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DO PPG GRADUATES MAKE A DIFFERENCE? SUSTAINED IMPACT OF TEACHER PROFESSIONAL EDUCATION ON SCHOOL PERFORMANCE AND CLIMATE

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ABSTRAK

Penelitian tentang Pendidikan Profesi Guru (PPG) masih menghadapi kesenjangan antara kompetensi yang dilaporkan lulusan dan penerapannya dalam pembelajaran. Kontribusi kondisi sekolah terhadap penerjemahan kompetensi guru menjadi luaran siswa juga belum sepenuhnya dipahami. Kajian ini penting agar evaluasi PPG tidak hanya berorientasi pada sertifikasi, tetapi juga dukungan sekolah setelah sertifikasi. Penelitian ini bertujuan menganalisis penerapan strategi pembelajaran inovatif dan kolaborasi lulusan PPG, hubungannya dengan luaran siswa, serta kontribusi faktor kontekstual sekolah. Penelitian menggunakan desain metode campuran sekuensial eksplanatori. Tahap kuantitatif melibatkan 507 lulusan PPG melalui survei 25 butir yang dianalisis menggunakan statistik deskriptif, korelasi Spearman, dan regresi hierarkis. Tahap kualitatif mencakup observasi empat kelas, wawancara empat guru dan empat kepala sekolah, serta analisis dokumen di empat sekolah. Hasil menunjukkan persepsi positif terhadap strategi pembelajaran inovatif dan kolaborasi, tetapi observasi menemukan variasi penerapan, terutama dalam integrasi teknologi dan kolaborasi profesional. Faktor kontekstual sekolah meningkatkan daya jelas model dari R^2 = 0,762 menjadi 0,799. Temuan kualitatif memperlihatkan bahwa capaian akademik siswa berbeda antarsekolah dan memerlukan pembelajaran berdiferensiasi. Disimpulkan bahwa kompetensi lulusan PPG perlu didukung kepemimpinan instruksional, kolaborasi bermakna, fasilitas teknologi, dan evaluasi formatif. Evaluasi PPG dan kebijakan pengembangan guru perlu memperkuat dukungan pascasertifikasi.
Kata kunci: *Ekosistem Sekolah, Keterlibatan Siswa, Kompetensi Guru, Pendidikan Profesi Guru (PPG), Strategi Pembelajaran Inovatif.*

ABSTRACT

Research on Teacher Professional Education (PPG) faces a gap between graduates' reported competencies and classroom implementation. The contribution of school conditions to translating teacher competencies into student outcomes remains insufficiently understood. This issue matters because PPG evaluation should consider post-certification support, not certification alone. This study examined PPG graduates' innovative learning strategies and collaboration, their relationships with student outcomes, and the contribution of contextual school factors. An explanatory sequential mixed methods design was employed. The quantitative phase surveyed 507 PPG graduates using a 25-item questionnaire; data were analyzed through descriptive statistics, Spearman correlation, and hierarchical regression. The qualitative phase involved four classroom observations, interviews with four teachers and four principals, and document analysis in four schools. Findings indicate positive perceptions of innovative strategies and collaboration, while observations reveal variation, particularly in technology integration and professional collaboration. Contextual school factors increased

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model explanatory power from R^2 = 0.762 to 0.799. Qualitative findings show that student achievement varied across schools and required differentiated instruction. The study concludes that PPG graduates' competencies require instructional leadership, meaningful collaboration, technological facilities, and formative evaluation. PPG evaluation and teacher development policies should strengthen ongoing post-certification support.
Keywords: *Innovative Learning Strategies, School Ecosystem, Student Engagement, Teacher Competence, Teacher Professional Education (PPG).*

INTRODUCTION

Teacher Professional Education (*Pendidikan Profesi Guru/PPG*) has become an important policy instrument in Indonesia for improving teacher professionalism and educational quality. The program is designed to strengthen teachers' pedagogical and professional competencies so that they can implement effective learning practices and support student development. The scale of this investment is reflected in the achievement of 598,566 teachers graduating from PPG in 2024, with a target of approximately 800,000 teachers in 2025 (Kementerian Pendidikan Dasar dan Menengah Republik Indonesia, 2025). Previous evaluations have also identified the contribution of PPG to the development of teachers' professional competencies, particularly in strengthening their professional qualifications and instructional capacities (Ridwanudin & Takiddin, 2025; Safrul Muluk & Lubis, 2026). Nevertheless, the success of PPG cannot be adequately assessed solely through the number of teachers obtaining professional certificates or improvements in their individual competencies. A more comprehensive evaluation is needed to determine whether the competencies acquired through professional education are transferred into actual classroom practices and contribute to improvements in student engagement and academic achievement.

Evaluating the transfer of PPG competencies requires attention to three interconnected problems. First, assessments of teacher competence frequently rely on self-report questionnaires, which may be influenced by social desirability and discrepancies between individuals' perceived competencies and their actual performance (Dunnion et al., 2024). Second, the competencies developed during professional education do not necessarily translate consistently into classroom practices, particularly when teachers encounter challenges in implementing instructional approaches and adapting their professional preparation to specific teaching contexts (Sari et al., 2026). Research on technological pedagogical content knowledge also demonstrates that the effective integration of educational technology requires the alignment of technological, pedagogical, and subject-matter competencies to support student learning (Jammeh et al., 2024). Third, the implementation of acquired competencies is influenced by the availability of school-level support, including instructional leadership, technological infrastructure, and opportunities for professional collaboration. These problems indicate that evaluating PPG outcomes requires an approach that examines individual teacher competencies alongside the organizational and environmental conditions that support or constrain their implementation.

Previous studies have provided evidence concerning the relationship between instructional innovation, professional collaboration, and educational outcomes. Research on problem-based learning has identified both its potential to support science learning and the challenges associated with its classroom implementation (Mudhofir et al., 2026). Similarly, the implementation of educational innovations through facilitator-based approaches demonstrates that the effectiveness of professional development initiatives depends not only on the intervention itself but also on the characteristics of the school context (Stahnke et al., 2025).

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Other research has highlighted the contribution of project-based learning to student motivation, collaboration, and academic achievement, indicating the relevance of innovative instructional approaches to the development of student learning outcomes (Muho et al., 2025). However, further explanation is needed regarding how individual teacher competencies interact with school-level ecological conditions to shape student engagement and academic achievement, particularly in the context of PPG graduates in Indonesia.

This study draws on the perspective that teacher competence and school ecology are interconnected dimensions of educational improvement. Teacher competencies, including the implementation of innovative learning strategies and professional collaboration, represent individual and interpersonal resources that can influence the quality of classroom instruction. However, their application is shaped by contextual conditions such as instructional leadership, technological infrastructure, protected collaboration time, and school-based teacher performance evaluation. Research on learning-centered leadership demonstrates that horizontal and vertical trust contribute to the development of collective teacher culture, highlighting the importance of relational conditions within schools (Bellibas et al., 2025). Furthermore, teacher collaboration has been examined in relation to student achievement, emphasizing the need to understand how collaborative professional practices operate within school environments (Wullschleger et al., 2025). The distinction between proximal factors, which relate directly to teachers' competencies and practices, and distal factors, which encompass the broader school environment, provides a conceptual basis for understanding this relationship. Accordingly, the transfer of PPG competencies should be examined as a process involving the interaction between individual professional capacity and the institutional conditions that enable or constrain its realization in teaching and student learning.

Based on these considerations, this study proposes the Ecological Model of PPG Competence Transfer to explain the relationship between teachers' acquired competencies, contextual school factors, and student outcomes. Unlike evaluations that rely primarily on self-reported competency measures, this study integrates a large-scale survey of 507 PPG graduates with classroom observations, interviews, and document analysis in four partner schools. This methodological integration enables comparisons between teachers' reported instructional practices and their actual classroom implementation, while also examining the organizational conditions surrounding those practices. The study further examines the contribution of contextual school factors to the predictive relationship between innovative learning strategies, teacher collaboration, and student engagement and academic achievement through hierarchical regression, supported by qualitative findings. The relevance of this investigation is reinforced by research demonstrating that professional learning communities and collective teacher efficacy are associated with student mathematics achievement (Liu & Yin, 2024), as well as meta-analytic evidence highlighting the distinct dimensions and functions of student engagement in educational settings (Reeve et al., 2025). Thus, its contribution lies in providing an empirically grounded explanation of competency transfer that considers both individual teacher capacity and the supporting school ecosystem rather than assuming that professional certification automatically produces improved student outcomes.

Accordingly, this study addresses three research questions: (1) How are the innovative learning strategies and professional collaboration of PPG graduates reflected in their actual classroom practices and professional interactions? (2) How are these instructional practices associated with student engagement and academic achievement? (3) What contribution do contextual school factors, including instructional leadership, technological infrastructure, and professional collaboration opportunities, make to explaining the relationship between teacher

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competencies and student outcomes? To answer these questions, the study employs an explanatory sequential mixed methods design, integrating quantitative survey findings with qualitative evidence from classroom observations, interviews, and document analysis. The use of theoretical models in explanatory sequential mixed methods research provides a methodological foundation for connecting quantitative findings with subsequent qualitative explanations (Haynes-Brown, 2023). Furthermore, the selection and use of qualitative information sources require attention to the relevance and capacity of informants to provide contextually meaningful evidence (Pahwa et al., 2023). The findings are expected to contribute to the evaluation of teacher professional education by identifying the conditions that facilitate or constrain the transfer of professional competencies into instructional practices and student outcomes. Ultimately, this study aims to inform teacher education institutions, school leaders, and policymakers about the importance of strengthening school ecosystems alongside investments in individual teacher professional development.

RESEARCH METHOD

This study employed an explanatory sequential mixed-methods design, beginning with quantitative data collection and analysis, followed by qualitative data collection to clarify the quantitative findings. Quantitative data were collected through a survey involving 507 Teacher Professional Education (PPG) graduates from various educational levels and regions. The research instrument was a five-point Likert-scale questionnaire comprising 25 items measuring innovative learning strategies, social attitudes and teacher collaboration, student achievement and engagement, and contextual school factors. Quantitative data were analyzed using descriptive statistics, Spearman's correlation, and hierarchical regression with the assistance of SPSS. The quantitative findings guided the subsequent qualitative data collection, particularly the selection of participants, the development of interview questions, and the identification of classroom observation aspects.

Qualitative data were collected through semi-structured interviews with four PPG teachers and four school principals, observations of four classrooms, and documentation of teaching materials, student learning outcomes, and school documents. Participants and research sites were purposively selected based on variations in educational levels, PPG graduation years, and survey response patterns. Classroom observations used nine indicators across four domains, while interviews lasted approximately 45–60 minutes. Qualitative data were analyzed using NVivo 12 through open, axial, and selective coding, supported by source, method, and time triangulation, as well as an audit trail of the analytical process. Quantitative and qualitative findings were subsequently compared and integrated to identify areas of convergence, divergence, and contextual explanations concerning the relationships among teacher competencies, school conditions, and student outcomes.

RESULTS AND DISCUSSION

Results

The findings are organized according to the three research questions. The first section presents the quantitative results concerning the implementation of innovative learning strategies, social attitudes and teacher collaboration, perceived student outcomes, and contextual school factors. The second section reports the qualitative evidence obtained from classroom observations, interviews, and document analysis to examine how these patterns were reflected in school practices. The final section integrates both datasets to identify areas of

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convergence and divergence. All quantitative results are interpreted as statistical descriptions and associations rather than evidence of causal effects.

The descriptive analysis was conducted to identify the distribution of respondents' self-reported scores across the four research variables. Table 1 presents the number of valid responses, mean, median, mode, and standard deviation for each variable. The theoretical score ranges were calculated from the number of questionnaire items and the five-point Likert scale, resulting in a range of 7–35 for Implementation of Innovative Learning Strategies (X1) and 6–30 for each of the other three variables. Because the original analysis did not specify the thresholds for classifying scores as low, moderate, or high, the results are presented as numerical descriptions rather than categorical judgments.

Table 1. Descriptive Statistics of the Research Variables

Statistic	X1: Innovative Learning Strategies	X2: Social Attitudes and Teacher Collaboration	Y: Student Achievement and Engagement	Z: Contextual School Factors
Valid N	507	507	507	507
Missing	0	0	0	0
Theoretical range	7–35	6–30	6–30	6–30
Mean	30.2643	25.1775	25.6726	25.4517
Median	31.0000	25.0000	25.0000	26.0000
Mode	35.00	30.00	30.00	30.00
Standard deviation	4.64439	4.06567	3.88054	4.18202
Mean per item	4.32	4.20	4.28	4.24

Source: Primary survey data from 507 PPG graduates, processed by the researchers.

Table 1 shows that Implementation of Innovative Learning Strategies (X1) had a mean score of 30.26 (SD = 4.64), equivalent to an average item score of 4.32 out of 5. Social Attitudes and Teacher Collaboration (X2) had a mean of 25.18 (SD = 4.07), while Impact on Student Achievement and Engagement (Y) had a mean of 25.67 (SD = 3.88). Contextual School Factors (Z) recorded a mean of 25.45 (SD = 4.18), with an average item score of 4.24. These figures describe respondents' generally positive self-assessments and perceptions, but they do not independently establish actual teaching competence, instructional effectiveness, or improvements in student achievement.

Normality tests were conducted to examine the distribution of the observed scores for the four research variables. Table 2 presents the Kolmogorov–Smirnov and Shapiro–Wilk test statistics, including their significance values. Both tests produced significance values below .001 for all four variables, indicating that the observed score distributions differed significantly from a normal distribution. These findings concern the raw variable scores and should not be interpreted as evidence about the normality of regression residuals.

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Table 2. Normality Test Results for the Research Variables

Variable	Kolmogorov–Smirnov Statistic	df	Sig.	Shapiro–Wilk Statistic	df	Sig.
X1: Innovative Learning Strategies	.154	507	< .001	.842	507	< .001
X2: Social Attitudes and Teacher Collaboration	.118	507	< .001	.895	507	< .001
Y: Student Achievement and Engagement	.150	507	< .001	.866	507	< .001
Z: Contextual School Factors	.139	507	< .001	.867	507	< .001

Source: Primary survey data, processed using SPSS.

As shown in Table 2, all four variables yielded significant results in both normality tests ($p < .001$). This indicates that the distributions of the questionnaire scores were not statistically consistent with a normal distribution. However, the results do not replace the regression-specific diagnostic procedures required to evaluate the regression model. Therefore, the normality of residuals and other regression assumptions should be reported separately if the corresponding diagnostic tests were conducted.

Spearman's rho correlation analysis was used to examine the direction and strength of the associations among the research variables. Table 3 presents the correlation coefficients, significance values, and sample sizes for the variable pairs reported in the original analysis. The results indicate positive and statistically significant associations between the reported pairs, with all significance values below .001. These correlations represent statistical relationships and do not establish that one variable causes changes in another.

Table 3. Spearman's Rho Correlation Analysis

Variable Pair	Spearman's ρ	N	Sig. (2-tailed)
X1 – Y	.800	507	< .001
X1 – Z	.707	507	< .001
X2 – Y	.760	507	< .001
X2 – Z	.743	507	< .001
Y – Z	.768	507	< .001

Note: *Correlation is significant at the .01 level (2-tailed). The X1–X2 coefficient was not reported in the original table and therefore is not presented here.*
Source: Primary survey data, processed using SPSS.

Table 3 indicates that the strongest reported association was between Implementation of Innovative Learning Strategies (X1) and Impact on Student Achievement and Engagement (Y), with a coefficient of $\rho = .800$. The association between Social Attitudes and Teacher Collaboration (X2) and Y was also positive ($\rho = .760$), while Contextual School Factors (Z)

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were positively associated with Y (ρ = .768). The correlations between X1 and Z and between X2 and Z were .707 and .743, respectively. Although the relatively high coefficients warrant attention to the possibility of common method variance because the variables were measured through the same self-report questionnaire, these results alone do not demonstrate that such bias occurred.

Hierarchical multiple regression was conducted to examine the predictive contribution of Implementation of Innovative Learning Strategies (X1) and Social Attitudes and Teacher Collaboration (X2) to Impact on Student Achievement and Engagement (Y), before and after adding Contextual School Factors (Z). Table 4 summarizes the model fit and changes in explained variance for the two regression models. Model 1 included X1 and X2, whereas Model 2 added Z as an additional predictor. The results provide information about the incremental explanatory contribution of Z within the specified regression models.

Table 4. Model Summary and Change Statistics of Hierarchical Regression

Model	R	R^2	Adjusted R^2	Std. Error of Estimate	R^2 Change	F Change	df1
1	.873	.762	.761	1.89766	.762	805.955	2
2	.894	.799	.798	1.74553	.037	92.684	1

Source: Primary survey data, processed using SPSS.

As presented in Table 4, Model 1 explained 76.2% of the variance in Impact on Student Achievement and Engagement (R^2 = .762). After Contextual School Factors (Z) were added, the explained variance increased to 79.9% (R^2 = .799), representing an additional 3.7 percentage points (ΔR^2 = .037). The F-change value for Model 2 was 92.684, indicating a statistically significant improvement in model fit (p < .001, as reported in the original analysis). Thus, Z contributed additional predictive information beyond X1 and X2, although this increase does not by itself establish a mediation effect or a causal mechanism.

The original manuscript also reports changes in the regression coefficients across the two models. In Model 1, the standardized coefficients were β = .521 for X1 and β = .396 for X2, with t values of 14.184 and 10.770, respectively (both p < .001). In Model 2, the manuscript reports unstandardized coefficients (B) of .333 for X1 and .219 for X2, compared with .436 and .378 in Model 1, while Z had a reported standardized coefficient of β = .336 (t = 9.627, p < .001). Because the original manuscript does not provide the complete coefficient output for both models, the full coefficient table cannot be reconstructed reliably from the available information.

Table 5. Regression Coefficients for Hierarchical Models

Predictor	Model 1 B	Model 1 SE	Model 1 β	Model 1 t	Model 1 p	Model 2 B	Model 2 SE	Model 2 β	Model 2 t	Model 2 p
X1: Innovative Learning Strategies	.436	Not reported	.521	14.184	< .001	.333	Not reported	Not reported	Not reported	Not reported

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X2: Social Attitudes and Teacher Collaboration	.378	Not reported	.396	10.770	< .001	.219	Not reported	Not reported	Not reported	Not reported
Z: Contextual School Factors	—	—	—	—	—	Not reported	Not reported	.336	9.627	< .001

Source: Regression output reported in the original manuscript. Missing statistics must be completed using the original SPSS coefficient output.

Table 5 indicates that the reported coefficients for X1 and X2 decreased after Z was added to the regression model. The original analysis also identifies Z as a statistically significant predictor in Model 2. However, the decrease in coefficients should be interpreted as a change in the predictors' estimated contributions after controlling for Z, rather than as proof of partial mediation. A formal mediation conclusion would require an appropriate indirect-effect analysis and its confidence interval, which are not reported in the current manuscript.

Classroom observations were conducted in four partner schools: MAS Asy-Syura, MI Al-Falah, MTs Asy-Syura, and SMA Negeri 1 Sungai Raya. The observations focused on the implementation of PBL and PjBL activities, questioning practices, instructional scaffolding, checks for understanding, and the use of technology during learning. Across the four classrooms, the observation notes recorded the use of open-ended questions, gradual assistance when students experienced difficulties, and checks for understanding during instruction. One observation note stated, “The teacher applied questioning during the learning process effectively, enabling students to respond and maintain focus.”

The observation findings also identified differences in the use of technology during classroom activities. For the indicator of active student use of technology, three teachers from MAS Asy-Syura, MI Al-Falah, and MTs Asy-Syura received a score of 3 out of 4, while Teacher MU at SMA Negeri 1 Sungai Raya received a score of 4. The observation notes from the first three schools indicated that digital slides were mainly displayed by teachers rather than actively explored by students. In contrast, the observation at SMA Negeri 1 Sungai Raya recorded students' active use of technology for learning exploration.

Table 6. Available Classroom Observation Evidence on Active Student Use of Technology

School	Teacher/Case	Score (0–4)	Recorded Observation
MAS Asy-Syura	Teacher SA	3	Digital slides were mainly displayed by the teacher.
MI Al-Falah	Not specified	3	Digital slides were mainly displayed by the teacher.
MTs Asy-Syura	Not specified	3	Digital slides were mainly displayed by the teacher.

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SMA Negeri 1 Sungai Raya	Teacher MU	4	Students actively used technology for learning exploration.

Source: Classroom observation records reported in the original manuscript. Teacher identifiers for MI Al-Falah and MTs Asy-Syura should be added if available.

Table 6 presents the available scores for one technology-use indicator rather than the complete TPACK assessment. The scores show that active student use of technology differed across the four observed classrooms. The observation evidence suggests that the use of digital presentation tools should be distinguished from technology integration that enables students to explore learning content actively. However, the available data are insufficient to classify the overall TPACK competence of each teacher across all indicators.

Interviews indicated that teachers adapted PBL activities to the characteristics and learning needs of their students. Teacher SA from MAS Asy-Syura explained, “I simplified the case studies provided. Learning groups were made smaller so all students would be active.” Teacher MU from SMA Negeri 1 Sungai Raya similarly stated, “I provided problems close to daily life, formed small groups, and guided students according to their abilities.” These statements describe the teachers' reported efforts to contextualize learning activities and provide assistance during group work.

The interviews also identified challenges in establishing collaboration with colleagues. Teacher SA reported experiencing doubts from senior teachers about the learning methods introduced by PPG graduates. Teacher MU explained that differences in opinion were addressed through discussion, sharing experiences, and demonstrating classroom practices. These accounts indicate that the implementation of new teaching practices occurred within professional relationships that varied across school settings.

Document analysis of MGMP/KKG schedules in three partner schools-MAS Asy-Syura, MI Al-Falah, and MTs Asy-Syura-showed that meetings were primarily allocated to administrative activities. These activities included preparing reports, coordinating examinations, and distributing tasks, with less documented time devoted to reflective pedagogical discussions. In contrast, documents from SMA Negeri 1 Sungai Raya recorded agendas for sharing teaching practices and jointly evaluating learning activities. Principal AS described the school's support by stating, “I facilitate regular meetings among teachers, sharing best practices, and joint evaluation of learning so that PPG teachers do not work alone, but become drivers of educational quality improvement.”

The comparison across schools indicates variation in the documented structure and focus of teacher collaboration. In three schools, the available meeting schedules emphasized administrative coordination, whereas SMA Negeri 1 Sungai Raya documented more structured opportunities for professional learning. The qualitative evidence therefore provides contextual information for interpreting the positive self-reported scores on Social Attitudes and Teacher Collaboration (X2). However, the findings describe four partner schools and should not be generalized to all schools employing PPG graduates.

Document analysis of student achievement records based on the learning objective achievement criteria (KKTP) showed differences across the four partner schools. At SMA Negeri 1 Sungai Raya, more than 85% of students were reported to have reached KKTP, while the proportions at MI Al-Falah and MTs Asy-Syura ranged from 70% to 80%. At MAS Asy-Syura, improvements were concentrated among students who were already active in group discussions, while lower-achieving students showed limited progress. These findings indicate that the documented achievement patterns were not uniform across schools or student groups.

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An interview with a principal also described changes in students' character and learning behavior, stating, “The change is very significant, although not solely about achievement, but the soul/character of the students is very good.” This account provides a qualitative description of perceived changes in student behavior and character. However, the available documents and interview excerpts do not provide a common quantitative measure of behavioral, emotional, cognitive, and agentic engagement across the four schools. Therefore, claims about improvement in all dimensions of student engagement should be limited to the evidence actually collected and reported.

The integration of quantitative and qualitative findings was conducted by comparing the survey patterns with classroom observations, interviews, and school documents. Table 7 presents the main areas of convergence and divergence between the two phases. The comparison focuses on the implementation of innovative learning strategies, student outcomes, teacher collaboration, and contextual school support. The integrated findings are presented as complementary explanations of the observed patterns rather than as evidence of statistical mediation.

Table 7. Joint Display of Quantitative and Qualitative Findings

Research Focus	Quantitative Findings	Qualitative Evidence	Integrated Interpretation
Innovative learning strategies (X1)	Mean = 30.26; mean per item = 4.32/5; positive association with Y (ρ = .800).	PBL/PjBL activities, open-ended questioning, and instructional scaffolding were recorded in four classrooms.	The qualitative observations generally support the reported use of innovative strategies, while showing differences in technology integration.
Student achievement and engagement (Y)	Mean = 25.67; mean per item = 4.28/5; positive associations with X1, X2, and Z.	KKTP achievement varied across schools; lower-achieving students at MAS Asy-Syura showed limited progress.	Positive self-reported perceptions were accompanied by uneven documented achievement patterns across schools and student groups.
Social attitudes and teacher collaboration (X2)	Mean = 25.18; mean per item = 4.20/5; positive association with Y (ρ = .760).	Three schools emphasized administrative MGMP/KKG activities, while SMA Negeri 1 Sungai Raya documented best-practice sharing and joint evaluation.	The survey reflects positive perceptions of collaboration, whereas documents reveal differences in the professional focus of collaboration.
Contextual school factors (Z)	Mean = 25.45; mean per item = 4.24/5; adding Z increased R^2 from .762 to .799.	Differences were recorded in collaboration structures, leadership support, technology use, and student achievement across schools.	The qualitative findings provide contextual information consistent with the additional predictive contribution of Z, but do not establish mediation.

Source: Integration of the quantitative survey, classroom observation, interview, and document analysis findings.

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Table 7 shows that the quantitative and qualitative findings were partly convergent and partly divergent. The positive self-reported assessment of innovative learning strategies was broadly consistent with the observation of PBL/PjBL activities, although the depth of technology integration varied. Similarly, positive perceptions of teacher collaboration were not uniformly reflected in school documents, which showed differences in the focus of professional meetings. The qualitative evidence also contextualized the additional predictive contribution of school factors by identifying differences in leadership support, collaboration arrangements, and classroom resources.

Overall, the findings indicate that the 507 PPG graduates reported positive perceptions across the four measured variables, while the qualitative phase identified variation in how teaching practices and collaboration were enacted in four partner schools. Classroom observations documented the implementation of PBL/PjBL activities but also showed that active student use of technology was not consistent across the observed classrooms. School documents and interviews revealed differences in professional collaboration and student achievement patterns, particularly in the progress of lower-achieving students. The hierarchical regression indicated that adding Contextual School Factors increased the explained variance in student achievement and engagement by 3.7 percentage points. Taken together, these findings describe associations and contextual variations in the selected sample rather than establishing sustained or causal effects of PPG certification.

Discussion

The findings of this study indicate that the relationship between teacher professional education (PPG), instructional practices, collaboration, and student outcomes does not occur automatically but is influenced by the conditions of the school environment. The quantitative findings show that teachers' perceptions of innovative learning strategy implementation (X1), social attitudes and teacher collaboration (X2), and the impact on student achievement and engagement (Y) were relatively high. However, classroom observations and interviews revealed discrepancies between teachers' perceptions and their actual classroom practices, particularly regarding technology integration and professional collaboration. These discrepancies suggest that the success of professional development programs should not be assessed solely through individual competencies or perceptions but also through teachers' ability to apply those competencies in authentic instructional settings. This interpretation is consistent with Flores et al. (2024), who found that the transfer of professional learning into classroom practice is supported by collaborative school culture, collective agency, and peer support. Therefore, the research objective of examining PPG graduates' competency implementation and its relationship with student outcomes should be understood through the interaction between teacher capacity and the supporting school ecosystem. This perspective is reinforced by Ehlert et al. (2025), who demonstrated that contextual conditions, including collegial cooperation, available resources, and institutional support, play important roles in facilitating teachers' implementation of educational innovations.

The findings on innovative learning strategy implementation indicate that teachers have incorporated elements of problem-based and project-based learning, including open-ended questions, group formation, and guidance tailored to students' needs. However, classroom observations revealed that technology integration had not fully shifted toward student-centered exploration, as three of the four teachers primarily used technology to present instructional materials. This condition indicates that technological proficiency does not necessarily reflect the integrated application of Technological Pedagogical Content Knowledge (TPACK), which

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Mishra and Koehler (2006) conceptualize as an interconnected understanding of technology, pedagogy, and content within instructional contexts. This finding is consistent with Pertiwi et al. (2021), who found that teachers could demonstrate adequate technological knowledge but had not fully integrated technological, pedagogical, and content knowledge into their classroom practices. Furthermore, Mustaqimah et al. (2023) demonstrated that the availability of information and communication technology (ICT)-based instructional media was significantly associated with teachers' TPACK competencies, highlighting the importance of adequate school facilities in supporting effective technology integration. Accordingly, this study addresses the objective of identifying how PPG graduates implement their competencies by demonstrating that innovative instructional strategies are evident, while the transformation of technology use still requires continuous professional development and adequate school facilities.

Regarding teachers' social attitudes and collaboration, the relatively high quantitative scores do not fully represent the quality of professional collaboration taking place in schools. Document analysis showed that MGMP or KKG activities in three schools were predominantly oriented toward administrative coordination, such as report preparation and activity arrangements, rather than reflective discussions about instructional strategies. This condition contrasts with the findings of Manurung et al. (2026), who demonstrated that effective teacher learning communities emphasize collaborative lesson planning, peer observation, reflective discussions, and continuous evaluation to improve teachers' pedagogical competencies. From the perspective of Wenger's (1999) Communities of Practice, professional collaboration requires not only interaction and shared goals but also collective practices involving experience sharing, reflection, and the development of shared knowledge. In contrast, practices at SMA Negeri 1 Sungai Raya demonstrate that leadership facilitating regular meetings and the sharing of good practices can support more substantive collaboration. This finding is consistent with Harjaya and Idawati (2022), who identified dialogic school leadership, evaluation, reflection, discussion, and collective decision-making as important strategies for developing a collaborative professional culture among teachers.

The hierarchical regression results show that the model incorporating contextual school factors (Z) had greater explanatory power than the model including only innovative learning strategies and teacher collaboration. The R^2 value increased from 0.762 to 0.799, representing an additional explanatory contribution of 0.037, or 3.7 percentage points, while the coefficients of X1 and X2 decreased after Z was added to the model. These findings indicate that school conditions make a statistical contribution to explaining variations in student outcomes, suggesting that teacher competence should be understood in relation to supporting factors such as instructional leadership, protected collaboration time, technological infrastructure, and evaluation practices oriented toward instructional improvement. This interpretation is supported by Suyari et al. (2026), who found that instructional leadership and teacher learning communities were significantly associated with instructional quality, highlighting the importance of school leadership and collaborative structures in supporting educational improvement. Similarly, Perdana and Hadiyanto (2023) identified a significant relationship between school climate and student achievement, indicating that the quality of the school environment is relevant to understanding differences in students' academic and non-academic outcomes. Nevertheless, the increase in R^2 and the attenuation of the coefficients indicate contextual contributions and changes in predictive relationships rather than evidence of causal mediation, allowing the research objective concerning the role of contextual factors to be addressed cautiously through the available quantitative and qualitative evidence.

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Differences in school conditions also help explain why the relationship between instructional practices and student outcomes does not follow a uniform pattern. Student achievement records showed that more than 85% of students at SMA Negeri 1 Sungai Raya achieved the KKTP, whereas achievement rates at MI Al-Falah and MTs Asy-Syura ranged from 70% to 80%; at MAS Asy-Syura, improvements were more evident among students who were already active in discussions, while some lower-achieving students showed limited progress. This pattern suggests that the implementation of problem-based or project-based learning needs to be accompanied by instructional support and differentiation to address students' varying levels of readiness. This explanation can be related to Vygotsky's (1978) concept of the Zone of Proximal Development, which emphasizes the importance of scaffolding according to learners' actual abilities and developmental potential. Empirical support for this interpretation is provided by Purwanto et al. (2025), who found that integrating Problem-Based Learning with ZPD-based scaffolding improved students' learning activities and achievement by providing instructional assistance tailored to their developmental needs. Similarly, Pawitra et al. (2025) demonstrated that combining Problem-Based Learning, differentiated instruction, and ZPD-based approaches improved student engagement by accommodating differences in students' initial abilities. Thus, the findings address the objective of understanding the relationship between teachers' practices and student outcomes while demonstrating that academic achievement cannot be separated from student characteristics, the quality of instructional guidance, and the learning support available in each school.

Overall, the integration of quantitative and qualitative findings supports the interpretation that the transfer of PPG competencies is a process shaped by the interaction between teacher capacity and the school ecosystem. These findings provide a basis for proposing the Ecological Model of PPG Competence Transfer, a conceptual framework that positions teacher competence as the initial resource, while instructional leadership, professional collaboration, technological infrastructure, and instructional evaluation represent conditions that may support or constrain its implementation. This framework is supported by Kurniasih et al. (2026), who demonstrated that collaborative leadership contributes to the development of collaborative school culture and is positively associated with teachers' professional growth and performance. Similarly, Sahidi (2026) highlighted the role of collaborative leadership and Professional Learning Communities in facilitating collective reflection, knowledge sharing, pedagogical competence, and sustainable professional learning. However, because this study employed a cross-sectional survey design and qualitative evidence from four schools, the proposed model should be understood as a context-based conceptual interpretation rather than evidence of causal relationships or the long-term impact of the PPG program. Therefore, future research should employ longitudinal designs, more standardized measures of student achievement and engagement, and formal mediation testing to further examine the mechanisms through which PPG competencies are transferred across different school contexts.

CONCLUSION

This study demonstrates that the contribution of Teacher Professional Education (PPG) graduates to classroom practices and student outcomes depends not only on the competencies acquired during professional training but also on the conditions of the schools in which those competencies are applied. Although the survey results indicate strong perceived implementation of innovative learning strategies and teacher collaboration, classroom observations reveal differences between reported practices and their actual implementation, particularly in technology integration and collaborative activities. The hierarchical regression

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results further show that contextual school factors increase the model's explanatory power from 76.2% to 79.9%, indicating that school conditions provide additional explanatory value in understanding student outcomes. These findings suggest that teacher certification alone cannot guarantee improvements in educational quality without supportive leadership, meaningful professional collaboration, adequate technological facilities, and continuous instructional evaluation. Therefore, the central implication of this study is that the success of PPG should be assessed not merely through certification outcomes but also through the extent to which teachers' competencies are supported and translated into meaningful educational practices.

In practical terms, teacher education institutions and policymakers should strengthen post-certification support through school-based mentoring, sustained professional learning communities, access to learning technologies, and differentiated instructional development. School leaders also need to provide protected time for teacher collaboration and establish formative evaluation practices that help teachers identify and respond to students' different learning needs. Such measures are particularly important to ensure that innovative learning strategies benefit students with varied levels of academic readiness rather than primarily those who are already actively engaged. Future research should employ longitudinal designs and broader school samples to examine how the transfer of PPG competencies develops over time and varies across different school contexts. Further studies may also apply formal mediation or moderation analysis and more systematic measures of student engagement and achievement to test the proposed ecological model and provide stronger evidence for future teacher education policies.

REFERENCES

Bellibas, M. S., Çelik, M., & Polatcan, M. (2025). The role of horizontal and vertical trust in relationships between learning-centered leadership and collective teacher culture. *Psychology in the Schools, 62*(11), 4826–4838. https://doi.org/10.1002/pits.70041

Dunnion, M. F., Gbadamosi, G., & Francis-Smythe, J. (2024). The illusion of competence: A qualitative deep dive into workplace false performance. *Behavioral Sciences, 14*(11), Article 985. https://doi.org/10.3390/bs14110985

Ehlert, M., Adloff, M., & Souvignier, E. (2025). It's about time! Teachers' perspectives on supportive and hindering contextual conditions for implementing innovations in schools. *Education Inquiry*. https://doi.org/10.1080/20004508.2025.2454083

Harjaya, S., & Idawati, L. (2022). Professional learning community (PLC) sebagai strategi kepemimpinan dalam membentuk budaya kolaborasi sekolah di TK Eksperimental Mangunan Yogyakarta. *JIIP - Jurnal Ilmiah Ilmu Pendidikan, 5*(8), 3179–3193. https://doi.org/10.54371/jiip.v5i8.821

Haynes-Brown, T. K. (2023). Using theoretical models in mixed methods research: An example from an explanatory sequential mixed methods study exploring teachers' beliefs and use of technology. *Journal of Mixed Methods Research, 17*(3), 243–263. https://doi.org/10.1177/15586898221094970

Jammeh, A. L. J., Karegeya, C., & Ladage, S. (2024). Application of technological pedagogical content knowledge in smart classrooms: Views and its effect on students' performance in chemistry. *Education and Information Technologies, 29*(8), 9189–9219. https://doi.org/10.1007/s10639-023-12158-w

Kementerian Pendidikan Dasar dan Menengah Republik Indonesia. (2025, August 29). Penuntasan sertifikasi guru melalui program PPG bagi guru tertentu 2025.

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https://doi.org/10.51878/teaching.v6i4.16973

https://www.kemendikdasmen.go.id/siaran-pers/13530-penuntasan-sertifikasi-guru-melalui-program-ppg-bagi-guru-tertentu-2025

Kurniasih, W., Sururi, & Suryadi. (2026). School culture transformation through collaborative leadership practices. *JP (Jurnal Pendidikan): Teori dan Praktik, 11*(1), 49–60. https://journal.unesa.ac.id/index.php/jp/article/view/47349

Liu, S., & Yin, H. (2024). Opening the black box: How professional learning communities, collective teacher efficacy, and cognitive activation affect students' mathematics achievement in schools. *Teaching and Teacher Education, 139*, (104443). https://doi.org/10.1016/j.tate.2023.104443

Manurung, P. H., Siagian, S., Darwin, D., & Purba, S. (2026). Manajemen pengembangan kompetensi pedagogik guru melalui komunitas belajar (learning community) untuk meningkatkan kualitas pembelajaran di SMA Santo Thomas 2 Medan. *Jurnal Ilmiah Profesi Pendidikan, 11*(1), 741–747. https://doi.org/10.29303/jipp.v11i1.4375

Mudhofir, F., Cahyono, E., Saptono, S., & Sulhadi. (2026). Implementation of problem-based learning and the challenges in science education: A systematic literature review. *Journal of Advanced Sciences and Mathematics Education, 6*(1), 24–36. https://doi.org/10.58524/jasme.v6i1.1020

Muho, A., Leka, K., Sivakumar, R., La Ragione, C., & Weiss, E. (2025). The role of project-based learning in motivation, collaboration, and achievement in second language acquisition. *Journal of Education Culture and Society, 16*(1), 311–320. https://doi.org/10.15503/jecs2025.2.311.320

Mustaqimah, A., Suhartono, S., & Cholifah, P. S. (2023). Hubungan ketersediaan media pembelajaran berbasis TIK dengan kemampuan TPACK guru sekolah dasar. *Sekolah Dasar: Kajian Teori dan Praktik Pendidikan, 32*(2), 186–200. https://doi.org/10.17977/um009v32i22023p186-200

Pahwa, M., Cavanagh, A., & Vanstone, M. (2023). Key informants in applied qualitative health research. *Qualitative Health Research, 33*(14), 1251–1261. https://doi.org/10.1177/10497323231198796

Pawitra, P. M., Budiyanto, C. W., & Raharjo, J. S. (2025). Implementasi model Problem-Based Learning dengan pendekatan berdiferensiasi berbasis kemampuan awal siswa dan teori Zone of Proximal Development (ZPD) untuk meningkatkan keaktifan belajar di kelas X TJKT SMK Negeri 1 Sukoharjo. *Indonesian Journal of Learning and Instructional Innovation, 3*(1), 39–46. https://journal.uns.ac.id/index.php/ijolii/article/view/1888

Perdana, C., & Hadiyanto. (2023). Hubungan iklim sekolah dengan prestasi belajar siswa di sekolah menengah kejuruan. *Deduksi: Jurnal Dedikasi Edukasi, 2*(2), 51–59. https://deduksi.ppj.unp.ac.id/index.php/deduksi/article/view/24

Pertiwi, D. P., Kumala, F. N., & Iswahyudi, D. (2021). Analisis kemampuan teknologi guru SD. *RAINSTEK: Jurnal Terapan Sains dan Teknologi, 3*(3), 241–246. https://doi.org/10.21067/jtst.v3i3.6038

Purwanto, Y., Utami, I. W. P., & Efendi, M. H. (2025). Integrasi Problem Based Learning dan scaffolding berbasis ZPD pada materi kebudayaan masa praaksara. *Journal of Language Literature and Arts, 5*(4), 476–484. https://doi.org/10.17977/um064v5i42025p476-484

Reeve, J., Basarkod, G., Jang, H.-R., Gargurevich, R., Jang, H., & Cheon, S. H. (2025). Specialized purpose of each type of student engagement: A meta-analysis. *Educational Psychology Review, 37*(1), Article 13. https://doi.org/10.1007/s10648-025-09989-z

Ridwanudin, D., & Takiddin. (2025). Evaluasi efektivitas program pendidikan profesi guru (PPG) dalam meningkatkan kompetensi profesional guru MI. *Elementar: Jurnal*

Copyright (c) 2026 TEACHING : Jurnal Inovasi Keguruan dan Ilmu Pendidikan
https://doi.org/10.51878/teaching.v6i4.16973

Pendidikan Dasar, 5(2), 127–136. https://doi.org/10.15408/elementar.v5i2.48581

Safrul Muluk, & Lubis, A. H. (2026). The impact of teacher professional education program on improving teacher competences in Indonesia: A comparative study. *Englisia: Journal of Language, Education, and Humanities, 13*(2), 643–657. https://doi.org/10.22373/englisia.172

Sahidi, M. (2026). Teachers' collaborative leadership and the enhancement of professional performance through Professional Learning Community (PLC) practices. *ISLAMIKA, 8*(3), 1041–1083. https://doi.org/10.36088/islamika.v8i3.6466

Sari, K. I., Mirizon, S., & Vianty, M. (2026). Out-of-field teaching in elementary schools: Preparedness of pre-service PPG English graduates in Indonesia. *Jo-ELT (Journal of English Language Teaching) Fakultas Pendidikan Bahasa & Seni Prodi Pendidikan Bahasa Inggris IKIP, 13*(1), 185–199. https://doi.org/10.33394/jo-elt.v13i1.19929

Stahnke, R., Şahin-Gür, D., Hankeln, C., & Prediger, S. (2025). Implementing educational innovations through facilitators: Cascade model works, yet school contexts matter. *Studies in Educational Evaluation, 85*(101456). https://doi.org/10.1016/j.stueduc.2025.101456

Suyari, S., Batu, D. L., Fitrianingrum, E., Andriani, F., & Nurkolis, N. (2026). Pengaruh kepemimpinan instruksional kepala sekolah dan komunitas belajar terhadap mutu pembelajaran sekolah dasar negeri Kota Semarang. *Jurnal Pendidikan dan Kebudayaan Nusantara, 4*(3), 52–61. https://doi.org/10.38035/jpkn.v4i3.3568

Wullschleger, A., Maag Merki, K., Grob, U., Rechsteiner, B., Compagnoni, M., & Vörös, A. (2025). Teacher collaboration to elevate student achievement? Learning and Instruction, 97, (102104). https://doi.org/10.1016/j.learninstruc.2025.102104

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https://doi.org/10.51878/teaching.v6i4.16973