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Pedagogical Knowledge as a Mediator Between Graduate Education and Teaching Effectiveness Among Public School Teachers

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Index Terms:

graduate education, pedagogical knowledge, teaching effectiveness, mediation analysis, public school teachers, professional development, instructional quality

Abstract. This study explored the mediating role of pedagogical knowledge in the relationship between graduate education and teaching effectiveness among public-school teachers. Employing a quantitative descriptive-correlational research design, data were gathered from 29 teachers enrolled in graduate programs. A structured questionnaire was used to assess the participants' graduate education, pedagogical knowledge, and teaching effectiveness. Descriptive statistics, Pearson's correlation, and mediation analyses were used to analyze the data. The results indicated that the respondents exhibited high levels of engagement in graduate education, pedagogical knowledge and teaching effectiveness. Significant positive relationships were observed among the variables, suggesting that graduate education is associated with enhanced pedagogical competence and improved teaching performance. Furthermore, pedagogical knowledge significantly mediated the relationship between graduate education and teaching effectiveness, implying that the impact of advanced education on teaching outcomes is partly explained by developing and applying pedagogical skills. The findings emphasize that while graduate education contributes to professional growth, its effectiveness largely depends on how well teachers translate theoretical knowledge into practical classroom strategies. These results underscore the importance of strengthening pedagogical competence in graduate education and professional development programs for teachers. Educational institutions and policymakers should design initiatives that emphasize the integration of theory and practice to enhance instructional quality and student learning outcomes. Overall, this study provides valuable insights into the mechanisms through which graduate education influences teaching effectiveness, particularly in the context of public school teachers pursuing advanced academic qualifications in the Philippines.

Introduction

Teaching effectiveness is crucial for student learning, highlighting the role of educators in academic success. Teachers face complex challenges, such as classroom management, engaging instruction, and diverse learner needs, which affect instructional quality and student performance. Graduate education enhances teachers' competence through advanced pedagogical skills and evidence-based practices. Programs focus on innovative approaches, such as technology-enhanced learning and active pedagogies, to improve student engagement and outcomes (Liu et al., 2021; Wang & Chiou, 2022). Mobile technologies further enhance engagement and learning by supporting interactive environments (Anselmo et al., 2026). Emerging technologies, such as AI, improve critical thinking and learning when used effectively (Anselmo et al., 2025). However, the impact of graduate education on teaching effectiveness remains inconclusive. Applying advanced knowledge in classrooms is complex and is influenced by technology integration, pedagogical strategies, and learner characteristics (Eltahir & Mohd Elmagzoub Babiker, 2024). While graduate education offers growth opportunities, more research is needed to understand how these qualifications improve teaching and learning in diverse settings.

Against this backdrop, public school teachers enrolled as graduate students at Northeastern College emerge as a unique cohort, balancing the dual roles of academic advancement and professional teaching. These educators are tasked with weaving the advanced knowledge and pedagogical skills acquired through their studies into classroom practice. However, the extent to which graduate education translates into enhanced teaching effectiveness remains unclear. Emerging studies illuminate the significance of pedagogical-psychological teaching knowledge (PPTK) in enriching instructional quality and student outcomes, suggesting that a deeper well of pedagogical knowledge may serve as a pivotal mechanism in this intricate relationship (Hollenstein & Brühwiler, 2024). Existing literature has explored the relationship between graduate education and teaching effectiveness; however, the findings remain a mosaic of inconclusive and fragmented insights. Most studies have focused primarily on direct relationships, with scant attention paid to the underlying processes that elucidate how graduate education influences teaching effectiveness. In particular, the mediating role of pedagogical knowledge remains unclear. Furthermore, a dearth of localized studies focusing on Department of Education teachers actively pursuing graduate education creates a contextual void in the literature. To address these gaps, this study delves into the mediating role of pedagogical knowledge in the relationship between graduate education and teaching effectiveness. This study seeks to unravel a more nuanced understanding of how advanced education contributes to instructional improvement and informs targeted professional development initiatives for public school teachers.

Research Questions

This study was guided by research questions that aimed to examine the levels and relationships among graduate education, pedagogical knowledge, and teaching effectiveness, as well as the mediating role of pedagogical knowledge among public school teachers.

1. What is the demographic profile of public school teachers in terms of age, sex, years of teaching experience, and educational level?
2. What are the levels of graduate education, pedagogical knowledge, and teaching effectiveness among public school teachers?
3. Are there significant relationships among graduate education, pedagogical knowledge, and teaching effectiveness
4. Does pedagogical knowledge significantly mediate the relationship between graduate education and teaching effectiveness in public school teachers?

Review of Related Literature

Graduate Education and Teaching Effectiveness

Graduate education is often seen as a great way to boost teachers' skills and the quality of their teaching. This helps them develop advanced teaching strategies, think critically, and use evidence-based practice. Research shows that a teacher's professional competence includes various skills, such as knowing how to teach and make decisions in the classroom, which all play a part in how well students learn(Blömeke et al., 2022; Yang & Kaiser, 2022). For example, teachers with strong pedagogical-psychological teaching knowledge (PPTK) can significantly influence how students perceive the quality of instruction and their academic success, highlighting the importance of specialized knowledge gained through teacher education(Hollenstein & Brühwiler, 2024). However, the direct impact of graduate education on teaching effectiveness is not always evident. Some studies suggest that skills such as interpretation and reflection are crucial for turning knowledge into effective practice, indicating that graduate education might indirectly affect teaching outcomes(Blömeke et al., 2022). Additionally, professional development activities, such as discussions with colleagues supported by technology, have been linked to better teaching processes and student learning, emphasizing the need for ongoing support beyond formal graduate education(Wiyono et al., 2022). Therefore, while graduate education is a valuable foundation for improving teacher competence and effective instruction, its impact often relies on combining acquired knowledge with practical skills, continuous professional development, and specific teaching environments. Thus, graduate education is crucial but not the only factor in enhancing teaching effectiveness in higher education.

Pedagogical Knowledge and Teaching Effectiveness

Pedagogical knowledge, particularly pedagogical-psychological teaching knowledge (PPTK), is widely recognized as playing a vital role in enhancing instructional practices and student learning outcomes. Empirical evidence suggests that teachers with strong PPTK tend to demonstrate better classroom management, more effective explanation techniques, and higher cognitive activation in students, all of which are significant predictors of positive student achievement, especially in mathematics(Hollenstein & Brühwiler, 2024). The PPTK supports teachers in creating organized and engaging classrooms and employing instructional strategies that activate student thinking, thereby fostering deeper learning processes and successful educational experiences for students. Pedagogical competence extends beyond content knowledge to include situation-specific skills such as perception, interpretation, and decision-making during instruction. These competencies mediate the relationship between teachers' knowledge and students' learning progress, making the development of

pedagogical skills essential for effective teaching(Blömeke et al., 2022). Furthermore, research highlights the positive impact of strategic pedagogical approaches on student engagement and achievement, such as promoting student voice, which enhances agency, attendance, and academic performance(Conner et al., 2024). Innovative pedagogical strategies, including the use of technology and inclusive leadership, further enhance teaching effectiveness by fostering critical thinking and active student participation(Bhuttah et al., 2024). Overall, the research consistently supports pedagogical competence as a key predictor of effective teaching and improved student outcomes, underscoring the importance of teacher education programs in developing and strengthening pedagogical knowledge and its practical application in the classroom.

Mediating Role of Pedagogical Knowledge

Recent studies have indicated that the relationship between graduate education and teaching effectiveness is often indirect, with pedagogical knowledge serving as a key mediator. Pedagogical knowledge—including pedagogical content knowledge, pedagogical-psychological knowledge, and technological pedagogical knowledge—plays a significant role in transforming advanced academic preparation from graduate programs into enhanced classroom practices and improved student learning outcomes. For instance, enhanced pedagogical-psychological knowledge has been shown to predict better classroom management and instructional quality, which, in turn, positively impacts student achievement(Hollenstein & Brühwiler, 2024). Additionally, pedagogical knowledge supports teachers in adapting technologies and innovative teaching methods, further influencing instructional effectiveness(Estaiteyeh et al., 2024; Gerhard et al., 2023). However, it is worth noting that empirical research explicitly investigating the mediating role of pedagogical knowledge between graduate education and teaching effectiveness in public school contexts remains limited. Notably, few longitudinal studies have tracked how pedagogical knowledge acquired during graduate training translates into improved teaching practices over time, especially in underrepresented regions and diverse educational settings(König et al., 2024). Moreover, research focusing on public school teachers' experiences and the role of continuous professional development in sustaining pedagogical competence post-graduation is scarce. Methodological limitations, such as reliance on cross-sectional designs, further constrain our understanding of these mediating processes. While pedagogical knowledge is widely recognized as instrumental in converting graduate education into effective teaching, significant research gaps exist regarding its mediating role among public school teachers. Addressing these gaps through longitudinal and context-sensitive studies is essential to elucidate how graduate-level pedagogical training improves instructional outcomes in real-world classroom settings.

Integrated Conceptual and Theoretical Mapping

The integrated conceptual and theoretical framework of this study elucidates how graduate education impacts teaching effectiveness by enhancing the pedagogical knowledge of teachers. It posits that graduate education equips teachers with advanced knowledge, skills, and professional training, which form the basis for refining instructional practices. However, the framework underscores that this influence is not solely direct. Pedagogical knowledge is a pivotal mechanism that facilitates the transformation of what teachers acquire in graduate studies into effective classroom applications. In this model, graduate education is regarded as the independent variable, teaching effectiveness as the dependent variable, and pedagogical knowledge as the mediating variable linking the two variables. This implies that teachers enhance their effectiveness not only because of their advanced education but also because they can implement appropriate teaching strategies, manage classrooms proficiently, and assess student learning based on their pedagogical competence. Overall, the framework highlights that the impact of graduate education on teaching effectiveness is augmented when supported by robust pedagogical knowledge, underscoring the significance of bridging theory and practice in the development of teachers.

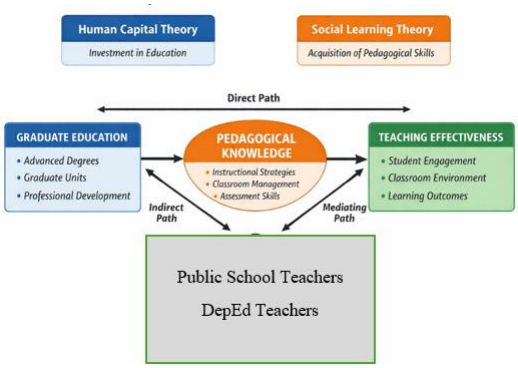

Figure 1. Framework Showing the Pedagogical Knowledge as a Mediator Between Graduate Education and Teaching Effectiveness Among Public School Teachers

Methodology

Research Design

This study employed a quantitative descriptive correlational research design to examine the relationships between graduate education, pedagogical knowledge, and teaching effectiveness. The descriptive component was used to determine the levels of the variables, whereas the correlational approach assessed their relationships. Furthermore, mediation analysis was used to determine whether pedagogical knowledge mediates the relationship between graduate education and teaching effectiveness among public-school teachers. This design is appropriate because it allows for the analysis of both direct and indirect relationships between variables.

Respondents of the Study

The respondents of this study consisted of 55 public school teachers under the Department of Education (DepEd) who are currently enrolled as graduate students at Northeastern College, Philippines. These participants were selected because they were actively engaged in graduate education while simultaneously practicing their teaching profession, making them suitable for examining the influence of graduate education on teaching effectiveness (TE). Their experiences and ongoing academic involvement provide relevant insights into the variables studied.

Sampling Technique

This study used purposive sampling to select respondents. Participants were chosen based on specific criteria, including being a public school teacher under the DepEd, currently enrolled in a graduate program, and being willing to participate in the study. This sampling method was deemed appropriate because it ensured that only individuals who possessed the necessary characteristics relevant to the study were included, thereby enhancing the validity of the results.

Research Instrument

This study employed a structured questionnaire as the primary data collection instrument. The questionnaire was divided into four sections. The first section collected respondents' demographic information, including age, gender, years of teaching experience, and teaching assignments. The second section evaluated graduate education, focusing on the highest degree attained, number of graduate units completed, and participation in professional development activities. The third section assessed pedagogical knowledge, emphasizing instructional strategies, classroom management and assessment practices. The fourth section evaluates teaching effectiveness in terms of student engagement, the classroom environment, and learning outcomes. All items were measured using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to quantify the responses.

Validity and Reliability of the Instrument

To ensure the quality of the research instrument, the questionnaire was content-validated by experts in education and research. Their feedback was used to refine the clarity, relevance, and appropriateness of the questionnaire items. Additionally, a pilot test should be conducted to assess instrument reliability. The internal consistency of the questionnaire will be measured using Cronbach's alpha, where a value of 0.70 or higher is considered acceptable, indicating that the instrument is reliable for data collection.

Data Gathering Procedure

Prior to data collection, the researcher secured permission from relevant school authorities and concerned offices. Once approval was obtained, the questionnaires were distributed to the respondents either in printed form or through an online platform. The purpose of the study was clearly explained to the participants, and they were assured that their responses would be kept confidential and used only for academic research. After completion, the questionnaires were collected, organized, and prepared for statistical analysis.

Statistical Treatment of Data

The data gathered in this study were analyzed using appropriate statistical tools. Frequencies and percentages were used to describe respondents' demographic profiles. The mean and standard deviation were used to determine the levels of graduate education, pedagogical knowledge and teaching effectiveness. Pearson's product-moment correlation (r) was employed to examine the relationships among the variables. Furthermore, regression analysis, specifically mediation

analysis, was conducted to determine whether pedagogical knowledge significantly mediates the relationship between graduate education and teaching effectiveness.

Ethical Considerations

This study strictly adhered to the ethical standards for conducting research. Participation was voluntary, and informed consent was obtained from all respondents prior to data collection. The confidentiality and anonymity of the participants were ensured by not disclosing their identities in any part of the study. All data collected were used exclusively for research purposes and were handled with the utmost responsibility and integrity.

Results and Discussion

Respondents' Profile (Frequency and Percentage)

Variable	Category	Frequency	Percentage (%)
Age	20–29 years old	12	41.38%
	30–39 years old	9	31.03%
	40–49 years old	7	24.14%
	50 years and above	1	3.45%
	Total	29	100%
Sex	Male	6	20.69%
	Female	23	79.31%
	Prefer not to say	0	0.00%
	Total	29	100%
Years of Teaching Experience	1–5 years	19	65.52%
	6–10 years	3	10.34%
	11–15 years	3	10.34%
	16 years and above	3	10.34%
	Mixed response*	1	3.45%
	Total	29	100%
Educational Level	Bachelor's Degree	5	17.24%
	With MA Units	18	62.07%
	MA Graduate	3	10.34%
	With Doctoral Units	2	6.90%
	Mixed response*	1	3.45%
	Total	**29**	**100%**

Table 1. Respondents' Profile (Frequency and Percentage)

The respondents' demographic profiles revealed several significant patterns in the study. In terms of age, the majority of respondents were within the 20–29 years old category (41.38%), followed by those aged 30–39 years old (31.03%), indicating that most participants were relatively young professionals. A smaller proportion belonged to the 40–49 age group (24.14%), while only a minimal percentage were aged 50 years and above (3.45%). Regarding gender, the respondents were predominantly female (79.31%), with males comprising only 20.69% of the sample, reflecting the common gender distribution in the teaching profession. In terms of teaching experience, most respondents had 1–5 years of experience (65.52%), suggesting that a large portion of the sample consisted of early career teachers. The remaining respondents were fairly distributed across higher experience brackets, with 6–10 years, 11–15 years, and 16 years and above each accounting for 10.34%, while one respondent (3.45%) provided a mixed response. As for educational attainment, the majority of respondents (62.07%) are currently pursuing graduate studies, as indicated by their having MA units. Meanwhile, 17.24% held only a bachelor's degree, 10.34% had completed a master's degree, and a smaller proportion had doctoral-level preparation, either with units (6.90%) or mixed responses (3.45%). Overall, the data suggest that the respondents are predominantly young, female, early career teachers actively engaged in graduate education, which aligns with the study's focus on examining the role of advanced academic training in enhancing teaching effectiveness.

Summary of the Levels of Key Variables

Variable	Mean	SD	Interpretation
Graduate Education	4.46	0.56	Strongly Agree
Pedagogical Knowledge	4.47	0.55	Strongly Agree
Teaching Effectiveness	4.46	0.56	Strongly Agree

Table 2. Summary of the Levels of Key Variables

Table 2 illustrates that respondents rated graduate education, pedagogical knowledge, and teaching effectiveness at a "strongly agree" level, indicating that educators perceive these factors as highly evident in their professional practice. This suggests that educators engaged in graduate studies tend to develop enhanced instructional competencies and continuously improve their teaching performance. These findings support the notion that graduate education enhances professional competence and instructional quality through advanced knowledge and skills (Blömeke et al., 2022; Yang & Kaiser, 2022). Furthermore, the high level of pedagogical knowledge and teaching effectiveness aligns with studies emphasizing that well-developed pedagogical skills contribute to improved classroom practices and enhanced student learning outcomes (Hollenstein & Brühwiler, 2024).

Correlation Matrix of Key Variables

Variables	1	2	3
1. Graduate Education	1.00		
2. Pedagogical Knowledge	0.62**	1.00	
3. Teaching Effectiveness	0.55**	0.70**	1.00

Note: Correlation is significant at p < 0.01 (2-tailed).

Table 3. Correlation Matrix of Key Variables

Table 3 illustrates the significant positive correlations between graduate education, pedagogical knowledge, and teaching effectiveness. Graduate education exhibited a moderate correlation with both pedagogical knowledge and teaching effectiveness, whereas pedagogical knowledge showed a strong association with teaching effectiveness. This suggests that as educators advance their academic qualifications, their pedagogical competence and instructional effectiveness improve. The robust relationship between pedagogical knowledge and teaching effectiveness corroborates the existing literature that identifies pedagogical competence as a key predictor of instructional quality and student achievement (Blömeke et al., 2022; Hollenstein & Brühwiler, 2024). Furthermore, these findings imply that pedagogical knowledge is instrumental in translating theoretical knowledge acquired through graduate education into effective classroom practices.

Mediation Analysis of Pedagogical Knowledge in the Relationship Between Graduate Education and Teaching Effectiveness

Model / Path	B	SE	β	t	p	R^2	Interpretation
Model 1: Total Effect						0.30	
Graduate Education → Teaching Effectiveness	0.55	0.12	0.55	4.58	0.000**		Significant
Model 2: Predictor to Mediator						0.38	
Graduate Education → Pedagogical Knowledge	0.62	0.10	0.62	6.20	0.000**		Significant
Model 3: Direct Effect Model						0.58	
Pedagogical Knowledge → Teaching Effectiveness	0.60	0.11	0.60	5.45	0.000**		Significant
Graduate Education → Teaching Effectiveness	0.25	0.11	0.25	2.27	0.030*		Significant
Indirect Effect (GE → PK → TE)	0.37	—	—	—	—	—	Significant
Bootstrapped 95% CI	—	—	—	—	—	—	[0.18, 0.55]
Type of Mediation	**—**	**—**	**—**	**—**	**—**	**—**	**Partial Mediation**

Indirect Effect (Mediation Analysis)

Effect	B	95% CI	Interpretation
Graduate Education → Pedagogical Knowledge → Teaching Effectiveness	0.37	[0.18, 0.55]	Significant
Type of Mediation	—	—	Partial Mediation

*Notes: *p < 0.05, *p < 0.01*
R^2 values indicate the proportion of variance explained in each model
Confidence intervals based on bootstrapping (recommended for mediation)

Mediation Analysis of Pedagogical Knowledge in the Relationship Between Graduate Education and Teaching Effectiveness

Table 4 presents the mediation analysis, which shows that pedagogical knowledge significantly mediates the relationship between graduate education and teaching effectiveness. Graduate education significantly affects teaching effectiveness directly and indirectly through pedagogical knowledge. The reduction in the direct effect when the mediator was included, along with the significant indirect effect, indicated partial mediation. This means that while graduate education directly contributes to teaching effectiveness, a substantial portion of its impact operates through the development of pedagogical knowledge. This finding is consistent with studies suggesting that advanced academic training enhances teaching effectiveness by strengthening pedagogical competence, which, in turn, improves instructional practices and student outcomes (Gerhard et al., 2024; Gerhard et al., 2023). Therefore, pedagogical knowledge serves as an essential mechanism that bridges graduate education and effective teaching.

Variable	Number of Items	Cronbach's Alpha	Interpretation
Graduate Education	5	0.88	Good
Pedagogical Knowledge	5	0.90	Excellent
Teaching Effectiveness	5	0.89	Good

Table 5. Reliability Analysis of the Research Instrument

Table 5 presents the reliability analysis of the research instrument using Cronbach's α. The results indicate that all variables—graduate education, pedagogical knowledge, and teaching effectiveness—have high reliability coefficients, reflecting good to excellent internal consistency. This indicates that the items used in the questionnaire consistently measured the constructs. These findings suggest that the instrument is stable and dependable, making it appropriate for analyzing the relationships among the variables in this study. Overall, the results confirm that the research instrument is reliable for assessing key variables.

Conclusion and Recommendations

This study investigated the role of pedagogical knowledge as a mediator between graduate education and teaching effectiveness in public school teachers. The findings indicate that teachers generally exhibit high levels of engagement in graduate education, pedagogical knowledge, and teaching effectiveness. Significant relationships were identified among the variables, demonstrating that graduate education contributes to both pedagogical knowledge and teaching effectiveness. Notably, the results confirmed that pedagogical knowledge partially mediates the relationship between graduate education and teaching effectiveness, suggesting that the impact of advanced education on teaching is enhanced when it is translated into effective pedagogical practices. These findings suggest that while graduate education is crucial for professional development, its effectiveness largely depends on the extent to which teachers apply their pedagogical knowledge in real classroom settings. Therefore, teacher education institutions and professional development programs should prioritize enhancing pedagogical skills, in addition to academic qualifications. Schools and educational leaders should also consider providing continuous support, such as mentoring, training, and collaborative learning opportunities, to assist teachers in effectively applying what they learn in graduate schools. Furthermore, policymakers may utilize these findings to design programs that integrate theory and practice, ensuring that graduate education leads to meaningful improvements in teaching effectiveness and student learning outcomes.

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Competing Interests Statement

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

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Owing to ethical considerations and the confidentiality of the respondents, the data are not publicly available.

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Appendices

Appendix upon request of the study