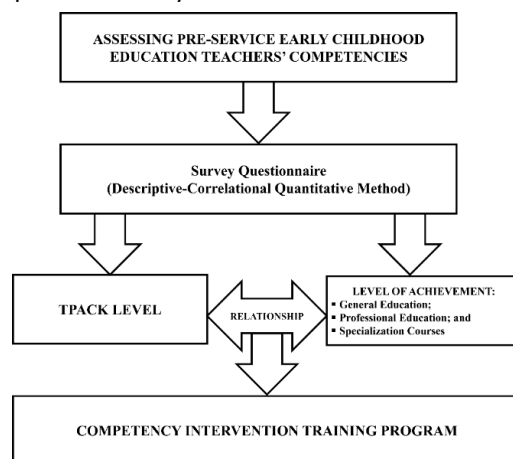


Figure 1. The Conceptual Framework of Assessing Pre-Service Early Childhood Students' Competencies



Statement of the Problem

The development of Technological Pedagogical Content Knowledge (TPACK) has become a fundamental component of teacher education in the 21st century. Future early childhood educators are expected to demonstrate strong content, pedagogical, and technological competencies to address the diverse developmental and instructional needs of young children while promoting learner-centered and technology-integrated instruction.

Despite the recognized importance of TPACK, empirical evidence on the relationship between the TPACK competencies of Bachelor of Early Childhood Education (BECEd) students and their perceived academic achievement in General, Professional, and Specialization Education courses remains limited. Moreover, little research has examined how competency assessment findings can inform targeted intervention programs to strengthen teacher preparation and professional readiness.

To address these gaps, this study assessed the TPACK competencies of BECEd students, determined their perceived academic achievement in key curricular areas, examined the relationship between TPACK competencies and perceived achievement, and developed a competency-based intervention program to enhance teacher preparation and professional competence.

Research Objectives

General Objective

To develop a competency-based intervention training program that enhances the Technological Pedagogical Content Knowledge (TPACK) proficiency and academic readiness of Bachelor of Early Childhood Education (BECEd) students.

Specific Objectives

1. To determine the level of knowledge of pre-service early childhood educators in terms of:
 - 1.1. Content Knowledge;
 - 1.2. Pedagogical Knowledge; and
 - 1.3. Technological Knowledge.
2. To determine the perceived level of achievement of the respondents in:
 - 2.1. General Education;
 - 2.2. Professional Education; and
 - 2.3. Specialization Education.
3. To examine the significant relationship between the respondents' TPACK knowledge levels and their perceived levels of achievement.
4. To develop a competency-based intervention training program based on the findings of the study.

Research Questions

1. What is the level of knowledge of pre-service early childhood educators in terms of:
 - 1.1. Content Knowledge;
 - 1.2. Pedagogical Knowledge; and
 - 1.3. Technological Knowledge?
2. What is the perceived level of achievement of the respondents in:
 - 2.1. General Education;
 - 2.2. Professional Education; and
 - 2.3. Specialization Education?
3. Is there a significant relationship between the respondents' levels of TPACK knowledge and their perceived levels of achievement?
4. What competency-based intervention training program may be developed based on the findings of the study?

Hypothesis

There is no significant relationship between the content knowledge, pedagogical knowledge, and technological knowledge of pre-service early childhood educators and their perceived achievement in General Education, Professional Education, and Specialization Education courses.



METHODOLOGY

Research Design

This study employed a descriptive-correlational research design to assess the Technological Pedagogical Content Knowledge (TPACK) competencies and perceived academic achievement of Bachelor of Early Childhood Education (BECEd) students. The descriptive component was used to determine students' competency levels and perceived achievement, while the correlational component examined the relationship between TPACK competencies and perceived academic achievement. This design was appropriate for addressing the study objectives and testing the hypothesized relationships among the variables.

Population and Sampling

The study involved Bachelor of Early Childhood Education (BECEd) students, with a total population of 154 across all year levels. Using Raosoft sample size computation with a 5% margin of error and a 95% confidence level, 111 respondents were selected through stratified sampling to ensure proportional representation. The sample comprised 18 first-year, 50 second-year, 22 third-year, and 21 fourth-year students, providing balanced representation for analyzing TPACK competencies and perceived academic achievement across year levels.

Research Instruments

This study utilized a survey questionnaire consisting of a standardized TPACK instrument developed by Schmidt et al. (2009), with permission secured through email correspondence, and a researcher-made questionnaire to assess students' perceived achievement in General, Professional, and Specialization courses. The instrument underwent expert validation, pilot testing, and reliability analysis, yielding an excellent Cronbach's alpha of .984. Responses were analyzed using a 4-point Likert scale to measure content, pedagogical, and technological knowledge, as well as perceived achievement. Higher mean scores indicated greater competency and perceived achievement and served as the basis for the proposed competency intervention training program.

Content Validation

To ensure content validity and alignment with the study objectives, the research instrument was reviewed by the research adviser, panel members, and program experts. All recommendations were incorporated into the final instrument. The panel of validators included:

- BECEd Program Chairperson,
- Primary Level Head Teacher,
- Primary Level Teacher, and
- Certified Statistician.

Reliability Testing

Reliability testing was conducted to determine the internal consistency of the research instrument. The analysis produced a Cronbach's Alpha value of 0.984, indicating excellent internal consistency and confirming that the questionnaire was highly reliable and appropriate for assessing the Technological Pedagogical Content Knowledge (TPACK) competencies and perceived achievement levels of BECEd students.

Data Collection Procedure

Data were collected from Bachelor of Early Childhood Education (BECEd) students at Batangas State University, The National Engineering University, during Academic Year 2025–2026. Prior to data collection, approval was obtained from the Dean of the College of Teacher Education, the Vice Chancellor for Academic Affairs, and the University Chancellor. The validated questionnaire was then administered through an online self-administered survey, with respondents given approximately 40 minutes to complete it. The completed responses were encoded and organized for statistical analysis to determine the respondents' TPACK competencies, perceived academic achievement, and the relationship between these variables.

Treatment of the Study

The study employed weighted mean to determine the overall level of pre-service early childhood educators' Technological Pedagogical Content Knowledge (TPACK). Standard deviation was employed to assess the variability of respondents' TPACK levels and perceived achievement in General, Professional, and Specialization Education courses. Pearson's *r* was utilized to examine the relationship between TPACK competencies and perceived academic achievement. Statistical significance was tested at the 0.05 level ($\alpha = .05$). The null hypothesis was rejected when the *p*-value was less than 0.05, indicating a significant relationship between the variables; otherwise, it was not accepted.

Ethical Considerations

The study ensured strict ethical procedures prior to data collection by securing the necessary permissions from the Dean of the College of Teacher Education, the Vice Chancellor for Academic Affairs, and the University Chancellor of Batangas State University, as well as ethical clearance from the Ethics Review Committee of the National Teachers College (NTC). Participants provided informed consent after being informed of the study's purpose, procedures, benefits, and their right to withdraw at any time without penalty. Confidentiality and anonymity were strictly maintained, and participation had no effect on academic standing. In compliance with Republic Act No. 10173 (Data Privacy Act of 2012), all data were anonymized, securely stored, and collected through privacy-protected digital platforms.

RESULTS and DISCUSSION

1. Knowledge Level of Pre-service Early Childhood Educators in the Content, Pedagogical, and Technological Aspects. This section presents the Technological, Pedagogical and Content Knowledge competencies of early childhood education. These competencies pertain to the abilities or skills of the respondents to carry out their tasks in an effective and efficient manner.

1.1. Content Knowledge. This competency refers to pre-service teachers' understanding of subject matter and their ability to apply and communicate knowledge effectively to support learning.

Table 1

Content knowledge level of pre-service early childhood educators

Items	Weighted Mean	Standard Deviation	Verbal Interpretation
Literacy			
1. I can use a literary way of thinking.	3.40	0.52	Agree
2. I have strategies to develop my understanding of Literacy.	3.39	0.49	Agree
3. I have sufficient knowledge about literacy.	3.28	0.49	Agree
Social Studies			
1. I have strategies to develop my understanding of Social Studies.	3.27	0.45	Agree
2. I can use a historical way of thinking.	3.18	0.49	Agree
3. I have sufficient knowledge about Social Studies.	3.12	0.46	Agree
Mathematics			
1. I have strategies to develop my understanding of Mathematics.	3.29	0.49	Agree
2. I can use a mathematical way of thinking.	3.15	0.51	Agree
3. I have sufficient knowledge about Mathematics.	3.08	0.43	Agree
Science			
1. I have strategies to develop my understanding of Science.	3.19	0.51	Agree
2. I can use a scientific way of thinking.	3.17	0.54	Agree
3. I have sufficient knowledge about Science.	3.13	0.49	Agree
Composite Mean	3.13	0.14	Agree

The findings indicate a high level of content knowledge among pre-service early childhood educators (composite mean = 3.13, SD = 0.14; Agree). Literacy obtained the highest mean ($M = 3.36$), followed by Social Studies ($M = 3.19$), Mathematics ($M = 3.17$), and Science ($M = 3.16$), reflecting strong confidence across core subject areas. These results are consistent with the learner-centered orientation of the BECED curriculum, which emphasizes inquiry, active learning, and continuous professional growth, and support previous studies highlighting the importance of content knowledge, critical thinking, communication, and lifelong learning in effective teaching (Bustos-Orosa, 2022; Thwe & Kálmán, 2023). However, the relatively lower ratings in Mathematics and Science suggest the need to strengthen STEM-related competencies. This finding aligns with Kapstad and Øvrum (2024), who emphasized the value of professional competence, reflective practice, and collaboration in teacher preparation. Accordingly, content enrichment, interdisciplinary learning, and TPACK-based interventions are recommended to further enhance subject-matter expertise and instructional effectiveness.

1.2. Pedagogical Knowledge. This competency refers to pre-service teachers' knowledge and application of instructional strategies, curriculum development, classroom management, and learning resource design to support diverse learners and promote achievement.

The findings revealed a high level of pedagogical knowledge among pre-service early childhood educators ($M = 3.45$, $SD = 0.16$; Agree), indicating strong preparedness to implement learner-centered and developmentally appropriate practices. The highest-rated indicators were creating an inclusive learning environment ($M = 3.54$), adjusting instruction based on learners' understanding ($M = 3.52$), and promoting collaboration, exploration, and critical thinking ($M = 3.51$). These findings reflect strong foundational pedagogical competencies and support the work of Kapstad and Øvrum (2024) and Thwe and Kálmán (2023), who emphasized the importance of pedagogical knowledge, professional competence, and reflective practice in effective teaching.

However, relatively lower ratings in familiarity with student misconceptions ($M = 3.29$), designing developmentally appropriate activities ($M = 3.40$), and classroom management ($M = 3.41$) indicate areas for improvement. Consistent with Çebi et al. (2022) and Papavaslopoulou et al. (2024), the findings suggest the need to strengthen pedagogical content knowledge, technology integration, and digital literacy. They also highlight the value of mentorship, field-based experiences, and targeted interventions to enhance classroom practice and teacher readiness (Bourke et al., 2024; Ranta et al., 2023).

Table 2.*Pedagogical knowledge level of pre-service early childhood educators*

Items	Weighted Mean	Standard Deviation	Verbal Interpretation
1. I create a positive and inclusive learning environment that supports the needs of every child.	3.54	0.50	Strongly Agree
2. I adjust my teaching method based on my pupils' level of understanding	3.52	0.52	Strongly Agree
3. I implement instructional strategies that encourage collaboration, exploration, and critical thinking in young children.	3.51	0.50	Strongly Agree
4. I assess student learning according to the competencies needed.	3.48	0.50	Agree
5. I adapt my teaching style to diversity of learners.	3.46	0.52	Agree
6. I apply various teaching strategies to ensure pupils are meaningfully engaged in the learning process.	3.45	0.52	Agree
7. I use a wide range of teaching approaches in a classroom setting.	3.43	0.52	Agree
8. I know how to organize and maintain classroom management.	3.41	0.39	Agree
9. I design developmentally appropriate learning activities that promote active engagement among diverse learners.	3.40	0.49	Agree
10. I am familiar with common student understandings and misconceptions.	3.29	0.47	Agree
Composite Mean	3.45	0.16	Agree

1.3. Technological Knowledge. This competency refers to pre-service teachers' understanding and effective use of digital tools, resources, and technologies to support teaching and learning.

Table 3.*Technological knowledge level of pre-service early childhood educators*

Items	Weighted Mean	Standard Deviation	Verbal Interpretation
1. I am committed to continually learning and adapting to new technological advancements in education.	3.50	0.50	Strongly Agree
2. I can identify when using technology will enhance or hinder children's learning experiences.	3.43	0.50	Agree
3. I effectively integrate appropriate digital tools into specific subject areas in early childhood education.	3.41	0.53	Agree

4. I can learn technology easily.	3.36	0.58	Agree
5. I keep up with important new technologies.	3.33	0.51	Agree
6. I have the technical skills necessary to utilize technology effectively in the classroom.	3.27	0.54	Agree
7. I frequently play around with the technology.	3.23	0.53	Agree
8. I have sufficient opportunities to work with different technologies.	3.21	0.54	Agree
9. I know about a lot of different technologies.	3.16	0.60	Agree
10. I solve my own technical problems.	3.13	0.57	Agree
Composite Mean	3.30	0.17	Agree

The findings revealed a high level of technological knowledge among BECED students (composite mean = 3.30, SD = 0.17; Agree), indicating strong confidence in their ICT competencies. The highest-rated indicators were commitment to learning new technologies ($M = 3.50$), recognizing technology's role in learning ($M = 3.43$), and integrating appropriate digital tools into instruction ($M = 3.41$). These results support Bustos-Orosa (2022), who emphasized the importance of digital literacy in effective teaching. However, lower ratings in technical problem-solving ($M = 3.13$), breadth of technology knowledge ($M = 3.16$), and hands-on ICT experience ($M = 3.21$) suggest that students possess greater technological awareness than practical skills. This finding is consistent with Çebi et al. (2022), who reported that pre-service teachers often demonstrate stronger confidence in technology knowledge than in its application, and with Deng and Zhang (2023), who highlighted the need to integrate technological, pedagogical, and content knowledge for effective instruction. These findings underscore the importance of experiential ICT training, including digital lesson design, technology-enhanced microteaching, and guided troubleshooting, to strengthen technology integration skills and professional readiness (Pozo-Rico et al., 2023).

2. Respondents' Level of Perceived Achievement. This section presents the perceived level of achievement of the respondents in General, Professional, and Specialization Education courses within the Bachelor of Early Childhood Education curriculum. These curricular components provide the knowledge, competencies, and learning experiences that support students' academic achievement, holistic development, and preparation for effective, learner-centered teaching.

2.1. General Education. This component develops a broad foundation of knowledge, skills, and values essential for personal growth and responsible citizenship. They focus on three main areas namely knowledge competence, civic and personal responsibilities and practical skills which are institutionally necessary to achieve by a future educator.

The findings revealed a high level of perceived achievement in General Education among BECED students (composite mean = 3.32, SD = 0.13; Agree). The highest ratings were observed in civic and personal responsibilities, particularly in human rights awareness ($M = 3.47$) and Filipino identity ($M = 3.48$), reflecting strong values formation and civic consciousness. However, relatively lower ratings in interpreting global perspectives ($M = 3.14$), applying concepts across disciplines ($M = 3.27$), and problem-solving skills ($M = 3.30$) suggest areas for improvement in higher-order thinking and integrative learning. These findings support the work of Ulferts (2021), González-Fernández et al. (2023), and Totto (2021), who emphasized the importance of professional competence, reflective practice, and inquiry-based learning in teacher education. The results highlight the need to strengthen interdisciplinary, inquiry-based, and technology-enhanced learning experiences to further develop students' critical thinking, problem-solving, and readiness for 21st-century teaching.

2.2. Professional Education. This component equips future teachers with the knowledge, skills, and professional values needed to become competent, innovative, ethical, and collaborative educators.

The findings revealed that BECED students demonstrated a high level of perceived achievement in professional education (composite mean = 3.30, SD = 0.09; Agree). The highest-rated competencies were promoting creative and critical thinking ($M = 3.41$), communicating clear learning goals ($M = 3.39$), and utilizing appropriate learning resources and infrastructure ($M = 3.38$), indicating strong confidence in instructional planning and technology-enhanced teaching. These findings are consistent with studies highlighting the importance of digital competence, innovative pedagogy, and effective technology integration in improving learning outcomes (Galindo-Domínguez & Bezanilla, 2021; González-Fernández et al., 2023; Ulferts, 2021). In contrast, lower ratings in understanding philosophical foundations ($M = 3.11$) and broader socio-cultural contexts ($M = 3.20$ – 3.22) suggest a weaker grounding in theoretical and contextual aspects of education. This finding underscores the importance of strengthening reflective practice and theory-based learning

experiences to better integrate conceptual understanding with instructional competence (Duraku et al., 2022). Overall, the results indicate a need to balance pedagogical innovation with stronger theoretical foundations to enhance readiness for early childhood education.

2.3. Specialization Education. This component of the BECEd program equips future teachers with the specialized knowledge, skills, and values needed to support the holistic development of young learners through effective and inclusive educational practices.

The findings revealed that BECEd students demonstrated a high level of perceived achievement in specialization education (composite mean = 3.33, SD = 0.11; Agree). The highest-rated areas were lifelong learning, including valuing continuous growth (M = 3.50), actively seeking learning opportunities (M = 3.49), and commitment to professional development (M = 3.46). High ratings were also observed in advocating for children's rights (M = 3.48) and applying critical problem-solving skills (M = 3.43), reflecting strong professional dispositions and learner-centered values. These findings are consistent with studies emphasizing the importance of professional competence, reflective practice, and technology integration in teacher preparation (Galindo-Domínguez & Bezanilla, 2021; González-Fernández et al., 2023; Ulferts, 2021). However, lower ratings in applying advanced content and pedagogical knowledge (M = 3.20–3.27) suggest less confidence in translating theoretical knowledge into effective classroom practice. This finding highlights the need for greater emphasis on practice-based learning, strengthened content preparation, and technology-enhanced instruction. Consistent with Duraku et al. (2022), continuous professional development and reflective practice remain essential for preparing competent, ethical, and adaptable early childhood educators.

3. Relationships Between the Knowledge Level and Perceived Level of Achievement of BECEd Students.

The correlational results in Table 4 show consistent, significant positive relationships between BECEd students' Content, Pedagogical, and Technological Knowledge and their perceived achievement in General, Professional, and Specialization Education ($r = .584-.759$, all $p < .001$).

Table 4

Relationships between the knowledge level and perceived level of achievement of BECEd students

Knowledge Domain	General Education r (Sig)	Professional Education r (Sig)	Specialization Education r (Sig)	Decision (Ho)	Verbal Interpretation
Content Knowledge	.621 (.000)	.679 (.000)	.584 (.000)	Reject Ho	Significant
Pedagogical Knowledge	.710 (.000)	.668 (.000)	.734 (.000)	Reject Ho	Significant
Technological Knowledge	.759 (.000)	.705 (.000)	.647 (.000)	Reject Ho	Significant

Note. All relationships are significant at $p < .05$ (two-tailed). Values reported as Pearson correlation coefficients (r).

Technological and pedagogical knowledge demonstrated the strongest associations with perceived achievement (Technology: $r = .759$ in General Education; Pedagogy: $r = .734$ in Specialization Education), indicating that students with higher TPACK competencies tend to report greater academic success. These findings suggest that the integration of content, pedagogy, and technology enhances meaningful learning, strengthens the connection between theory and practice, and supports academic performance. The results are consistent with Galindo-Domínguez and Bezanilla (2021) and González-Fernández et al. (2023), who emphasized the importance of digital competence, pedagogical adaptability, and reflective practice in teacher education. The findings further suggest that stronger TPACK competencies contribute to greater teacher self-efficacy and perceived academic achievement (Ulferts, 2021). This supports the integration of TPACK across the BECEd curriculum through authentic and practice-oriented learning experiences. Consistent with Duraku et al. (2022), continuous professional development and evidence-based teaching practices remain essential in preparing competent and adaptable early childhood educators. Overall, the significant positive relationships across all domains indicate that higher TPACK proficiency is associated with higher perceived achievement among BECEd students.

4. Proposed Intervention Training Program. The findings indicate that while BECEd students possess strong foundations in TPACK, literacy, inclusive pedagogy, and lifelong learning, areas for improvement remain in Mathematics, Science, classroom management, educational philosophy, critical thinking, instructional design, and practical ICT troubleshooting. The significant positive relationships between TPACK components and perceived achievement further suggest that integrated technological, pedagogical, and content competencies contribute to

academic success and professional readiness (Galindo-Domínguez & Bezanilla, 2021; González-Fernández et al., 2023; Ulferts, 2021; Duraku et al., 2022).

To address these gaps, the TEACHER (Transformative Education Advancement for Competent, Holistic, and Empowered Reflective Educators) Intervention Training Program was developed through a Google Site platform. The program consists of three components: LEARN, which focuses on PPST-aligned content enhancement; LIVE, which promotes ICT integration, AI-supported learning, and instructional practice; and LOVE, which emphasizes mentoring, reflective practice, and professional growth. Table 5 presents the proposed TEACHER Competency Intervention Training Program.

Table 5

TEACHER (Transformative Education Advancement for Competent, Holistic, and Empowered Reflective Educators): Competency-Based Intervention Training Program

Component	Objectives	Activities	Timeline	Office/ Persons Involved	Expected Outcomes
LEARN: Lighting Excellence through Academic Reinforcement and Nurturing	- Strengthen content mastery in Mathematics, Science, Educational Philosophies, and Contemporary World. - Enhance critical thinking and problem-solving.	- Mathematics and Science modules - Educational Philosophies infographics - Contemporary World lesson presentations	- Mathematics Second Semester (Four months) - Science: First Semester (Four months) - Educational Philosophies: Second Semester (Four months) - Contemporary World: First Semester (Four months)	Program Chairperson, Faculty Members, Project Proponent, First-Year and Second-Year BECED Students	- Improved mastery of core concepts in Mathematics, Science, and Educational Philosophies. - Increased student performance in content-based courses. - Enhanced academic preparedness and retention of foundational knowledge.
LIVE: Learning Integration through Virtual and Experiential Engagement	- Enhance technology integration and digital literacy. - Promote ethical and creative instructional design.	- Technology application module - ICT ethics guide - Digital resource repository - Digital lesson plans and instructional materials	First Semester (Four months)	Program Chairperson, Faculty Members, Project Proponent, Third-Year BECED Students	- Improved technology integration skills - Innovative digital instructional materials - Ethical and collaborative technology use
LOVE:	Strengthen pedagogical	- Webinars - Seminars	Annually during the	College Dean, Program	Strengthened professional ethics



International Journal of Education, Learning, and Pedagogical Sciences

International Journal of Education, Learning, and Pedagogical Sciences (INJELPS)

P - ISSN 3116-3769; E - ISSN 3116-3777

National Book Development Board (NBDB)
Registration as Book Publisher
(Print & Digital): 6312

PRC-CPD Accredited Provider:
PTR-2025-749

Learning
Opportunities
through
Values-Based
Education

competence,
reflective
practice, and
professional
ethics.
• Promote
inclusive and
values-based
teaching.

• Reflective
workshops

First Semester
(2026–2028)

One whole
day activity

Chairperson,
Faculty
Members,
Project
Proponent,
Resource
Speakers,
Student
Leaders, and
BECED
Students
(1st–4th Year)

and reflective
teaching practices.
• Increased
appreciation of
diversity, inclusivity,
and compassionate
education.
• Enhanced
commitment to
values-based and
learner-centered
teaching.

Through performance-based activities, competency assessments, and technology-enhanced learning experiences, the program aims to strengthen content mastery, pedagogical competence, classroom management, and ICT skills. Consistent with previous studies (Naida et al., 2024; Kulaksız & Toran, 2022; Pozo-Rico et al., 2023), the intervention supports teacher self-efficacy, innovation, and readiness for contemporary early childhood education while providing a framework for curriculum enhancement and sustainable technology integration. Additional details are available at the Google Site: <https://sites.google.com/view/teachercompetencies>.

Conclusions

Based on the study's key findings, the following conclusions were drawn:

1. The findings revealed that pre-service early childhood educators possess high proficiency in content, pedagogical, and technological knowledge, indicating strong preparation for the teaching profession. However, areas such as Mathematics, Science, and practical technology application require further enhancement highlighting the need for stronger teaching strategies, curriculum enhancement, and technology-integrated instruction.
2. Students demonstrated high perceived achievement in General, Professional, and Specialization Education, reflecting alignment with national teaching standards and strengths in competency application, ethical practice, and lifelong learning. Nonetheless, improvement is needed in educational philosophy and contemporary pedagogical content through better teacher development and reflective practice.
3. A significant positive relationship was found between students' knowledge levels and perceived academic achievement, highlighting the importance of knowledge mastery, self-efficacy, experiential learning, and technology-integrated training in developing competent future educators.
4. The study supports the implementation of a holistic intervention training program integrating academic reinforcement, technology-enhanced experiential learning, reflective practice, and values-based professional development to strengthen TPACK competencies, lifelong learning, and adaptability among future early childhood educators, and highlights the role of educational leadership in improving curriculum, faculty development, and program quality for stronger teacher preparation.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are offered.

1. Teacher education institutions may review, refine, and implement the proposed TEACHER competency-based intervention training program to strengthen BECED students' competencies in Mathematics, Science, reflective practice, classroom management, and technology integration.
2. Curriculum developers and teacher education program administrators may enhance the integration of experiential learning, technology-enhanced instruction, and authentic classroom applications across General, Professional, and Specialization Education courses to improve student confidence and instructional readiness.
3. Faculty members and teacher educators may provide enriched learning experiences that promote critical thinking, pedagogical content knowledge, educational philosophy, and practical technology application to support the development of competent and reflective future educators.
4. School leaders and educational administrators may support continuous professional development initiatives focusing on ethical teaching, inclusive education, classroom management, digital competence, and innovative pedagogical practices to strengthen teacher preparation and educational quality.
5. Educational policymakers may consider the findings when developing teacher competency standards, technology integration initiatives, and professional development frameworks that support future early childhood educators.

6. Future researchers may replicate and extend the study in other teacher education institutions and academic disciplines to validate the findings and examine the long-term effectiveness of competency-based intervention programs.

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P - ISSN 3116-3769; E - ISSN 3116-3777

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(Print & Digital): 6312

PRC-CPD Accredited Provider:
PTR-2025-749

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