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The lesson planning knowledge of pre-service science teachers

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Abstract

This study assessed lesson planning knowledge and final teaching demonstration performance among pre-service science teachers at Central Bicol State University of Agriculture–Pasacao Campus during the second semester of academic year 2025–2026. Using a quantitative descriptive-correlational design, the study covered all 82 fourth-year Bachelor of Secondary Education major in Science interns. Data were obtained through a 24-item five-point Likert-scale lesson planning knowledge questionnaire and the Pre-Service Student Teaching Demonstration Evaluation Form. Weighted means, one-way analysis of variance, and Pearson product–moment correlation with t-tests were employed. Respondents were classified as having Very High Knowledge in writing lesson plans (4.52), competencies required to write a lesson plan (4.50), and assessment and assignment (4.59), and Very Knowledgeable in creating lesson objectives (4.46). Knowledge did not significantly differ across the four dimensions ($p = .233$). All seven final teaching demonstration parameters were rated Outstanding Performance, with means from 4.55 to 4.67; differences among performance parameters were not significant ($p = .705$). Positive statistically significant correlations were reported between all four knowledge dimensions and seven performance parameters ($r = .317–.772$). The findings support targeted enhancement in objective writing, lesson planning, higher-order thinking strategies, and classroom communication. The correlational design does not establish causation.

Keywords: lesson planning knowledge, pre-service science teachers, teaching demonstration, teacher education, instructional planning

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The lesson planning knowledge of pre-service science teachers

1. Introduction

Lesson planning is recognized as one of the most essential competencies of teachers because it provides a structured framework for instruction, aligns learning objectives with activities, and ensures that assessment measures intended outcomes. Technically, a lesson plan is the instructor's road map of what students need to learn and how it will be done effectively during the class time (Singapore Management University, 2026). In the same way, Cox (2019), which stated instructional guides emphasize that lesson plans function as roadmaps that organize content, strategies, and evaluation methods to support effective classroom teaching. National policy guidelines further stress that daily lesson preparation must demonstrate alignment among objectives, procedures, and assessment to ensure instructional quality and learner achievement (Department of Education, 2016). Professional teaching standards likewise identify instructional planning as a core domain of teacher competence (Department of Education, 2017). Thus, the quality of lesson planning directly influences instructional effectiveness and student learning outcomes.

In the context of teacher education, a lesson plan is one of the major components of the various activities that pre-service teachers and teacher interns undertake. Lesson plan writing is perceived as an endeavor that develops pre-service teachers' proficiency in planning relevant and appropriate learning activities and effective assessments to achieve intended and optimal learning outcomes (Joint DEPED–CHED Memorandum Order No. 1, s. 2021). In fact, according to Capobianco & Faber (2017), lesson planning is crucial to pre-service teachers' development, because it demonstrates all the components needed to deliver an excellent class.

As a matter of fact, lesson plans are widely recognized as an essential part of basic education instruction worldwide because of their usefulness in the classroom, particularly for pre-service instructors (Schulten, 2017). For example, Wagner (2016) justified the value of lesson plans, claiming that they are used all over the world because they help students develop the attitudes, knowledge, and skills necessary to live and work in the connected world of today and to create a sustainable, peaceful, and inclusive world for future generations. Additionally, he argued that these global abilities are frequently acknowledged as "21st century skills" necessary for hiring in the modern global economy. Henceforth, in order to prepare pre-service teachers to be effective, engaged, and compassionate global citizens, these global competences must now be taught to them. Teachers could help their students develop these competencies both within and outside of the classroom by using well-organized and thoughtfully created lesson plans. Thoughtfully structured lesson plans not only enhance classroom learning but also nurture the development of global citizenship competencies in both teachers and students.

Scholarly literature describes lesson planning as both a technical and cognitive process that requires analysis of learner needs, selection of appropriate strategies, and preparation of aligned assessment tools. Lesson planning is not merely compliance with format but an expression of pedagogical decision-making and curriculum interpretation (Cox, 2019).

In the Philippines, The Department of Education (DepEd) has recognized the importance of the lesson plan under Section 42 of DepEd Order No. 2016, often referred to as "Daily Lesson Policy Guidelines K–12 Basic Education Program Preparation." This directive is consistent with the Republic of The Enhanced Basic Education Act of 2013, also known as Act (RA) No. 10533. For planners of education in the Philippines, these legal document alignments are based on the idea that a lesson plan is essential to guaranteeing the most effective and efficient way to give instruction and learning in schools in order to accomplish learning results. Teacher education policies and standards reinforce the need for strong lesson planning competence among pre-service teachers. National curriculum and teacher education guidelines specify that teacher preparation programs must develop competency in preparing aligned lesson plans and assessment tools (Commission on Higher Education [CHED], 2017a, 2017b).

Guidelines for pre-service teacher deployment also emphasize instructional readiness and planning competence prior to classroom immersion (CHED–DepEd, 2021).

Consistently, according to Cuñado and Abocejo (2019), a well-executed lesson plan consistently results in capable educators who develop into successful and productive instructors. When examining the teaching process, planning exercises should be a key component, starting from instructional planning, followed by the lesson plan's successful execution. This viewpoint, among others, serves as the basis for why pre-service teachers' creation of lesson plans is essential to programs for teacher education. During the internship of pre-service teachers, they are expected to develop and know the knowledge necessary to create effective lesson plans. Lesson planning is a crucial competency because it guides instruction, aligns objectives with learning activities, and ensures appropriate assessment of learning outcomes. However, questions remain about how well pre-service teachers understand and apply the principles of lesson planning, particularly in designing objectives, aligning activities, and preparing assessments. Research focusing on pre-service teachers indicates that many are familiar with lesson plan formats but encounter difficulties in writing measurable objectives, aligning activities with competencies, and constructing appropriate assessment measures indicating the feels that they are still unprepared for the more difficult stage of their training—preservice teaching. Empirical investigations of pre-service teacher lesson plans reveal frequent problems in congruence among objectives, subject matter, and evaluation components (Tantoy, 2019).

Analyses of planning outputs show that assessment and assignment sections are often weakly aligned with intended learning outcomes, which reduces instructional effectiveness (Abate, T. & Mishore, E., 2024). Studies recommend structured mentoring, guided practice, and validated lesson planning frameworks to strengthen pre-service teachers' planning skills (Tantoy, 2019; Sudirman, 2017). In study of Sanchez (2024), it demonstrated difficulties in creating SMART goals, establishing forms, guaranteeing congruence, combining disciplines, picking pertinent activities, and upholding proper syntax. Limited exposure, minimal feedback, and inadequate references were among the causes. Additionally, studies by Gafoor & T.K. (2016) stated that the most frequent difficulties cited by student teachers in lesson planning are: in choosing learning experiences appropriate to the learners, deciding and allotting the time suitably for every lesson, in identifying and developing proper learning aids, and in executing the planned lesson in classroom. Moreover, a study on lesson planning challenges among pre-service teachers by Sebullen, M. (2023) found poorly stated instructional goals and a failure to integrate the key elements of lesson planning (objectives, activities, assessments). Research also shows that insufficient guided practice and feedback contribute to planning errors and misalignment across lesson components (Tantoy, 2019).

These difficulties are one of the reasons why pre-service teachers and even in-service teachers differ in their lesson planning knowledge and skills. In Sanchez's (2024) mixed-method study of 229 pre-service teachers in the Philippines showed that respondents demonstrated partial mastery of lesson planning concepts, with poor planning skills and a moderate correlation between knowledge and skills — indicating that challenges in planning are associated with lower lesson planning knowledge.

In pursuant to the research findings presented above, it is implied that pre-service teachers must possess a high level of knowledge in all key aspects of lesson planning—including writing lesson plans, creating lesson objectives, identifying the competencies required to write a lesson plan, and designing appropriate assessments and assignments. Adequate knowledge in these areas equips pre-service teachers with the necessary foundation to become efficient and effective teachers in the making. More importantly, strong lesson planning knowledge ensures that they are better prepared for real classroom teaching as they complete their training and transition into the teaching profession.

The gathered related literature and studies showed that the student teachers have difficulties and challenges during their teaching internship program in terms of formulating lesson plans. Hence, there is a need to conduct an assessment on lesson planning knowledge and performance in final teaching demonstrations of the pre-service science teachers. However, only few of them have conducted studies at the end of their internship. Thus, this study determined the level of lesson planning knowledge and performance in final teaching demonstration of pre-service

science teachers at Central Bicol State University of Agriculture – Pasacao Campus during the second semester of Academic Year 2025–2026. The findings of this study served as a basis for programs aimed at strengthening the lesson planning knowledge and performance in final teaching demonstration of pre-service science teachers.

Gap-Bridged: Previous studies have examined the lesson planning knowledge and challenges of pre-service teachers. However, limited research has specifically investigated the lesson planning knowledge of pre-service science teachers at the end of their teaching internship and its relationship with their performance in final teaching demonstrations. This study addresses that gap by assessing their lesson planning knowledge across four dimensions and teaching performance across seven parameters, particularly among fourth-year BSEd Science students at CBSUA–Pasacao Campus.

Objective: This study, which focuses on the level of lesson planning knowledge and performance in final teaching demonstration of pre-service science teachers in Central Bicol State University of Agriculture, Pasacao Campus, academic year 2025 to 2026, aims to achieve the following objectives:

- Assess the level of knowledge of pre-service teachers in lesson planning along the following dimensions: Writing a lesson plan, creating lesson objectives, competencies required to write a lesson plan, assessments and assignments
- Describe the significant difference in the level of lesson planning knowledge along with the dimensions.
- Assess the level of performance of pre-service science teachers in final teaching demonstration along with the following parameters: Established safe and secure learning environments, content knowledge across curriculum teaching areas, literacy and numeracy teaching strategies, fair, respectful, and caring learning environment, critical, creative, and higher-order thinking strategies, proficient use of mother tongue, Filipino, and English, timely, accurate, and constructive feedback?
- Describe the significant difference in the level of performance of pre-service science teachers in final teaching demonstration along the parameters
- Describe the significant relationship between the level of performance in final teaching demonstration and the level of lesson planning knowledge of pre-service science teachers
- Propose enhancement program that can be developed out of the study to improve the lesson planning knowledge and performance in final teaching demonstration of pre-service science teachers.

Scope and Delimitation: The study involved only 82 fourth-year Bachelor of Secondary Education major in Science students at Central Bicol State University of Agriculture – Pasacao Campus during Academic Year 2025–2026. Although the study covered the entire target population, the findings may not be generalizable to pre-service teachers from other specializations, year levels, or educational institutions.

2. Methods

Research Design - The research employed a quantitative descriptive-correlational design. Descriptive analyses characterized lesson planning knowledge and teaching demonstration performance; one-way ANOVA compared dimension and parameter means, and Pearson correlations examined associations between the two constructs. As an observational cross-sectional investigation, the study does not permit causal interpretation.

Research Locale and Respondents - The study was conducted at Central Bicol State University of Agriculture, Pasacao Campus, during the second semester of academic year 2025–2026. The participants were 82 fourth-year

Bachelor of Secondary Education major in Science interns, comprising 44 students from Science 4-A and 38 from Science 4-B.

Sampling Technique - Total population enumeration was used: all 82 eligible fourth-year BSEd Science interns were included rather than drawing a sample.

Research Instruments - Lesson planning knowledge was measured using a 24-item, five-point Likert-scale questionnaire adopted from Cantero and Muegna (2025). The instrument yielded a Cronbach alpha of .898 for the adopted instrument. Four dimensions were assessed: writing a lesson plan, creating lesson objectives, competencies required to write a lesson plan, and assessment and assignment. This study interprets means of 4.50–5.00 as Very High Knowledgeable and 3.50–4.49 as Very Knowledgeable. Teaching performance was assessed using the College of Education's Pre-Service Student Teaching Demonstration Evaluation Form, covering seven teaching parameters: established safe and secure learning environments; content knowledge across curriculum teaching areas; literacy and numeracy teaching strategies; fair, respectful, and caring learning environment; critical, creative, and higher-order thinking strategies; proficient use of mother tongue, Filipino, and English; and timely, accurate, and constructive feedback. Scores of 4.50–5.00 were interpreted as Outstanding Performance.

Data Collection, Analysis, and Ethics - Following institutional permission, the researchers obtained informed consent and administered the instruments using Google Forms. Responses were checked, organized, and analyzed using weighted means, one-way ANOVA, and Pearson product–moment correlations with significance testing at the .05 level. This study reports voluntary participation, confidentiality, and observance of the Philippine Data Privacy Act of 2012.

3. Results And Discussion

Table 1
Lesson Planning Knowledge

Dimension	Mean	Interpretation
Writing a lesson plan	4.52	Very High Knowledgeable
Creating lesson objectives	4.46	Very Knowledgeable
Competencies required to write a lesson plan	4.50	Very High Knowledgeable
Assessment and assignment	4.59	Very High Knowledgeable

The results indicate that pre-service science teachers demonstrated a high level of lesson planning knowledge across all four dimensions. Assessment and assignment obtained the highest mean (4.59), followed by writing a lesson plan (4.52) and competencies required to write a lesson plan (4.50), all interpreted as Very High Knowledgeable. Meanwhile, creating lesson objectives recorded the lowest mean (4.46), interpreted as Very Knowledgeable. These findings suggest that respondents possess strong foundational knowledge of lesson planning, particularly in assessment preparation. However, the relatively lower rating in creating lesson objectives highlights an area for further improvement through targeted instructional training and practice. These patterns indicate useful areas for targeted preparation even when overall self-reported knowledge is high.

Table 2
Significant difference in the level of lesson planning knowledge of the pre-service science teachers along the dimensions

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.828777	3	0.276259	1.433418	0.233	2.63248
Within Groups	62.44367	324	0.192727			
Total	63.27245	327				

Table 2 shows that there is no significant difference in the level of lesson planning knowledge of pre-service science teachers along with writing a lesson plan, creating lesson objectives, competencies required to write lesson plan, and assessment and assignment. It was shown that the p-value of 0.233 was greater than the significance level of 0.05, and therefore, there is no significant difference in the level of lesson planning knowledge of pre-service science teachers across four dimensions.

The findings imply that pre-service science teachers demonstrate strong lesson planning knowledge in all dimensions, particularly in assessment and assignment. However, creating lesson objectives appears to be the least developed area among the dimensions. This may suggest that while pre-service science teachers are knowledgeable in preparing activities and assessments, they may still need enhancement in writing objectives that are specific, measurable, achievable, relevant, and time-bound. This finding supports the study of Ponce (2024), which revealed that pre-service teachers commonly demonstrate stronger performance in instructional activities and assessment than in objective formulation. Likewise, Sanchez (2024) found that lesson objective construction remains one of the most challenging aspects of lesson planning among pre-service teachers.

Table 3
Final Teaching Demonstration Performance

Teaching performance parameter	Mean	Interpretation
Safe and secure learning environment	4.62	Outstanding Performance
Content knowledge across curriculum areas	4.58	Outstanding Performance
Literacy and numeracy teaching strategies	4.60	Outstanding Performance
Fair, respectful, and caring learning environment	4.61	Outstanding Performance
Critical, creative, and higher-order thinking strategies	4.59	Outstanding Performance
Proficient use of mother tongue, Filipino, and English	4.55	Outstanding Performance
Timely, accurate, and constructive feedback	4.67	Outstanding Performance

All seven parameters were classified as Outstanding Performance. Timely, accurate, and constructive feedback obtained the highest mean (4.67), followed by maintaining a safe and secure learning environment (4.62) and promoting fairness, respect, and care (4.61). Meanwhile, proficient use of mother tongue, Filipino, and English recorded the lowest mean (4.55). Although the differences may guide training priorities, the ANOVA indicated no statistically significant differences among performance parameters ($p = .705$). The computed p-value of 0.705 is greater than the 0.05 level of significance. This indicates that there is no significant difference in the performance of the pre-service science teachers across the seven teaching parameters. The findings imply that pre-service science teachers demonstrated a relatively consistent level of performance in all parameters of their final teaching demonstrations. Although slight variations in the mean scores were observed, these differences were not statistically significant. This suggests that the pre-service science teachers were able to perform uniformly across all seven parameters.

Table 4
Significant difference in the performance of the pre-service science teachers in final teaching demonstration along the parameters

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.752718	6	0.125453	0.631727	0.705	2.114554
Within Groups	112.599	567	0.198587			
Total	113.3517	573				

Table 4 presents the analysis of variance (ANOVA) on the performance of pre-service science teachers in their final teaching demonstration along the different parameters. The computed p-value of 0.705 is greater than the 0.05 level of significance. This indicates that there is no significant difference in the performance of the pre-service science teachers across the seven teaching parameters. The findings imply that pre-service science teachers demonstrated a relatively consistent level of performance in all parameters of their final teaching demonstrations. Although slight variations in the mean scores were observed, these differences were not statistically significant. This suggests that the pre-service science teachers were able to perform uniformly across all seven parameters.

3.1 Relationship Between Lesson Planning Knowledge and Teaching Performance

The Pearson product–moment correlation analysis revealed statistically significant positive relationships between the four dimensions of lesson planning knowledge and the seven parameters of final teaching demonstration performance, with correlation coefficients ranging from $r = .317$ to $r = .772$. The strongest relationship was observed between knowledge in assessment and assignment and the ability to establish a safe and

secure learning environment (r = .772). Conversely, the weakest relationship was recorded between knowledge in writing a lesson plan and proficiency in using the mother tongue, Filipino, and English (r = .317).

These findings indicate that pre-service science teachers who reported higher levels of lesson planning knowledge also tended to obtain higher ratings in their final teaching demonstrations. The positive associations across all dimensions suggest that lesson planning knowledge and teaching performance are closely related aspects of pre-service teacher preparation. Nevertheless, these relationships should not be interpreted as causal because the study employed a descriptive-correlational research design.

3.2 Proposed Enhancement Programs

Four programs were proposed on the basis of the observed relative weaknesses: a Lesson Objective Writing Enhancement Seminar; an Effective Lesson Planning Workshop; a Higher-Order Thinking Skills Integration Workshop; and Communication Skills and Language Proficiency Training. The Lesson Objective Writing Enhancement Seminar was proposed because creating lesson objectives obtained the lowest mean among the dimensions of lesson planning knowledge. This program aims to improve the competency of pre-service science teachers in writing SMART learning objectives. According to Benjamin Bloom, clearly stated and measurable learning objectives are essential in achieving effective instruction and learner outcomes. The comparatively lower mean obtained in creating lesson objectives suggests that there are still areas where pre-service science teachers need improvement. Strengthening competencies in writing lesson objectives may help improve lesson alignment, classroom activities, and assessment procedures.

The Effective Lesson Planning Workshop was proposed based on the significant relationship found between lesson planning knowledge and teaching performance. Since the study revealed that higher lesson planning knowledge was associated with better teaching demonstration performance, the program aims to strengthen competencies in preparing organized, learner-centered, and competency-based lesson plans. DepEd Order No. 42, s. 2016 supports this program by stating that proper daily lesson preparation enhances teachers' instructional practices and ensures meaningful learning experiences among learners. The Higher-Order Thinking Skills (HOTS) Teaching Strategies Seminar was proposed because the indicator "Ask questions that develop critical thinking skills/higher-order thinking skills (HOTS)" received the lowest mean in the parameter "Critical, creative, and higher-order thinking strategies". This program aims to enhance the ability of pre-service science teachers to integrate higher-order questioning techniques, inquiry-based activities, and problem-solving strategies into lesson planning and classroom instruction.

The Communication Skills and Language Proficiency Training was proposed because the indicator "Proficient use of Mother Tongue, Filipino, and English" obtained the lowest mean among the seven teaching performance parameters. This program aims to improve classroom communication and instructional language use among pre-service science teachers. Wagner (2016) explained that effective communication strategies help learners connect classroom learning to real-life contexts, while Schulten (2017) emphasized that meaningful and relevant classroom communication improves learner engagement and participation. These proposed enhancement programs are linked to the findings of the present study, which examined the lesson planning knowledge and teaching performance of pre-service science teachers. They translate the study's findings into practical professional development opportunities that may further strengthen the participants' competencies.

4. Conclusion

The 82 pre-service science teachers demonstrated high reported knowledge across four lesson planning dimensions and outstanding final teaching demonstration ratings across seven performance parameters. Differences across knowledge dimensions and across teaching performance parameters were not statistically significant, while this study reported positive significant associations between lesson planning knowledge and teaching performance. Creating lesson objectives and classroom language proficiency were the lowest-rated areas

in their respective sets. Teacher education programs may prioritize differentiated objective writing, instructional design, higher-order thinking, and communication practice while sustaining existing strengths. Future research could test the proposed enhancement programs and use additional direct measures of lesson plan quality. Findings are specific to one campus and cohort and should not be interpreted as causal.

Implications of the Study - The findings of this study have significant implications for teacher education, curriculum development, instructional practices, and the professional preparation of pre-service science teachers. The results provide a basis for sustaining existing strengths and addressing areas that require further improvement in lesson planning knowledge and teaching performance. Specifically, the findings have the following implications for the identified beneficiaries:

- ***Administration of Central Bicol State University of Agriculture – Pasacao Campus.*** The findings imply that the institution should sustain its existing teacher education practices while implementing the proposed enhancement programs to further strengthen the lesson planning knowledge and teaching performance of pre-service science teachers. Although the respondents demonstrated generally high levels of knowledge and outstanding teaching performance, areas such as creating lesson objectives, developing higher-order thinking skills, and improving communication proficiency still require attention. Thus, the administration may consider providing institutional support for seminars, workshops, and training programs that address these areas.

- ***Curriculum Planners.*** The results highlight the need for continuous evaluation and improvement of the existing teacher education curriculum, particularly in strengthening the integration of lesson planning knowledge and practical teaching competencies. Although the respondents demonstrated high levels of knowledge across the four dimensions, creating lesson objectives obtained the lowest overall mean. This suggests that greater emphasis may be placed on developing clear, measurable, learner-centered, and differentiated objectives. Furthermore, the significant positive relationships between lesson planning knowledge and teaching performance underscore the importance of providing learning experiences that connect theoretical knowledge with actual classroom applications. These considerations may guide curriculum planners in refining existing courses and instructional activities to further develop the competencies of future science teachers.

- ***Teachers.*** The study emphasizes the important role of instructors and cooperating teachers in developing and sustaining the lesson planning competencies of pre-service science teachers. Despite the favorable results, continuous guidance and constructive feedback remain essential in addressing specific areas that require further development. Teachers may provide additional opportunities for guided lesson planning, microteaching, and teaching demonstrations that emphasize effective time management, differentiated instruction, higher-order thinking strategies, and classroom communication. Through these practices, pre-service science teachers may further improve their ability to apply lesson planning knowledge in actual teaching situations.

- ***Pre-service Science Teachers.*** The significant positive relationships between lesson planning knowledge and performance in final teaching demonstrations highlight the importance of continuously developing instructional planning competencies as part of professional preparation. While the respondents demonstrated generally high levels of knowledge, the relatively lower mean in creating lesson objectives indicates an area that deserves further attention. Pre-service science teachers may use these results to reflect on their existing competencies and identify specific aspects of lesson planning that require improvement. Strengthening their ability to formulate measurable objectives, align instructional activities with learning competencies, manage instructional time, and design appropriate assessments may contribute to their readiness for future classroom teaching responsibilities.

- ***Students.*** The results provide an opportunity for students enrolled in teacher education programs to recognize the importance of lesson planning knowledge in developing effective teaching competencies.

The positive relationships established between lesson planning knowledge and teaching performance emphasize the value of acquiring a strong foundation in instructional planning before engaging in actual classroom teaching. Students may be encouraged to participate actively in lesson planning exercises, teaching simulations, and other instructional activities that develop their knowledge and skills. These experiences may also promote self-assessment and continuous improvement as they progress through their teacher education program.

- ***Researchers.*** The results provide an empirical basis for developing recommendations and proposing enhancement programs that address the identified areas requiring improvement in lesson planning knowledge and teaching performance. The relatively lower ratings in certain indicators, despite the generally favorable overall results, highlight the importance of identifying specific competencies that may benefit from additional training and instructional support. Moreover, the significant positive relationships between the variables strengthen the rationale for proposing programs that integrate lesson planning knowledge with practical teaching experiences. These insights may guide the researchers in developing relevant and responsive interventions for pre-service science teachers.

- ***Future Researchers.*** The study provides a foundation for further investigations concerning lesson planning knowledge and teaching performance among pre-service teachers. Future researchers may examine the effectiveness of the proposed enhancement programs after their implementation to determine whether improvements occur in the identified competencies. Similar investigations may also be conducted among pre-service teachers from other specializations, year levels, or educational institutions to explore the applicability of the results in different contexts. Additionally, future studies may consider other factors associated with teaching performance, including pedagogical content knowledge, instructional confidence, mentoring experiences, and classroom exposure, to provide a broader understanding of teacher preparation and professional development.

AI use declaration: In the interest of academic integrity and transparency, the researchers also acknowledged the use of Quillbot AI v44.200.7 and Grammarly tools for grammatical refinement and improvement of sentence construction. However, all ideas, interpretations, analyses, and conclusions presented in the study were conceptualized, verified, and finalized by the researchers themselves.

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