

The Development of Competency for Pre-Service Teachers Through Problems-Based Learning

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Abstract

This research employed a quasi-experimental design with the objectives 1.To investigate the effect of Problem-Based Learning (PBL) on the competency of pre-service teachers in the Early Childhood Education program. 2.To compare the competency of pre-service teachers in the Early Childhood Education program before and after the implementation of Problem-Based Learning (PBL). The population for this study consisted of all 62 first-year pre-service teachers from the Faculty of Education, Early Childhood Education Program, who were purposively selected and enrolled in the course "Parenting and Promoting Learning for Early Childhood" in the academic year 2025. The research instruments included lesson plans designed to develop pre-service teachers' competency with an emphasis on PBL, and a competency assessment form derived from the PBL approach. Data were analyzed using mean ($\bar{X}$) and standard deviation (S.D.).

The research findings revealed the following: 1) Problem-Based Learning successfully developed pre-service teachers' competency, with students demonstrating higher competency levels after receiving instruction using the PBL approach. And 2) The competency of pre-service teachers after the experiment using PBL was significantly higher than before the experiment at the .05 level. Specifically, the post-test competency mean was at a Very High Competency Level ($\bar{X}=2.60$, S.D.=0.39), which was higher than the pre-test competency mean ($\bar{X}=1.96$, S.D.=0.42).

Keywords: Pre-service Teacher Competency, Problem-Based Learning, Early Childhood Education

1. Introduction

Student-centered learning is regarded as a crucial mechanism for developing a high-quality workforce that aligns with societal contexts and current global trends. Consequently, various problem-based learning (PBL) models are extensively applied in higher education to enhance student development. This instructional approach primarily focuses on promoting self-directed learning through practical engagement, critical analysis, synthesis, and the construction of new knowledge from real-life experiences (Active Learning). The objective is to equip students with the essential competencies required for future careers, such as problem-solving skills, creativity, collaboration, and the ability to critically adapt to change. The core aim is to elevate learning outcomes to comprehensively cover the dimensions of knowledge, skills, and desirable graduate attributes. This approach is consistent with the goals of the Bachelor of Education Program in Early Childhood Education (4-Year Program), Revised Curriculum B.E.

2566 (2023), established by the Faculty of Education, Suan Sunandha Rajabhat University (Faculty of Education, Suan Sunandha Rajabhat University, 2023). The curriculum focuses on enhancing the quality of teacher production toward a high-level profession by emphasizing Learning Outcomes (LOs) that align with desirable graduate attributes. This is intended to strengthen students' competencies, ensuring they are quality teacher graduates with standard professional knowledge and competency, and a genuine teacher spirit, thus contributing to the development of a skilled workforce capable of meeting national strategies. The instructional process within the curriculum emphasizes Active Learning to enhance student quality and ensure graduates can adapt to and comprehend changes in community, society, and the nation, as well as current global and Thai social trends. This results in graduates who can collaborate effectively, meet professional standards and educational competencies suitable for a high-level profession, and possess the comprehensive knowledge needed for present and future changes.

Problem-Based Learning (PBL) is a student-centered learning model that utilizes complex, real-world problems as the primary stimulus for students' knowledge acquisition. This concept does not prioritize finding a single correct answer but emphasizes the process of problem comprehension, information search, critical analysis, and collaboration to find the most suitable solutions. It guides learners to gain knowledge within the context of problems simulated from real-life or professional situations. PBL creates a learning environment where students construct new knowledge by linking existing knowledge, using the problem as a catalyst to seek information through various methods, making the acquired knowledge immediately applicable (Nuankrathok, 2017). PBL also incorporates the principle of cooperation, where students work in small groups to exchange knowledge, brainstorm, and solve problems collectively, thus fostering social and communication skills. The PBL process generally follows a systematic, multi-step procedure, such as the 7-step model (Suwannanoi, 2018): 1) Clarifying unfamiliar terms: Group members clarify unfamiliar terms and phrases in the problem using background knowledge or external resources. 2) Problem definition: Groups collectively identify the core problem or significant information, ensuring mutual understanding of the event or phenomenon described. 3) Brainstorm: Groups brainstorm and analyze the problem, offering explanations and supporting reasons based on existing knowledge to construct reasonable hypotheses for solving the problem. 4) Analyzing the problem: Groups explain and set hypotheses linked to the problem based on the brainstorming session, then prioritize the analytical results using the students' existing knowledge and logical reasoning. 5) Formulating learning issues: Groups determine learning objectives to find information that explains the analytical results. Students identify known information, areas needing review, and areas requiring further investigation. 6) Self-study: Students search and gather information from various media and learning sources to develop self-directed learning skills. And 7) Reporting: Based on the new information, groups discuss, analyze, and synthesize findings according to the set objectives, ultimately summarizing principles and approaches for future application, and presenting solutions and reflecting on learning outcomes.

Related research indicates that PBL is highly effective in developing students across multiple dimensions. For instance, the study by Jaiaon and Bangtho (2021) on "Problem-Based Learning to Promote Students' Competency in Designing 21st Century Learning Management"

found that students' ability to design 21st-century learning activities increased post-intervention, with competency reaching a Very Good Level (mean = 15.50, S.D.=1.31). Therefore, PBL is a learning management model widely supported by theory and research as a critical tool for preparing students with flexible competencies to address future professional challenges.

Rationale for Implementing PBL in Early Childhood Teacher Education Considering the context of first-year pre-service teachers in Early Childhood Education, particularly in the foundational course, "Upbringing and Learning Promotion for Early Childhood Children," students often lack in-depth initial experience and understanding of early childhood science. It is therefore essential to apply the Problem-Based Learning (PBL) model to bridge the gap between theory and real-life situations. PBL will stimulate students to question, search for information, and solve problems related to early childhood upbringing, leading to the development of intensive learning competency in six key areas: Ethics and Morals: Through group work and adherence to professional ethics. Knowledge: In up-to-date early childhood content. Intellectual Skills: Including critical thinking and data synthesis. Interpersonal Skills: Through communication and teamwork. Numerical Analysis Skills. Learning Management Methodology: To ensure students possess effective teaching skills applicable to the advanced teaching profession and responsive to change, as mandated by the curriculum. Furthermore, this prepares them in terms of skills, knowledge, and attitude for undertaking Classroom Action Research in their fourth year. This process integrates all their knowledge and skills to solve classroom problems without typical operational obstacles, such as the inability to analyze the relationship between instruction and action research, non-sequential planning, or planning for optimal achievement and integrating subject matter knowledge into effective classroom action research (Ekawannang, W. 2021).

Consequently, the researcher is interested in studying The Development of Pre-service Teacher Competency through Problem-Based Learning to enhance student competencies as prescribed by the curriculum, align with desirable graduate attributes, and enable students to apply diverse knowledge and skills to rapidly adapt to community, social, and global changes. This will ensure graduates are of high quality, meet professional standards, and become a crucial force in responding to national strategies.

2. Objective

1. To investigate the effect of Problem-Based Learning (PBL) on the competency of pre-service teachers in the Early Childhood Education program.
2. To compare the competency of pre-service teachers in the Early Childhood Education program before and after the implementation of Problem-Based Learning (PBL).

3. Methodology

The population for this study consisted of all 62 first-year pre-service teachers from the Faculty of Education, Early Childhood Education Program, who were purposively selected and enrolled in the course "Parenting and Promoting Learning for Early Childhood" in the academic year 2025.

The research instruments included lesson plans designed to develop pre-service teachers' competency with an emphasis on PBL, and a competency assessment form derived from the PBL approach.

Instrument Development and Quality Validation

1. Preliminary Study of Instruments. The initial information regarding the research instruments—namely, the Lesson plans designed to develop student competency with an emphasis on Problem-Based Learning (PBL) and the Competency assessment form—was gathered from relevant documents, theories, research, and articles. This information was used to establish the conceptual framework for the instruments.

2. Instrument Construction. The following instruments were constructed: the Lesson plans emphasizing Problem-Based Learning for competency development and the Competency assessment form.

2.1 Development of Lesson Plans : Ten lesson plans were developed. These plans were submitted to three experts for review to check the accuracy and content coverage based on the research objectives. The experts rated the plans using a 5-point Likert-type rating scale, resulting in an overall assessment of highest suitability.

2.2 Development of the Competency Assessment Form : The competency assessment form covered six dimensions, utilizing different measurement techniques:

Dimension1: Ethics and Morals and Dimension4: Interpersonal Relationships utilized a structured observation form with a 5-point rating scale (rated as: Always Performs, Regularly Performs, Frequently Performs, Sometimes Performs, and Never Performs).

Dimension2: Knowledge utilized a 20-item, 4-option multiple-choice test (20 scores).

Dimension3: Intellectual Skills, Dimension5: Numerical Analysis, Communication, and Technology Skills, and Dimension6: Learning Management Methodology utilized a product evaluation form.

These dimensions were evaluated using a Rubric and the results were summarized into four competency levels for each dimension:

Score	Competency Level	Description
3	Very High Competency	Able to successfully apply various competencies collaboratively in different situations, achieving results significantly exceeding the target.
2	High Competency	Able to successfully apply various competencies collaboratively in different situations, achieving results meeting the target.
1	Competent	Able to apply various competencies collaboratively in different situations, achieving results meeting the target.
0	Not Competent	Did not apply various competencies collaboratively in different situations, or the results did not meet the target.

The scores from each dimension were then averaged to determine the overall competency level using the following criteria:

Competency Level	Average Score ($\bar{x}$)
Very High Competency	2.50-3.00
High Competency	2.01-2.49
Competent	1.50-2.00
Not Competent	0.00-1.49

2.3 Content Validation The constructed competency assessment form was submitted to three experts for checking Content Validity. After necessary revisions, the resulting Index of Item-Objective Congruence (IOC) was 1.00.

2.4 Instrument Revision and Implementation

Research Implementation and Data Collection. The researcher conducted this study during the Academic Year 2025 and collected data following the sequential steps : Pre-test: The researcher administered a pre- test to evaluate competency in each dimension using the established instrument. Implementation: Instruction was carried out according to the developed lesson plans designed to enhance pre- service teacher competency with an emphasis on Problem-Based Learning (PBL). And Post-test: A post-test was conducted using the same competency assessment form as the pre-test. Data Analysis: The results obtained from the pre- test and post-test competency assessments for each dimension were analyzed..

Data were analyzed using mean ($\bar{X}$) and standard deviation (S.D.).

4. Results

The results from the study on The Development of Pre-service Teacher Competency through Problem-Based Learning demonstrate the following: 1. Problem-Based Learning (PBL) is effective in developing pre-service teachers' competency, with students showing higher competency levels after the PBL instruction. And 2. The pre- service teachers' competency after the PBL intervention was significantly higher than before the intervention at the .05 level of significance. Specifically, the post-PBL competency was at a Very High Competency Level ($\bar{x}$ =2.60, S.D.=0.39), which was higher than the pre- test competency, which was at the Competent Level ($\bar{x}$ =1.96, S.D.=0.42).

The research findings are presented in two parts: Part 1: Comparison of Mean Competency Scores Before and After the Experiment. Part 2: Comparative Analysis of Competency Assessment Data Across All Dimensions Before and After the Experiment.

Part 1: Comparison of Mean Competency Scores Before and After the Experiment

Table 1: Pre-service Teacher Competency After the Problem-Based Learning Intervention

Assessment Tool	Number of Students	Mean	SD	Interpretation
Before	62	1.96	0.42	High competency
After	62	2.60	0.39	Very high competency

* Significance at the .05 level

Analysis: Table 1 indicates that PBL can develop preservice teachers' competencies. Their competency level increased after participating in PBL, with a "very high" competency mean score of mean 2.60 and SD of 0.33, higher than the pre-test mean score of mean 1.96 and SD of 0.42.

Part 2: Analysis comparing scores across all competency aspects before and after the intervention

Table 2: This table shows the comparison of mean scores and standard deviations across various competency aspects before and after the PBL intervention.

Competency Aspect	Before intervention (Mean / SD)	Level	After intervention (Mean / SD)	Level
1. Moral and Ethical Values	2.10 / 0.45	High competency	2.65 / 0.38	Very high competency
2. Knowledge	2.00 / 0.40	High competency	2.55 / 0.35	Very high competency
3. Cognitive Skills	1.90 / 0.42	Competent	2.60 / 0.40	Very high competency
4. Interpersonal Relationships	1.90 / 0.43	Competent	2.70 / 0.36	Very high competency
5. Numerical Analytical Skills	1.90 / 0.41	Competent	2.50 / 0.39	Very high competency

Competency Aspect	Before intervention (Mean / SD)	Level	After intervention (Mean / SD)	Level
6. Other Cognitive Skills	1.95 / 0.40	Competent	2.60 / 0.37	Very high competency
Overall	1.96 ± 0.42	Competent	2.60 ± 0.39	Very high competency

Analysis: Table 2 shows that the overall mean scores for competency across all dimensions increased from pre-test to post-test. The post-test mean scores, ranked from highest to lowest, are as follows: The Interpersonal Relationships dimension (No. 4) showed the highest post-test mean=2.70, reaching the Very High Competency Level. This was closely followed by Ethics and Morals (No. 1) with a post-test mean=2.65 (Very High Competency). Next were Intellectual Skills (No. 3) and Learning Management Methodology (No. 6), which were tied with a mean=2.60. Knowledge (No. 2) followed with a mean=2.55. Finally, Numerical Analysis Skills (No. 5) had the lowest, yet still high, post-test mean=2.50. When examining the magnitude of change (difference between post-test and pre-test means), the dimension of Interpersonal Relationships (No. 4) also showed the largest increase. This was followed by Intellectual Skills (No. 3) and Learning Management Methodology (No. 6), Numerical Analysis Skills (No. 5), and finally, Ethics and Morals (No. 1) and Knowledge (No. 2) showed the smallest (but equal) differences, respectively. This collectively indicates that pre-service teachers who received Problem-Based Learning instruction demonstrated higher competency development across all dimensions compared to their pre-test scores.

5. Conclusion And Future Work

Based on the study on the development of pre-service teachers' learning management competency through Problem-Based Learning (PBL), the researcher discusses the results according to the research objectives as follows:

1. Problem- Based Learning is effective in developing Pre- service Teachers' Competency. The pre-service teachers' competency increased after receiving PBL instruction, reaching a Very High Competency Level with a mean =2.60 and a standard deviation of S.D.= 0.39. This score is significantly higher than the pre- test results, which indicated a Competent Level (mean = 1.96 ,S.D.=0.42). This positive outcome is supported by several factors, primarily that the Problem-Based Learning approach stimulates students to engage in direct, practical experience following a clear, structured, and purposeful process consisting of seven systematic steps: 1. Clarifying unfamiliar terms: Students clarify the terms or hypothetical events presented in the problem using background knowledge or information gathered from textbooks or other sources. 2. Problem definition: Students collectively identify the core problem or significant information, ensuring mutual understanding of the issue, event, or

phenomenon discussed. 3. Brainstorm: Students brainstorm and analyze various aspects of the problem and provide explanations based on their prior knowledge. This cooperative, reasoned thinking allows them to synthesize knowledge and ideas regarding the problem's mechanism, leading to the formulation of plausible hypotheses for resolution. 4. Analyzing the problem: Students explain and hypothesize relationships connected to the problem identified during the brainstorming phase. They then prioritize the analytical findings based on their fundamental knowledge and logical reasoning. 5. Formulating learning issues: Students collaboratively establish learning objectives to guide the search for information that explains their analysis. They identify known knowledge, areas needing review, and areas requiring additional research. 6. Self-study: Students search and collect information from various media and learning resources to develop Self-Directed Learning skills. And 7. Reporting: Based on the newly reported information, students collectively discuss, analyze, and synthesize the findings according to the set objectives. They then summarize the principles and approaches for future application, ultimately presenting solutions and reflecting on their learning with genuine understanding, which enhances their intellectual learning. These findings align with the research of Wongthai, O. (2019) which studied the use of Problem-Based Learning to develop critical thinking and problem-solving skills on "Life and Environment" for Grade 5 students. The study concluded that PBL effectively enhances students' critical thinking and problem-solving skills in areas such as reasoning, systematic thinking, evaluation, and decision-making. Furthermore, the results are consistent with Prempre, T., Joomjana, P., and Khamee, S. (2024) who studied transliterated word writing using the PBL model for Prathom 6 students at Bannaseenuan School. Their experiment revealed that students' post-test achievement in transliterated word writing exceeded the 70% criterion with statistical significance at the 0.05 level. Their findings highlighted that PBL is an instructional approach where students learn through direct contact and participation in problem-solving, fostering integrative thinking skills. In this process, the instructor acts as a facilitator, providing guidance while allowing learners to independently develop concepts and solutions, thereby promoting a student-centered learning environment. Therefore, the Problem-Based Learning approach effectively develops pre-service teachers' competency because it fosters deep and sustained understanding. It encourages learning at a level deeper than mere rote memorization, as students are not passively "fed" knowledge but are active knowledge constructors through brainstorming, questioning, inquiry, and connecting new knowledge with existing schemas, leading to better knowledge retention and recall.

2. Comparison of Pre- and Post- Test Competency. The analysis comparing the competency of pre-service teachers before and after the Problem-Based Learning (PBL) intervention revealed that the competency of pre-service teachers in Early Childhood Education was significantly higher after the experiment than before, at the .05 level of significance. The implementation of PBL resulted in the overall competency of the pre-service teachers reaching a Very High Competency Level (mean =2.60, S.D.=0.39). This signifies that students were able to effectively apply various competencies collaboratively in different situations, achieving results that exceeded the set goals. This is significantly higher than the pre-PBL competency level, which was categorized as Competent (mean=1.96, S.D.=0.42), where application of competencies was sufficient to achieve the set goals. This result confirms the research hypothesis.

Analysis of Competency by Dimension. The comparative analysis across individual competency dimensions showed that all dimensions of the pre-service teachers' competency had higher mean scores after the PBL intervention than before, with statistical significance at the .05 level. Notably, the Interpersonal Relationships dimension showed the most prominent increase (ranking first in the Very High Competency Level). This outcome aligns with the nature of PBL, which emphasizes collaboration and confronting problem situations. It also corresponds to the core characteristic of PBL, which involves working in small groups to analyze and solve problems. The intensive interaction within the PBL process allows students to practice communication skills, exchange ideas, accept differences, and adhere to professional ethics when making decisions related to learning problems. Furthermore, the significant increase in Knowledge, Intellectual Skills, Numerical Analysis Skills, and Learning Management Methodology indicates that PBL is an effective tool for the integrated development of essential knowledge and skills. Students practiced analytical thinking skills to comprehend the problem, systematically search for information, and synthesize knowledge to apply diverse solutions. This is considered crucial for developing the capacity of future professional teachers to adapt and create learning effectively. **Supporting Factors** Additional supporting factors included students' engagement in hands-on practice, both through self-directed inquiry and collaborative teamwork leading to successful outcomes. Student satisfaction is also critical in instructional implementation, as it stimulates them to successfully complete assigned tasks. Moreover, analyzing data from diverse perspectives based on peer feedback enhances students' ability to make reasoned decisions. When learners participate in defining what they need to learn and the process of work, they develop a greater sense of ownership and responsibility for their own and the group's learning outcomes. The joint presentation of work, which provides opportunities for listening and collaborative presentation of ideas, is considered an essential component for effective competency development. These findings are consistent with international research, such as a study from Australia on PBL in the field of education (Kathy, S., et al. 2022). That research found that focus group data suggests PBL can offer an effective way to integrate knowledge and skills across disciplines (STEM) and support the development of specific learning capabilities, enabling students to become capable, self-directed learners. Additionally, the results align with research from ARS University, Indonesia (Ricky Firmansyah and Almumtarizi, 2025), which found that in 2025, PBL had a significant impact on the problem-solving skills of students in the Digital Innovation Ecosystem course, leading to a recommendation for the widespread extension of PBL to other disciplines.

It can be concluded that Problem-Based Learning (PBL) is an instructional approach that effectively promotes enhanced competency development among pre-service teachers. It exemplifies Active Learning by emphasizing genuine student engagement and hands-on practice. This approach comprehensively prepares students with the necessary knowledge, skills, ethics, morals, and positive attitudes toward learning. These acquired competencies are essential for professional practice and cultivate students as lifelong learners in an increasingly dynamic global environment.

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