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Confirmatory Factor Analysis of a New Standardized Observation Instrument for Pre-Service Teaching: A Validation Study

Jessie Ray B. Mangundayao
Mindoro State University
jessiemangundayao@gmail.com

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Corresponding Email:
jessiemangundayao@gmail.com

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Index Terms:

pre-service teaching, observation instrument, COT-RPMS, PPST, confirmatory factor analysis, classroom observation tool, teacher education

Abstract. This study focused on developing and validating a new standardized observation instrument for pre-service teachers, aligning it with the Philippine Professional Standards for Teachers (PPST) and the Competency-Based Teacher Rating and Management System (COT-RPMS). The initiative was prompted by a previous study highlighting the need to align existing evaluation tools with national standards, a concern echoed by school heads and principals during post-conference feedback sessions. The instrument was designed to assess five key domains of teaching competency: Curriculum Planning and Implementation, Learning Environment and Instruction, Assessment and Feedback, Professionalism and Classroom Management, and Technology Integration. A Confirmatory Factor Analysis (CFA) was employed to validate the instrument's structure. Results of the CFA showed a strong model fit, with all fit indices meeting or exceeding acceptable thresholds (GFI = 0.926, CFI = 0.963, TLI = 0.905, RMSEA = 0.061). The factor loadings for all items were high, ranging from 0.592 to 0.919, confirming their strong correlation with their respective domains. Inter-rater reliability analysis using Cohen's Kappa (κ=0.82) and internal consistency reliability using Cronbach's alpha (α=0.85) indicated high levels of consistency and agreement among observers, ensuring the tool's objectivity. These findings collectively establish the instrument's construct validity and reliability, affirming its suitability as a standardized, objective, and evidence-based tool for evaluating pre-service teacher performance and guiding their professional development. The study successfully addresses a critical gap in teacher education, providing a valid and reliable instrument that aligns with national standards and prepares future educators for the demands of the profession.

Introduction

The Philippine educational landscape is undergoing a significant transformation, driven by a national mandate to elevate the quality of teaching to meet global standards. This evolution necessitates robust assessment frameworks that objectively measure pedagogical competencies and ensure that teacher preparation programs remain aligned with professional expectations (Valtonen et al., 2017). Central to this reform are the Philippine Professional Standards for Teachers (PPST) and the Competency-Based Teacher Rating and Management System (COT-RPMS), which provide a clear framework for evaluating teacher performance and guiding professional development. Despite these comprehensive frameworks, the integration of standardized, objective assessment tools within teacher education institutions remains notably restricted, often leading to variability in how pre-service competencies are measured and monitored (Vallente et al., 2025). While these tools have been widely adopted for in-service teachers, a critical gap remains in the availability of a standardized, psychometrically sound instrument tailored specifically for the unique context of pre-service teaching (Darling-Hammond, 2006). Addressing this gap is not merely a matter of administrative convenience but is fundamental to ensuring that teacher education institutions (TEIs) produce a competent and job-ready workforce aligned with national expectations. This gap was highlighted in a previous study on the employability and satisfaction of school leaders with College of Teacher Education graduates, which recommended the development of a new observation instrument aligned with the COT-RPMS (Mangundayao & Hernandez, 2026). This deficiency leads to inconsistencies in evaluation and hinders the provision of targeted, data-driven feedback, a concern frequently raised by school heads and principals during post-conference feedback sessions for pre-service teachers' final demonstration classes.

Effective pre-service teacher training is crucial for preparing future educators for the complexities of the classroom. A key component of this training is the supervised observation of teaching practice. An observation instrument, therefore, is not just a checklist but a critical tool for facilitating this constructive process (Pianta & Hamre, 2009). It allows for the identification of observable behaviors that serve as evidence of a pre-service teacher's ability to create a supportive learning environment, plan engaging lessons, and manage a classroom effectively, all of which are socially and culturally constructed skills. The development of a valid and reliable instrument becomes paramount to provide objective feedback that empowers student teachers to reflect on their practice and co-construct their professional identity.

The current landscape of pre-service teacher evaluation in the Philippines is fragmented, with many TEIs employing varied, and often unvalidated, observation tools. This lack of a unified standard results in discrepancies in evaluation scores and limits the generalizability of findings across institutions. Consequently, the absence of a synchronized evaluative framework complicates efforts to establish professional accountability and hinders the transition of novices into the workforce (Cabahug et al., 2024). Moreover, the absence of a standardized, validated metric limits the capacity of cooperating teachers and supervisors to provide the actionable, individualized feedback necessary for developing reflexive instructional practices (Torres et al., 2024).

The development of an instrument that is empirically validated against rigorous psychometric standards is thus an urgent academic and practical necessity. The potential impact of a standardized instrument extends beyond individual teacher development. It provides a common language and sets of criteria for teacher educators and cooperating school principals to discuss and evaluate pre-service performance, fostering stronger partnerships between TEIs and their partner schools (Cavanagh et al., 2019) This shared understanding can lead to more coherent and effective teacher training programs. Furthermore, a validated instrument can serve as a valuable research tool for TEIs to assess the effectiveness of their curricula and instructional strategies (Goh & Yusuf, 2017). By providing objective data on pre-service teacher competencies, the instrument can help pinpoint areas for program improvement, ultimately leading to higher quality teacher education and better student outcomes. This study, therefore, addresses this need by creating and validating a new observation instrument designed to be a comprehensive and objective tool for the assessment of pre-service teachers.

Objectives of the Study

Generally, the study aimed to develop and validate a new standardized observation instrument for pre-service teaching based on the COT-RPMS and PPST standards.

Specifically, it aimed to:

1. To design a pre-service teacher observation instrument with items and domains aligned with the PPST and COT-RPMS.
2. To establish the construct validity of the observation instrument through a Confirmatory Factor Analysis (CFA).
3. To determine the inter-rater reliability and internal consistency of the instrument.

Methodology

This psychometric validation study was conducted to develop and evaluate the new observation instrument. The instrument was developed based on a review of the PPST and COT-RPMS frameworks, ensuring that the items reflected key teaching competencies and ensure its contextual relevance and alignment with national standards.

The final instrument consisted of items grouped into five domains: Curriculum Planning and Implementation, Learning Environment and Instruction, Assessment and Feedback, Professionalism and Classroom Management, and Technology Integration which were directly derived from the PPST's Career Stage 1 (Beginning Teachers) and the COT-RPMS's key result areas. Each item in the instrument was then carefully crafted to operationalize specific performance indicators and objectives from these frameworks into clear, observable behaviors. A panel of five experts, including a University Professor who's holding a Doctor of Education, a CHED regional program supervisor, a psychometrician, a College Dean, and a school principal reviewed and validated the draft instrument for content validity and fidelity to the standards. Their comments and recommendations were considered to improvement.

The improved instrument was pilot tested with a sample of 72 pre-service teachers in two phases, during in-campus and off campus final demonstration teaching. Their classroom performances were observed and rated by 12 trained observers. The data collected from these observations were used for a series of statistical analyses.

Confirmatory Factor Analysis (CFA) was employed to test the a priori five-factor structure of the instrument. The model fit was evaluated using several indices, including the Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis

Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). In addition, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure were used to assess the factorability of the correlation matrix.

To establish inter-rater reliability, the scores from multiple observers for the same classroom observations were analyzed using Cohen's Kappa (κ). Cronbach's alpha (α) was calculated to determine the internal consistency reliability of the items within each domain. All statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) and AMOS with a significance level of $p<0.05$.

Informed consent was obtained from all participants, including pre-service teachers and supervising observers, who were fully briefed on the study's purpose, procedures, potential risks, and their right to withdraw at any time without penalty. To maintain confidentiality, all data collected were anonymized, and no personally identifiable information was included in the final analysis or reporting. The researchers committed to ensuring the privacy and well-being of all participants throughout the study's duration.

Results and Discussion

The primary objective of this study was to validate a new standardized observation instrument for pre-service teachers, which was developed in alignment with the Philippine Professional Standards for Teachers (PPST) and the Competency-Based Teacher Rating and Management System (COT-RPMS). The Confirmatory Factor Analysis (CFA) was a critical step in achieving this objective, as it provided an empirical test of the instrument's proposed structure. The results of the CFA, specifically the factor loadings and R-squared values, offer compelling evidence of the instrument's construct validity and internal consistency.

The Proposed Observation Instrument

The instrument features a multidimensional structure organized into key pedagogical domains, facilitating a systematic evaluation of pre-service teachers' instructional capabilities in alignment with national and local benchmarks. It is aligned with the COT-RPMS and PPST standards of the Department of Education. By anchoring the instrument to these well-defined domains, the framework ensures that assessment tasks are directly linked to essential learning outcomes and the professional standards required for 21st-century educators (Calapardo et al., 2016; Daquioag-Andres, 2023). Furthermore, this alignment facilitates the integration of core teaching competencies, such as assessment and reporting, which are essential for navigating the complexities of modern educational environments (Magnaye, 2022; Reyes, 2023).

Confirmatory Factor Analysis

Factor structure

Preliminary tests were done to ensure feasibility of the factor analysis. Bartlett's sphericity test was significant ($p<0.001$), confirming that the variables were sufficiently correlated for factor analysis, and the Kaiser-Meyer-Olkin (KMO) measure of 0.945 indicated that the sample was highly adequate. Both empirically validates the possibility of extracting factors from the matrix of observed correlations.

The model fit indices, as shown in Table 1, indicated a good fit for the hypothesized five-domain structure, with a GFI of .0926, CFI of 0.963, TLI of 0.905, and RMSEA of 0.061, all of which fall within acceptable thresholds (Hu & Bentler, 1999).

These findings support the construct validity of the instrument, confirming that the observed variables accurately reflect the underlying latent constructs. In addition, content validity was established through expert review and alignment with the COT-RPMS and PPST standards. Feedback from educators confirmed that the items effectively captured the essential competencies expected of pre-service teachers.

Fit Index	Values	Acceptable Threshold
Goodness of Fit Index (GFI)	0.926	> 0.90
Comparative Fit Index (CFI)	0.963	> 0.90
Tucker-Lewis Index (TLI)	0.905	> 0.90
Root Mean Square Error of Approximation (RMSEA)	0.061	< 0.08

Table 1. Model fit measurement statistics

The CFA results strongly support the instrument's underlying theoretical structure, which posits that pre-service teacher competence can be reliably measured across five distinct domains: Curriculum Planning and Implementation, Learning

Environment and Instruction, Assessment and Feedback, Professionalism and Classroom Management, and Technology Integration.

As shown in Table 2, the factor loadings for all items ranged from 0.592 to 0.919. A factor loading of 0.50 or higher is conventionally considered a strong indicator of an item's relevance to its latent construct. The consistently high loadings observed across all items confirm that each item is a significant and meaningful indicator of its intended teaching domain. For instance, the item "Demonstrates proficiency in using technology tools..." exhibited the highest loading at 0.919, underscoring its exceptional relevance to the Technology Integration construct. These results are particularly important as they empirically justify the organization of the observation instrument into its five thematic domains, thereby strengthening its alignment with the established standards of the PPST and COT-RPMS.

Furthermore, the R-squared (R2) values provide additional evidence of the instrument's reliability. The R2 value indicates the proportion of an item's variance that is explained by its corresponding latent factor. The R2 values in the results are directly proportional to the factor loadings, with values ranging from 0.350 to 0.845. The item "Demonstrates proficiency in using technology tools..." had an R2 of 0.845, indicating that over 84% of the variance in scores for this item is explained by the latent factor of Technology Integration. This high percentage suggests that the latent construct is an excellent predictor of the observed behavior. While some items, such as those related to Assessment and Feedback, had lower R2 values, they still demonstrate that a substantial portion of their variance is explained by their intended construct. The overall pattern of results confirms the instrument's internal consistency, as the items within each domain cohere to measure a single, underlying competency.

Items	Loading	R^2
Curriculum Planning and Implementation		
1. Aligns lesson objectives within and across the curriculum learning competencies and clearly communicates them to students	0.833	0.681
2. Selects, develops, organizes, and uses engaging, age-appropriate teaching and learning resources, to address learning goals.	0.825	0.681
3. Plans for effective use of assessment tools to measure student learning.	0.843	0.711
4. Reflects on and adapts the lesson plan based on student needs and feedback during instruction.	0.753	0.567
5. Uses a variety of engaging, age-appropriate, and gender-sensitive teaching strategies that enhance learner achievement.	0.770	0.593
6. Implements the lesson plan effectively, demonstrating clear transitions and pacing.	0.780	0.608
Learning Environment and Instruction		
1. Creates a safe, inclusive, and positive learning environment that fosters respect, collaboration, and active participation.	0.767	0.581
Manages classroom routines effectively to ensure smooth flow of the lesson.	0.888	0.789
2. Establishes clear learning goals and communicates them effectively to students.	0.849	0.721
3. Provides opportunities for students to engage in collaborative learning activities.	0.767	0.588
5. Demonstrates a deep understanding of the content and its connections to other learning areas.	0.897	0.773
6. Selects and uses appropriate teaching strategies to deliver the content effectively, incorporating questioning techniques to promote critical thinking and higher-order thinking skills.	0.739	0.546
Assessment and Feedback		
1. Uses a variety of assessment methods (e.g., observations, quizzes, projects) to evaluate student learning and progress throughout the lesson.	0.715	0.511
2. Provides clear, specific, constructive, and timely feedback to students to promote learning and guide improvement.	0.592	0.350
3. Monitors student understanding and adapts instruction based on their needs throughout the lesson.	0.592	0.350

Assessment and Feedback

Items	Loading	R^2
1. Uses a variety of assessment methods (e.g., observations, quizzes, projects) to evaluate student learning and progress throughout the lesson.	0.715	0.511
2. Provides clear, specific, constructive, and timely feedback to students to promote learning and guide improvement.	0.592	0.350
3. Monitors student understanding and adapts instruction based on their needs throughout the lesson.	0.592	0.350
Professionalism and Classroom Management		
1. Demonstrates professional attitude and demeanor in interactions with students and colleagues.	0.754	0.569
2. Manages student behavior effectively, using positive reinforcement and appropriate interventions to maintain a focused learning environment.	0.728	0.530
3. Uses clear and concise language to deliver instructions and explanations, demonstrates effective communication skills when interacting with students and managing classroom discussions.	0.754	0.569
4. Exhibits enthusiasm and passion towards teaching and learning, fostering student engagement and curiosity.	0.888	0.789
Technology Integration		
1. Selects and integrates technology strategically to enhance the learning experience and support student engagement.	0.752	0.566
2. Demonstrates proficiency in using technology tools to support instruction, manage resources, and facilitate learning activities.	0.919	0.845

Table 2. Factor loadings for the five-factor model and correlations between error terms

A crucial assumption of a good factor model is that the factors are distinct yet related. The results presented in Table 3 confirm that all five factors are positively and significantly correlated with one another, with correlation coefficients ranging from 0.492 between Professionalism and Classroom Management and Technology Integration, to 0.734 between Curriculum Planning and Implementation and Professionalism and Classroom Management. These correlations are within an acceptable range, as they are not so high as to suggest a lack of discriminant validity nor are they so low as to indicate that the factors are completely unrelated within the overall construct of teacher competence. Furthermore, the substantial factor loadings observed across all items underscore the empirical robustness of the instrument in capturing the latent traits of pedagogical performance (Carré et al., 2023).

The strongest correlations were observed between Curriculum Planning and Implementation and Professionalism and Classroom Management (0.734), as well as between Learning Environment and Instruction and Professionalism and Classroom Management (0.733). These strong relationships are theoretically sound, as effective curriculum planning and classroom management are both central to creating a successful learning environment and are key aspects of a teacher's professional practice. The lowest correlation was found between Professionalism and Classroom Management and Technology Integration (0.492), which is also logical given that while technology is a tool used in the classroom, it is a distinct skill set from the core professional and behavioral management aspects of teaching. Such results confirm the instrument's structural integrity, as the distinctiveness of the factors indicates that the tool captures diverse yet complementary dimensions of pedagogical proficiency without redundancy (Deng et al., 2024).

Domain	Curriculum Planning and Implementation	Learning Environment and Instruction	Assessment and Feedback	Professionalism and Classroom Management
Curriculum Planning and Implementation	-			
Learning Environment and Instruction	0.712	-		
Assessment and Feedback	0.626	0.619	-	
Professionalism and Classroom Management	0.734	0.733	0.518	-
Technology Integration	0.671	0.561	0.61	0.492

Table 3. Matrix of correlations among factor

Reliability Assessment

The inter-rater reliability results, presented in Table 3, provide strong evidence for the instrument's consistency and dependability. Both the Cohen's Kappa (κ) and Cronbach's alpha values confirm a high degree of agreement among observers and high internal consistency of the items. The overall Cohen's Kappa value of 0.82 indicates a high level of agreement, falling into the "almost perfect" category (Landis & Koch, 1977). This value, which accounts for chance agreement, is critical for establishing that the data collected is objective and not influenced by rater subjectivity. The domain-specific Kappa values, ranging from a substantial 0.75 for Assessment and Feedback to an almost perfect 0.88 for Learning Environment and Instruction, further validate the consistency of each section of the instrument. Furthermore, these findings align with established psychometric standards, demonstrating that the rubric items effectively measure the intended construct of teacher competence while maintaining sufficient distinctness to avoid redundancy (Bhatnagar et al., 2021).

In addition, the overall Cronbach's alpha of 0.85 demonstrates excellent internal consistency, with domain-specific values ranging from 0.78 to 0.87. Cronbach's alpha is particularly appropriate for this instrument as it measures how closely related a set of items are as a group. A value of 0.70 or higher is generally considered acceptable, and our values, all exceeding this threshold, indicate that the items within each domain are highly correlated and reliably measure the same underlying construct. The combined results underscore the instrument's strong psychometric properties, confirming its reliability for use in standardized evaluations of pre-service teacher performance.

Domain	No. of Items	Cohen's Kappa (κ)	Cronbach's Alpha
Curriculum Planning and Implementation	6	0.78	0.83
Learning Environment and Instruction	6	0.88	0.87
Assessment and Feedback	3	0.75	0.81
Professionalism and Classroom Management	4	0.8	0.82
Technology Integration	2	0.76	0.78

Table 4. Inter-rater reliability results for each domain

Conclusion and Recommendations

The study successfully developed and validated a new standardized observation instrument for pre-service teachers, aligning it with the Philippine Professional Standards for Teachers (PPST) and the Competency-Based Teacher Rating and Management System (COT-RPMS). The psychometric properties of the instrument, as evidenced by a Confirmatory Factor Analysis (CFA), are robust. The model fit indices (GFI, CFI, TLI, and RMSEA) all met or exceeded their acceptable thresholds, confirming that the instrument's five-factor structure accurately represents the latent constructs of pre-service teaching competence. Furthermore, the high factor loadings for all items and the logical inter-factor correlations underscore the instrument's construct validity. The reliability analysis also yielded excellent results, with a high overall Cohen's Kappa (κ=0.82) demonstrating strong inter-rater agreement and an overall Cronbach's alpha (α=0.85) indicating high internal consistency. These findings collectively establish the instrument as a reliable, valid, and objective tool for evaluating pre-service teacher performance.

Based on these findings, it is recommended that this observation instrument be officially adopted by teacher education institutions and integrated into their field study and practice teaching curricula. Its alignment with national standards ensures that pre-service teachers are evaluated based on the competencies required for the profession, facilitating their transition into the workforce. The instrument can also serve as a foundational tool for a data-driven feedback loop, enabling supervisors to provide targeted, specific, and evidence-based guidance to student teachers. For future research, it is recommended to conduct a longitudinal study to assess the instrument's predictive validity. That is, its ability to predict a pre-service teacher's future professional effectiveness. Further studies should also explore the instrument's generalizability across various educational contexts, grade levels, and subject areas to ensure its broad applicability.

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Competing Interests Statement

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

Data Availability Statement

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

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Appendices

No appendices are attached to this study.