



Structural Supervision and Reflective Professionalism as Determinants of Deep Learning Quality in Elementary Education

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Abstract:

This study examines the influence of classroom observation and teachers' reflective ability on deep learning quality in public elementary schools in Singorojo District, Kendal Regency. The research employed a quantitative correlational design involving 183 teachers selected through proportional random sampling. Data were collected using structured questionnaires and analyzed using Pearson correlation and multiple linear regression techniques. The findings demonstrate that both classroom observation and reflective ability significantly contribute to deep learning quality, with classroom observation emerging as the dominant predictor. When examined simultaneously, both variables provide substantial explanatory power, accounting for a large proportion of variance in deep learning quality. Effect size analysis further confirms that these relationships are not only statistically significant but also practically robust, indicating very large effects. These results suggest that deep learning quality is primarily driven by structured instructional supervision, supported by teachers' internal reflective competence. This study advances educational management literature by proposing an integrated framework that conceptualizes deep learning quality as the outcome of the interaction between external supervisory systems and internal professional capacity. The findings also provide practical implications for designing sustainable instructional improvement strategies in elementary education.

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Introduction

Competency-Based Education (CBE) emphasizes mastery of specific competencies over traditional learning. Thereby encouraging deeper learning with a focus on conceptual understanding, critical thinking skills, and the application of knowledge in real-world contexts (Dagore & Singh, 2025; Jain et al., 2025). CBE allows students to learn at their own pace, increasing motivation and engagement through ownership of the learning process and the use of technology for performance-based assessment (Akramova et al., 2025; Dagore & Singh, 2025). The integration of technologies such as artificial intelligence (AI) and machine learning further strengthens the personalization of learning and adaptive competency

evaluation, which can reduce stress and increase learning effectiveness (Akramova et al., 2025; Faucher et al., 2025; LiMengyang et al., 2025). In Indonesia, this paradigm is reinforced through the implementation of the Merdeka Curriculum and the enactment of Ministerial Regulation (Permendikdasmen No. 13 of 2025), which formally mandates student-centered and competency-oriented instruction. Deep learning is therefore not merely a pedagogical preference but a strategic national priority aimed at improving educational quality and preparing students for complex societal challenges (Mustaghfirin, 2025).

Despite its strong policy endorsement, the implementation of deep learning in schools remains uneven. Theoretical perspectives suggest that deep learning quality is highly dependent on teacher effectiveness and instructional design (Khofifah et al., 2025; Oktaviana et al., 2025). Hattie, (2019) argues that the most influential factor in student learning outcomes is the quality of teacher actions, particularly in designing meaningful learning experiences and engaging students cognitively. Similarly, Liao, (2025) emphasizes that instructional quality is determined by the coherence between objectives, teaching strategies, classroom interaction, and assessment practices. However, transforming instructional ideals into consistent classroom practice requires not only individual pedagogical competence but also systemic professional support mechanisms.

From an educational management perspective, academic supervision particularly classroom observation functions as a structural instrument to ensure instructional quality (Ko et al., 2024). Classroom observation is seen as a systematic effort to examine teaching practices and provide developmental feedback to teachers (Haep et al., 2016; Impedovo & Ligorio, 2026; Tarusha & Bushi, 2024). This process serves not only as an evaluation tool, but also as a means to improve teachers' skills and competencies through reflection and collective discussion related to the teaching practices observed (Martinez et al., 2016; Tarusha & Bushi, 2024). Development supervision emphasizes its role in facilitating teachers' professional growth, not merely administrative evaluation, thereby encouraging continuous improvement in teaching quality. This approach promotes reflective dialogue and continuous improvement that can significantly enhance instructional performance. Classroom observation as an external organizational mechanism serves to align teaching practices with deep learning standards, supporting development-oriented supervision (Subaidi, 2020). Thus, supervision oriented toward professional development can create a more effective learning environment through constructive feedback and collaboration between supervisors and teachers.

Parallel to structural supervision, teachers' reflective ability constitutes an internal professional mechanism that shapes instructional transformation (Glickman et al., 2018). Korthagen, (2018) explains that reflective practice enables teachers to critically analyze their teaching experiences, confront instructional dilemmas, and reconstruct pedagogical strategies. Reflective competence fosters adaptive expertise, allowing teachers to respond effectively to diverse classroom contexts. Magdalena et al. (2023) and Agnihotri (2024) highlight that reflective teachers demonstrate greater awareness of instructional strengths and weaknesses, leading to sustained professional growth. In elementary school settings, reflective practice is particularly essential in adapting teaching approaches to developmental characteristics and promoting active learning environments (Sholeh, 2021).

Although supervision and reflective practice are both recognized as critical components of instructional improvement, prior studies have predominantly examined these factors independently. Research by Hafid et al. (2024) and Mawaddah, (2021) confirmed the positive effect of academic supervision on instructional performance, while Feruza Masharipova (2025) and Agnihotri (2024) demonstrated that reflective practice enhances teaching effectiveness. However, limited empirical attention has been given to how external supervision and internal reflective competence interact in shaping deep learning quality as a multidimensional instructional outcome. Most existing studies focus on general teaching performance or student achievement rather than specifically addressing deep learning as a comprehensive construct encompassing cognitive, affective, and collaborative dimensions.

Empirical evidence from the Education Report Card of public elementary schools in Singorojo District, Kendal Regency, reveals a decline in instructional quality indicators between 2024 and 2025, particularly in classroom management and instructional methods. This decline indicates a misalignment between policy aspirations and classroom realities. Such discrepancies raise important questions regarding whether supervisory mechanisms and reflective professional practices have been sufficiently optimized to support deep learning implementation.

The present study addresses this conceptual and empirical gap by integrating classroom observation and teachers' reflective ability within a single analytical framework to explain variations in deep learning quality. By simultaneously examining external supervisory structures and internal professional capacity, this research extends existing educational management literature beyond isolated variable analysis. The study contributes theoretically by proposing that sustainable deep learning quality emerges from the interaction between organizational supervision systems and individual reflective professionalism. Empirically, it provides district-level evidence from elementary schools, offering context-specific insights into how managerial and professional factors converge in shaping instructional depth.

Accordingly, this study aims to (1) examine the effect of classroom observation on deep learning quality, (2) analyze the effect of teachers' reflective ability on deep learning quality, and (3) investigate the simultaneous influence of both variables on deep learning quality in public elementary schools in Singorojo District, Kendal Regency.

Metode

This study employed a quantitative correlational design to examine the partial and simultaneous effects of classroom observation and teachers' reflective ability on deep learning quality. The research was conducted in public elementary schools in Singorojo District, Kendal Regency, Indonesia. A correlational approach was selected as it enables the identification of predictive relationships among variables and provides an initial empirical basis for theory development in contexts where structural models have not yet been fully established.

The population consisted of 337 teachers from public elementary schools in the district. The sample size was determined using Slovin's formula with a 5% margin of error, resulting in 183 teachers. Participants were selected through proportional random sampling to ensure representative distribution across schools and to minimize sampling bias.

Data were collected using structured questionnaires developed based on established

theoretical indicators for each variable. The instrument for deep learning quality initially consisted of 36 items, classroom observation comprised 36 items, and teachers' reflective ability included 36 items. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). To ensure content validity, the instruments were evaluated by experts in educational management and instructional practice. Construct validity testing resulted in 32 valid items for deep learning quality, 33 valid items for classroom observation, and 32 valid items for teachers' reflective ability. Reliability testing using Cronbach's Alpha indicated that all variables exceeded the acceptable threshold of 0.70, confirming adequate internal consistency.

Several procedural remedies were applied during data collection to reduce potential response bias, including ensuring respondent anonymity, clarifying that there were no right or wrong answers, and minimizing evaluation apprehension. These steps were intended to improve the accuracy and honesty of responses.

Data analysis was conducted using SPSS version 25 and proceeded in several stages, including descriptive statistics, assumption testing, and hypothesis testing. Normality was examined using the Kolmogorov–Smirnov test. Multicollinearity was assessed through tolerance and Variance Inflation Factor (VIF) values to ensure that independent variables did not exhibit excessive overlap. Linearity and heteroscedasticity tests were also performed to confirm that the data met the assumptions required for regression analysis. The results indicated that all assumptions were satisfied.

In addition, to assess the potential for common method bias (CMB) resulting from the use of self-reported data collected from a single source, Harman's single-factor test was conducted. The results indicated that a single factor did not account for the majority of the total variance, suggesting that common method bias is unlikely to significantly affect the findings. Nevertheless, it is acknowledged that Harman's test has limitations, and future studies are encouraged to apply more robust techniques such as marker variables or confirmatory factor analysis (CFA)-based approaches.

Pearson correlation analysis was applied to examine the strength and direction of relationships between variables. Simple linear regression was used to test the partial effects of each independent variable on deep learning quality, while multiple linear regression was employed to examine their simultaneous influence. Regression analysis was considered appropriate as it allows for the estimation of predictive relationships and the quantification of variance explained by each predictor within a correlational framework. In addition, this approach is suitable for initial model testing prior to the application of more complex techniques such as structural equation modeling (SEM).

Hypothesis testing was conducted using t-tests for partial effects and F-tests for simultaneous effects with a significance level of 0.05. To complement statistical significance testing, effect size analysis was performed using the coefficient of determination (R^2) and Cohen's f^2 to evaluate the magnitude and practical relevance of the identified relationships.

Participation in this study was voluntary. Respondents were informed about the purpose of the research and assured that their responses would remain confidential and used solely for academic purposes.

Result and Discussion

1. Result

a. The Effect of Classroom Observation on Deep Learning Quality

To examine the relationship between classroom observation and deep learning quality, Pearson correlation and simple linear regression analyses were conducted. The results of the correlation analysis are presented in Table 1.

Table 1. Correlation between Classroom Observation and Deep Learning Quality

Variable	r	p-value	N
Classroom Observation – Deep Learning Quality	0.802	< 0.001	183

As shown in Table 1, classroom observation demonstrates a strong and positive correlation with deep learning quality ($r = 0.802$, $p < 0.001$). This indicates that improvements in classroom observation practices are associated with higher levels of deep learning quality. The statistically significant p-value confirms that this relationship is unlikely to have occurred by chance.

To further determine the predictive contribution of classroom observation, a simple linear regression analysis was conducted. The regression coefficients and overall model summary are presented in Tables 2 and 3.

Table 2. Simple Linear Regression Coefficients

Predictor	B	t	p
Constant	6.461	—	—
Classroom Observation	0.896	18.093	< 0.001

Table 3. Model Summary

R	R ²	Adjusted R ²	Std. Error
0.802	0.644	0.642	6.356

The regression results indicate that classroom observation significantly predicts deep learning quality ($t = 18.093$, $p < 0.001$). The regression equation is expressed as $\hat{Y} = 6.461 + 0.896X_1$. The coefficient of determination ($R^2 = 0.644$) shows that 64.4% of the variance in deep learning quality can be explained by classroom observation alone, while the remaining proportion is influenced by other variables not included in the model.

b. The Effect of Teachers' Reflective Ability on Deep Learning Quality

Following the analysis of classroom observation, the study examined whether teachers' reflective ability independently predicts deep learning quality. Pearson correlation analysis was first conducted to assess the association between these variables, and the findings are presented in Table 4.

Table 4. Correlation between Teachers' Reflective Ability and Deep Learning Quality

Variable	r	p-value	N
Reflective Ability – Deep Learning Quality	0.750	< 0.001	183

Table 4 indicates that teachers' reflective ability has a strong positive correlation with deep learning quality ($r = 0.750$, $p < 0.001$). This result suggests that teachers who demonstrate higher levels of reflective competence tend to exhibit higher levels of deep learning quality in their instructional practices.

To evaluate the predictive strength of reflective ability, a simple linear regression analysis was subsequently performed. The regression coefficients and model summary are provided in Tables 5 and 6.

Table 5. Simple Linear Regression Coefficients

Predictor	B	t	p
Constant	7.889	—	—
Reflective Ability	0.917	15.266	< 0.001

Table 6. Model Summary

R	R ²	Adjusted R ²	Std. Error
0.750	0.563	0.560	7.043

The regression equation is expressed as $\hat{Y} = 7.889 + 0.917X_2$. The results demonstrate that teachers' reflective ability significantly predicts deep learning quality ($t = 15.266, p < 0.001$). The R^2 value of 0.563 indicates that 56.3% of the variance in deep learning quality is explained by reflective ability. Although the explanatory power is slightly lower than that of classroom observation, it still represents a substantial contribution.

c. The Simultaneous Effect of Classroom Observation and Teachers' Reflective Ability

After analyzing the independent contributions of each predictor, multiple linear regression analysis was conducted to determine whether classroom observation and teachers' reflective ability jointly explain deep learning quality. The regression coefficients are presented in Table 7.

Table 7. Multiple Regression Coefficients

Predictor	B	Beta	t	p
Constant	5.382	—	1.167	.245
Classroom Observation	0.810	0.726	6.455	< 0.001
Reflective Ability	0.102	0.084	2.745	< 0.01

Table 8. Model Summary

R	R ²	Adjusted R ²	Std. Error
0.803	0.645	0.641	6.364

The regression model is formulated as $\hat{Y} = 5.382 + 0.810X_1 + 0.102X_2$. The results indicate that both classroom observation and teachers' reflective ability significantly contribute to deep learning quality when analyzed simultaneously. The coefficient of determination ($R^2 = 0.645$) shows that 64.5% of the variance in deep learning quality is explained collectively by the two predictors. The standardized beta coefficients suggest that classroom observation provides a stronger relative contribution compared to teachers' reflective ability within the combined model.

d. Effect Size Analysis

In addition to testing statistical significance, effect size analysis was conducted to evaluate the magnitude of the relationships identified in the regression models. While p-values indicate whether an effect exists, effect size measures the practical strength of that effect. In this study, both the coefficient of determination (R^2) and Cohen's f^2 were used to assess effect magnitude.

Cohen (1988) classifies f^2 values of 0.02, 0.15, and 0.35 as small, medium, and large effects, respectively. The calculated effect sizes for all regression models are presented in Table 9.

Table 9. Effect Size Analysis

Model	R²	Variance Explained (%)	f²	Effect Size Category
Classroom Observation	0.644	64.4%	1.809	Very Large
Reflective Ability	0.563	56.3%	1.288	Very Large
Combined Model	0.645	64.5%	1.817	Very Large

As shown in Table 9, all regression models demonstrate very large effect sizes. The f^2 values substantially exceed the threshold for a large effect (0.35), indicating that the identified relationships possess strong practical significance. Specifically, classroom observation and teachers' reflective ability contribute meaningfully to explaining variance in deep learning quality, both independently and collectively.

The results therefore confirm that the findings of this study are not only statistically significant but also substantively robust in magnitude. The large effect sizes strengthen the empirical contribution of this research by demonstrating that the identified predictors play a substantial role in shaping deep learning quality in the studied educational context.

2. Discussion

The findings of this study demonstrate that classroom observation has a significant and substantial influence on deep learning quality. This result reinforces the argument that structured academic supervision plays a central role in improving instructional practices. Effective classroom observation enables school leaders to provide constructive feedback, ensure alignment between instructional practices and curriculum standards, and promote continuous pedagogical refinement. This finding supports Glickman et al., (2018), who argue that instructional supervision enhances teaching quality when it is developmental rather than administrative in nature. Similarly, Subaidi, (2020) emphasizes that classroom observation functions as a professional guidance mechanism aimed at improving instructional effectiveness. More recent studies also confirm that structured observation combined with feedback significantly improves instructional coherence and student engagement (Impedovo & Ligorio, 2026; Tarusha & Bushi, 2024).

Beyond confirming prior research, the magnitude of the effect observed in this study indicates that classroom observation operates not merely as a supportive factor but as a primary structural driver of deep learning quality. This finding extends the argument of Hattie, (2019), demonstrating that teacher effectiveness is not solely an individual attribute but is strongly shaped by institutionalized supervisory practices. In this regard, classroom observation functions as an organizational mechanism that systematically directs instructional behavior toward deep learning standards through monitoring, feedback, and professional dialogue. This interpretation is consistent with recent evidence suggesting that instructional quality is strongly influenced by the coherence between teaching practices, assessment, and learning objectives (Liao, 2025).

However, the dominance of classroom observation also raises an important theoretical concern regarding the sustainability of instructional improvement. The strong reliance on external supervision suggests that instructional quality in the studied context may remain structurally dependent rather than professionally autonomous. This condition implies that teachers may respond more strongly to formal supervisory systems than to internally driven professional reflection. Such a pattern reflects characteristics often found in centralized educational environments, where compliance-oriented practices may take precedence over self-regulated professional learning. This aligns with broader discussions on system-driven reform, where institutional control mechanisms frequently shape teacher

behavior more strongly than intrinsic professional motivation (Fullan et al., 2017).

The results further reveal that teachers' reflective ability has a significant positive effect on deep learning quality. This finding is consistent with (Korthagen, 2018), who argues that reflective practice enables teachers to bridge the gap between actual and ideal instructional practices. Reflective competence encourages teachers to critically evaluate their teaching strategies, student engagement, and learning outcomes, thereby fostering continuous pedagogical improvement. In line with (Magdalena et al., 2023; Maghfiroh & Mahmudah, 2025), reflective practice enhances teachers' awareness of instructional strengths and weaknesses. Recent empirical studies also highlight that reflective practice contributes to adaptive teaching and sustained professional growth, particularly in dynamic classroom environments (Agnihotri, 2024; Feruza Masharipova, 2025; Rahmawati & Sholeh, 2021).

Nevertheless, a more nuanced interpretation emerges when both variables are examined simultaneously. Although reflective ability remains statistically significant, its additional contribution to the explanatory power of the model is minimal, as indicated by the negligible increase in R^2 (from 0.644 to 0.645). This finding suggests that reflective ability does not function as an independent primary predictor of deep learning quality to the same extent as classroom observation. Instead, it operates as a complementary and reinforcing mechanism embedded within the supervisory process.

The negligible increase in R^2 indicates that reflective ability shares substantial variance with classroom observation, suggesting that reflective practice may be partially shaped by supervisory processes rather than functioning as a fully independent construct. In other words, reflective ability may develop through structured supervision, where feedback and observation trigger reflective thinking and instructional adjustment. This interpretation challenges dominant assumptions in the literature that position reflective practice as a standalone driver of instructional transformation. Instead, the relationship between supervision and reflection is better understood as interdependent but asymmetrical.

Within this framework, classroom observation provides direction, structure, and external accountability, while reflective ability facilitates the internalization and adaptation of feedback into improved instructional practice. This perspective aligns with Michael Fullan et al. (2017), who emphasize that sustainable educational change requires both systemic intervention and individual professional learning. However, the present study extends this perspective by demonstrating that these components do not contribute equally; rather, external supervision acts as the primary catalyst, while reflective practice consolidates and sustains instructional improvement.

Furthermore, the findings provide important insights into the nature of deep learning itself. Although deep learning is often associated with student-centered and constructivist approaches, the strong influence of classroom observation suggests that its effective implementation remains highly dependent on structured instructional design and guided pedagogical practices (Khofifah et al., 2025). This implies that deep learning quality may be more sensitive to instructional coherence and implementation fidelity than to purely reflective or cognitive dimensions of teaching. Consequently, expecting high levels of autonomous reflective practice without strong supervisory support may be unrealistic, particularly in contexts where professional learning cultures are still developing.

Autonomous reflective practice, while valuable, requires strong supervisory and collaborative support, particularly in underdeveloped professional learning cultures. Structured professional development, clear implementation guidelines, and collaborative frameworks like PLCs are essential for fostering both reflective practice and instructional fidelity (Davey & Chambers, 2026; Shabeeb & Akkary, 2014; Vroom et al., 2020).

From a practical perspective, these findings highlight the importance of adopting an

integrated approach to instructional improvement. School leaders should strengthen academic supervision systems by implementing systematic and developmental classroom observation practices that include structured feedback, collaborative dialogue, and follow-up actions. At the same time, schools must cultivate reflective professionalism through reflective journals, peer discussions, lesson study, and professional learning communities. In this regard, supervision should not be positioned merely as an evaluative mechanism but as a developmental scaffold that activates and sustains reflective practice.

Despite its contributions, several limitations should be acknowledged. First, the use of self-reported questionnaire data introduces the potential for common method bias, which may inflate the observed relationships among variables. Although procedural remedies were applied, future research should incorporate statistical controls such as marker variables or CFA-based approaches to further minimize this bias.

Overall, this study contributes to the educational management literature by proposing that deep learning quality emerges from a dual-system mechanism involving structural supervision and reflective professionalism. Importantly, the findings reveal that these components do not contribute equally; rather, external supervisory structures function as the primary driver, while reflective ability serves as a reinforcing and internalizing mechanism. This asymmetrical relationship provides a critical insight for both theory and practice, emphasizing that sustainable instructional improvement depends not only on the presence of both mechanisms but also on a clear understanding of their relative roles and interaction.

Conclusion

This study confirms that classroom observation and teachers' reflective ability are significant determinants of deep learning quality in public elementary schools. Classroom observation serves as a structural mechanism that strengthens instructional implementation through systematic supervision and developmental feedback. At the same time, teachers' reflective ability functions as an internal professional capacity that enables continuous instructional improvement. The findings demonstrate that both external supervisory structures and internal reflective competence are essential components in fostering meaningful and conceptually rich learning processes.

When examined simultaneously, the two variables collectively provide a strong explanatory framework for understanding variations in deep learning quality. The results suggest that sustainable instructional improvement requires an integrated managerial approach that aligns academic supervision with reflective professional development. Thus, enhancing deep learning quality should not rely solely on policy reform or curriculum transformation, but must be supported by coherent supervisory systems and a strong culture of reflective practice within schools. This study contributes to the educational management literature by empirically demonstrating the complementary relationship between instructional supervision and reflective professionalism in shaping deep learning quality at the elementary school level. Future studies are encouraged to examine the potential mediation or hierarchical relationships between supervision and reflective ability using more advanced analytical techniques such as structural equation modeling (SEM).

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