

Optimizing Elementary School Teacher Performance: Integration of Instructional Leadership and Collegial Supervision in an Integrated Supervision Model

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ABSTRACT

This study examines how a combined supervision approach can improve elementary school teacher performance by linking principal-led guidance with peer-based professional support. The problem addressed is the limited effectiveness of supervision practices that rely only on hierarchical evaluation without sustained collaborative learning among teachers. A quantitative explanatory design was employed using survey data from 300 teachers across 51 public elementary schools. Data were analyzed through Partial Least Squares Structural Equation Modeling to test direct and mediating relationships among the main constructs. The results show that both instructional leadership and collegial supervision have significant positive effects on teacher performance, with the model explaining 18.1% of the variance. Collegial supervision also partially mediates the effect of instructional leadership, indicating that peer collaboration functions as an important mechanism through which leadership influences classroom practice. The findings suggest that supervision is more effective when formal leadership direction is reinforced by structured collegial processes. This study contributes an integrated supervision perspective that offers practical implications for strengthening teacher development and school improvement.

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INTRODUCTION

Educational supervision in Indonesia confronts significant contemporary challenges as pedagogical demands evolve and accountability expectations for teacher effectiveness intensify (Hariri et al., 2024). Research indicates that teacher quality remains a primary concern in Indonesian basic education, with international assessments consistently showing suboptimal student learning outcomes, particularly in mathematics and science (OECD, 2023). Traditional supervision models that predominantly rely on hierarchical approaches with periodic administrative evaluation have demonstrated significant limitations in enhancing teacher performance (Hoque et al., 2020). Research on supervisory practices in Malaysia revealed that "teachers felt they are being insulted as they do not agree with the way supervision is conducted" (Hoque et al., 2020), highlighting how conventional approaches generate negative teacher responses. This phenomenon, while documented internationally, carries particular urgency in the Indonesian context, where supervision systems must serve increasingly diverse school contexts spanning urban, semi-urban, and remote rural areas with varying resource constraints (Wiyono et al., 2021).

To address these limitations, contemporary research emphasizes alternative approaches. Collaborative supervision and collegial techniques represent supervision approaches where "problems faced by teachers tend to be specific to individual teachers" (Wiyono et al., 2021). The implementation of such diverse supervision strategies affects how "teachers' competence in applying the learning models and

materials" develops across different contexts (Maisyaroh et al., 2021). Furthermore, research demonstrates that "group supervision techniques are more effective to enhance teachers' performance than individual supervision techniques since teachers can interact and provide positive feedback to their peers" (Wiyono et al., 2022). The utilization of technology in collegial supervision reflects how the quality of the teacher's instructional process is influenced by the effectiveness of supervision (Wiyono et al., 2022). The complexity of contemporary educational environments thus requires a more sophisticated supervision framework to address diverse teacher development needs while promoting sustained instructional improvement.

Current research literature reveals a critical theoretical and empirical gap regarding the integration of instructional leadership and collegial supervision approaches. Most existing supervision research treats instructional leadership and collegial supervision as separate or competing models rather than examining their combined effects within a unified framework. Instructional leadership theory demonstrates consistent positive effects on teacher performance across various contexts, with substantial contributions to teacher performance variation (He et al., 2024; Hallinger et al., 2025). Meta-analyses show that instructional leadership encompasses three primary dimensions: defining school mission and instructional goals, managing curriculum and instruction, and promoting positive school climate supporting learning. However, the top-down nature of instructional leadership creates limitations in addressing heterogeneous individual teacher needs and providing sustained support for continuous improvement. Recent research confirms that while principal leadership significantly influences school and student outcomes, it operates largely through indirect effects on teacher practices and organizational conditions (Leithwood, Sun, et al., 2020) (Robinson, et al., 2008).

Conversely, collegial supervision emphasizes peer learning, collaborative reflection, and mutual support in teacher professional development. Recent empirical studies demonstrate that peer observation structures foster positive collective teacher efficacy beliefs among educators (Mather & Visone, 2024). Research shows that collegial supervision can enhance teacher self-efficacy, job satisfaction, and instructional quality through social learning mechanisms, creating psychological safety and open communication. Studies demonstrate that collaborative approaches enable teachers to develop self-directed learning capabilities and create sustainable professional learning communities focusing on continuous improvement (Liu & Yin, 2024). Research on professional learning communities emphasizes that collaborative structures centered on learning for all students drive sustainable improvement and teacher professional growth through shared goals, reflective inquiry, and collective responsibility (Hudson, 2024). Peer collaboration approaches have proven more effective at developing reflective practice and fostering teacher autonomy than top-down accountability models, with supportive school environments and collegial trust serving as foundational elements for meaningful professional development (Potvin et al., 2024).

Although both approaches demonstrate individual effectiveness, significant theoretical and empirical gaps remain regarding their integration within a unified supervision system. Current literature on instructional supervision in Indonesia, particularly within the Teacher Competency Development Program (GTK), emphasizes administrative oversight rather than systematically examining how formal leadership direction combines with peer-based professional learning to optimize teacher development. This fragmentation represents a critical knowledge gap, limiting the development of holistic supervision frameworks capable of addressing the multifactorial nature of teacher performance optimization (Bush, 2024). Systematic literature review on supervision reveals limited empirical research examining the simultaneous effects of instructional leadership and collegial supervision on teacher performance using advanced statistical techniques. Most studies focus on single approaches, creating an incomplete understanding of how multiple supervision sources interact to influence teacher effectiveness (Kraatz et al., 2020). This integrated supervision approach differs fundamentally from previous studies by examining not merely the separate effects of each supervision component but rather how these approaches function synergistically to produce enhanced outcomes beyond additive effects.

Recent developments in distributed leadership theory indicate that successful schools utilize multiple sources of leadership influence to systematically support teacher development (Lave & Wenger, 1991; Wenger, 1998). Recent research on school restructuring and student outcomes demonstrates that distributed leadership approaches significantly enhance school improvement efforts through increased teacher engagement and collective efficacy. From this perspective, instructional leadership and collegial supervision represent complementary manifestations of distributed leadership operating at different organizational levels: instructional leadership represents formal leadership authority exercised by school principals, while collegial supervision represents distributed leadership enacted through peer-to-peer interactions among teachers (Zachary & Fain, 2022). From this perspective, instructional leadership and collegial supervision can be viewed as manifestations of distributed leadership at different organizational levels: instructional leadership represents formal leadership authority while collegial supervision represents distributed leadership at the peer level (Zachary & Fain, 2022). However, empirical validation of integrated supervision models remains rare, particularly in developing country contexts where resource constraints and cultural factors may affect

implementation effectiveness. The Indonesian elementary education context presents unique challenges that existing supervision research has not adequately addressed, requiring locally-adapted supervision models integrating global best practices with contextual realities. This research, therefore, addresses a critical and timely gap by developing and empirically validating an integrated supervision model specifically designed for Indonesian elementary school contexts, where such comprehensive approaches to supervision remain underdeveloped in both practice and research.

Theoretical Framework and Research Hypotheses

This research develops and tests an integrated supervision model grounded in Systems Theory and Distributed Leadership Theory. Systems Theory posits that organizational effectiveness emerges from synergistic interactions among interconnected components, suggesting that combining instructional leadership and collegial supervision generates emerging properties exceeding individual contributions (Xi, 2021). Distributed Leadership Theory recognizes that effective schools distribute leadership functions across multiple organizational levels rather than concentrating authority in formal positions (Harris, 2022).

Within this framework, instructional leadership establishes clear educational direction and accountability mechanisms, while collegial supervision enables peer learning and shared problem-solving. Collegial supervision serves as a mediation pathway through which instructional leadership intentions materialize into observable teaching improvements. When principals establish clear priorities, teachers collaboratively interpret and enact these through peer observation and collegial feedback, translating leadership directives into substantive change. This integration aligns with Social Learning Theory, where professional development occurs through observation and reinforcement within supportive peer environments, amplified when combined with formal leadership direction.

The study applies Structural Equation Modeling - Partial Least Squares (SEM-PLS) analysis following contemporary best practices (Galli & New, 2022; Hashim et al., 2023). SEM-PLS enables examination of complex mediation pathways with modest sample sizes, robust evaluation of measurement models, and multi-group analysis across diverse contexts such as urban and rural schools (Hair, Hult, Ringle, & Sarstedt, 2022). Based on this framework, three hypotheses are proposed: (1) Instructional leadership directly and significantly affects teacher performance; (2) Collegial supervision directly and significantly affects teacher performance; and (3) Collegial supervision mediates the relationship between instructional leadership and teacher performance. These hypotheses operationalize the proposition that integrated supervision generates synergistic effects superior to single-approach implementation.

METHOD

This research employed a quantitative correlational-explanatory design analyzing the simultaneous effects of instructional leadership and collegial supervision on teacher performance. The population comprised public elementary school teachers from Purwakarta Regency, West Java, Indonesia. Sample size determination using G*Power 3.1.9.7 with a medium effect size ($f^2 = 0.15$), power = 0.80, and $\alpha = 0.05$ yielded 68 minimum respondents. For SEM-PLS, applying the 10:1 ratio criterion between sample and parameters yielded 90 minimum respondents. Accounting for 20% non-response, the target sample was 375. The final sample comprised 300 teachers from 51 public elementary schools selected through proportional cluster stratified random sampling based on geographical distribution, school size, and accreditation status.

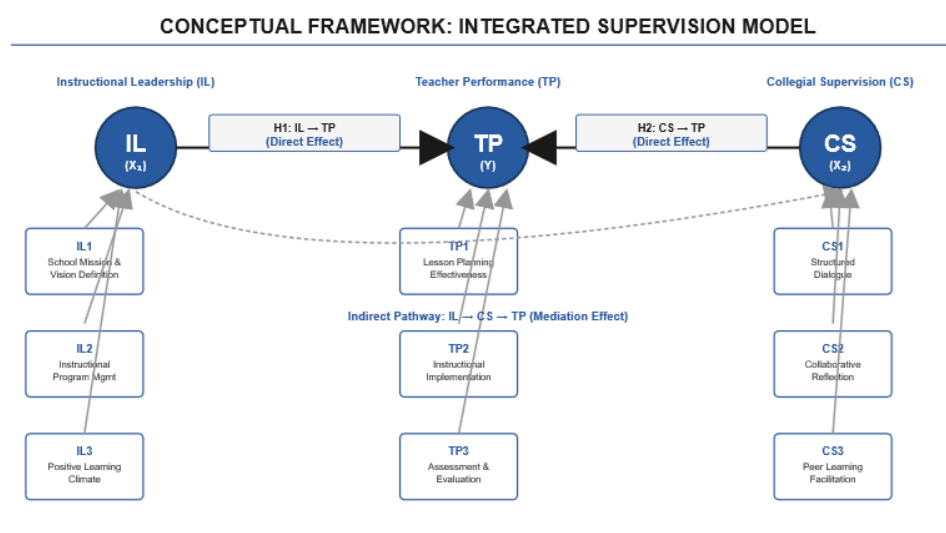


Figure 1. Conceptual Framework and Research Flow

Model Description: The integrated supervision model comprises three latent constructs: Instructional Leadership (IL, X_1), Collegial Supervision (CS, X_2), and Teacher Performance (TP, Y), each measured through three observed indicators. Curved arrows represent measurement relationships (indicator loading on latent constructs). Straight arrows represent structural relationships: H1 directly affects TP; H2 directly affects TP; and IL indirectly affects TP through CS as a mediating pathway. The model will be tested using SEM-PLS methodology with 300 teachers from 51 elementary schools.

Data collection proceeded through systematic stages, ensuring methodological rigor. Research assistants administered structured questionnaires during scheduled school meetings between March and May 2024, covering both urban and rural contexts. Double-entry procedures verified data accuracy. Pre-analysis screening identified outliers and assessed missing data patterns before substantive analysis.

Three constructs were measured using validated instruments with three indicators each. Instructional Leadership is defined as defining school mission and vision, managing instructional programs, and promoting a positive learning climate (Leithwood, et al., 2020). Sample items: "The principal clearly articulates the school's educational mission," "The principal regularly observes classroom instruction and provides developmental feedback." Collegial Supervision assessed structured peer observation, collaborative reflection sessions, and peer learning facilitation (Chae, 2022). Sample items: "Teachers engage in structured peer observation focusing on specific instructional practices," "Teachers participate in regular collaborative planning sessions." Teacher Performance evaluated learning plan effectiveness, implementation quality, and assessment competence. All instruments used 5-point Likert scales.

Instruments underwent cultural adaptation, including forward-backward translation, expert review, cognitive interviews with 10 teachers, and pilot testing. Validity testing showed all items with $r > 0.339$ (valid). Reliability yielded Cronbach's Alpha: Instructional Leadership ($\alpha = 0.892$), Collegial Supervision ($\alpha = 0.884$), and Teacher Performance ($\alpha = 0.901$), demonstrating strong internal consistency. Assumption testing showed: Mahalanobis Distance identified no significant outliers; VIF < 3.0 for all indicators; skewness (-0.34 to 1.12) and kurtosis (-0.89 to 2.15) acceptable for PLS; Harman's test showed 32.8% variance ($< 50\%$), indicating no common method bias.

Analysis proceeded in three stages: (1) Confirmatory Factor Analysis (CFA) using AMOS 26 validating measurement model quality ($\chi^2/df < 3$, CFI > 0.90 , TLI > 0.90 , RMSEA < 0.08); (2) SEM-PLS analysis using SmartPLS 4.0 with bootstrapping (5000 resamples, BCa method) examining direct hypothesis relationships; and (3) Advanced analysis including mediation calculations and blindfolding assessing predictive validity and model stability across contexts.

RESULTS AND DISCUSSION

Result

The final sample (n=300) comprised 69.0% female teachers and 31.0% male teachers. By teaching experience: 16.0% had less than 5 years, 54.0% had 5-15 years, and 30.0% had more than 15 years. Education level: 82.0% held bachelor's degrees and 18.0% held master's degrees. School location: 50.0% urban and 50.0% rural schools. All variables showed high implementation levels with means above 3.89 on the 5-point scale, indicating good to excellent performance across all constructs.

Confirmatory Factor Analysis results indicated excellent model fit: $\chi^2/df = 2.147 (< 3.0)$, CFI = 0.976 (> 0.90), TLI = 0.968 (> 0.90), RMSEA = 0.062 (< 0.08), and SRMR = 0.045 (< 0.08), confirming that the measurement model adequately represented the theoretical constructs. All constructs achieved excellent convergent validity with factor loadings > 0.7, AVE > 0.5, and reliability indicators (Cronbach's α , CR, rho_A) > 0.7, meeting established criteria. Discriminant validity was confirmed through three criteria: Fornell-Larcker criterion with \sqrt{AVE} values higher than inter-construct correlations, HTMT ratios below the 0.90 threshold, and cross-loadings showing each indicator loading higher on its intended construct than on other constructs (Henseler et al., 2015).

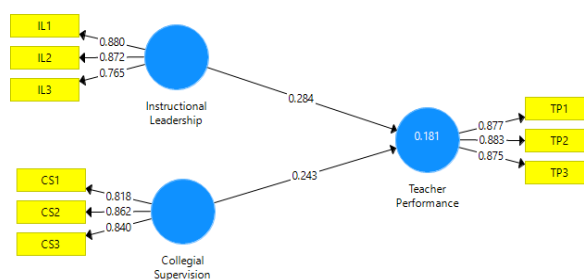


Figure 2. Measurement Model (Outer Model) SEM-PLS

Measurement model path diagram displaying: (1) Instructional Leadership construct with three indicators (IL1: 0.880, IL2: 0.872, IL3: 0.840); (2) Collegial Supervision construct with three indicators (CS1: 0.818, CS2: 0.862, CS3: 0.840); (3) Teacher Performance construct with three indicators (TP1: 0.877, TP2: 0.883, TP3: 0.875); with all measurement paths (curved arrows) showing factor loadings exceeding the 0.7 threshold, indicating excellent convergent validity

The measurement model demonstrates high quality with all factor loadings exceeding the 0.7 threshold. Instructional Leadership construct displayed factor loadings of 0.880 (IL1), 0.872 (IL2), and 0.840 (IL3), indicating that all three dimensions contribute substantially to the latent construct. Collegial Supervision showed loadings of 0.818 (CS1), 0.862 (CS2), and 0.840 (CS3), confirming that structured dialogue, collaborative reflection, and peer learning each capture distinct dimensions of collegial supervision. Teacher Performance displayed loadings of 0.877 (TP1), 0.883 (TP2), and 0.875 (TP3), establishing that learning plan effectiveness, implementation quality, and assessment-evaluation competence represent integral components of overall teaching performance. All indicators demonstrated excellent convergent validity.

As shown in Table 1, all constructs demonstrated excellent validity and reliability. Factor loadings ranged from 0.818 to 0.883, all exceeding the 0.7 threshold. Average Variance Extracted (AVE) values ranged from 0.707 to 0.773, confirming adequate convergent validity. All reliability indicators (Cronbach's α , CR, and rho_A) exceeded 0.7, demonstrating strong internal consistency.

Construct	Indicator	Loading	AVE	α	CR	rho A
IL	IL1-IL3	0.765-0.880	0.748	0.892	0.899	0.893
CS	CS1-CS3	0.818-0.862	0.707	0.884	0.879	0.885
TP	TP1-TP3	0.875-0.883	0.773	0.901	0.911	0.903

Note: IL = Instructional Leadership, CS = Collegial Supervision, TP = Teacher Performance

Hypothesis testing was conducted through structural model analysis as presented in Table 2. Both hypotheses received strong empirical support. H1 (Instructional Leadership \rightarrow Teacher Performance) showed path coefficient $\beta = 0.284$ ($t = 5.950$, $p < 0.001$) with effect size $f^2 = 0.090$. H2 (Collegial Supervision \rightarrow Teacher Performance) showed path coefficient $\beta = 0.243$ ($t = 4.650$, $p < 0.001$) with effect size $f^2 = 0.066$. The model explained 18.1% of teacher performance variance with excellent predictive relevance ($Q^2 = 0.131$) and acceptable model fit (SRMR = 0.066).

Structural model path diagram displaying: (1) H1 pathway: Instructional Leadership → Teacher Performance with path coefficient $\beta = 0.284$ ($p < 0.001$); (2) H2 pathway: Collegial Supervision → Teacher Performance with path coefficient $\beta = 0.243$ ($p < 0.001$); (3) Model fit indicators showing $R^2 = 0.181$ (18.1% variance explained), $Q^2 = 0.131$ (excellent predictive relevance), and $SRMR = 0.066$ (acceptable model fit); with all paths showing statistically significant relationships at $p < 0.001$ level.

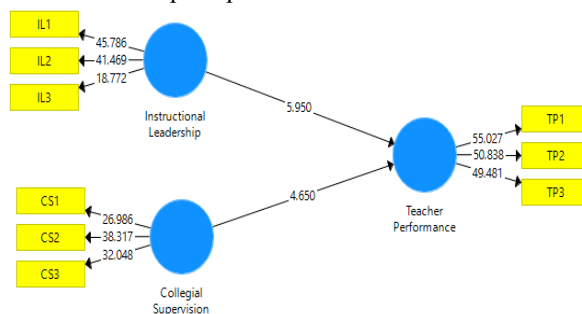


Figure 3. Structural Model (Inner Model) SEM-PLS

Table 2. Structural Model Assessment

Hypothesis	Path	β	SE	T-Value	P-Value	95% CI	f ²	Decision
H1	IL → TP	0.284	0.048	5.950	< 0.001	[0.193, 0.374]	0.090	Supported
H2	CS → TP	0.243	0.052	4.650	< 0.001	[0.135, 0.339]	0.066	Supported

Model Quality: $R^2 = 0.181$, $Q^2 = 0.131$, $SRMR = 0.066$

The path coefficients demonstrate that instructional leadership produces a slightly larger direct effect on teacher performance ($\beta = 0.284$) compared to collegial supervision ($\beta = 0.243$), yet both effects achieve statistical significance at $p < 0.001$ with substantial practical effect sizes. This near-equivalence between coefficients carries important theoretical implications, suggesting that formal administrative leadership and peer-based professional learning contribute with comparable magnitude to teacher performance, contradicting traditional models that emphasize principal leadership as the dominant influence on teacher effectiveness. Mediation analysis revealed partial mediation effects as detailed in Table 3. The direct effect of IL → TP ($\beta = 0.284$) remained significant alongside the indirect effect through CS ($\beta = 0.150$), with total effect $\beta = 0.434$. The Variance Accounted For (VAF) of 34.6% indicates significant partial mediation.

Table 4. Mediation Analysis Results

Effect Type	Path	β	SE	T-Value	P-Value	95% CI
Direct	IL → TP	0.284	0.048	5.950	< 0.001	[0.193, 0.374]
Indirect	IL → CS → TP	0.150	0.038	3.947	< 0.001	[0.084, 0.229]
Total	IL → TP (total)	0.434	0.052	8.346	< 0.001	[0.337, 0.535]

VAF = 34.6% (Partial Mediation)

The mediation pathway reveals that collegial supervision mediates approximately one-third of instructional leadership's total effect on teacher performance, functioning as a crucial intermediate mechanism. This can be understood through an analogy: if instructional leadership establishes the destination (improved teaching quality), collegial supervision serves as a primary pathway through which teachers collectively navigate toward that destination through peer learning, shared problem-solving, and mutual support. When principals establish clear instructional direction, teachers interpret and enact these directives through collaborative interactions, peer observation, and collegial feedback. The remaining direct effect ($\beta = 0.284$) represents the influence of leadership that operates through other mechanisms beyond collegial supervision, such as resource allocation decisions, evaluation systems, and establishment of accountability structures. Together, both pathways combine to produce a substantial total effect ($\beta = 0.434$), demonstrating that integrated supervision generates a comprehensive influence on teacher performance. Multi-group analysis revealed no significant differences between urban and rural schools ($p > 0.05$), demonstrating model robustness across contexts. Cross-validation with a separate sample ($n=150$) confirmed model stability with $R^2 = 0.179$.

Discussion

The empirical findings strongly support both hypotheses, confirming that instructional leadership and collegial supervision have a simultaneous and significant influence on teacher performance. The near-equivalent path coefficients indicate that peer-based professional development mechanisms have a comparable impact to formal administrative leadership in driving teacher effectiveness, thereby fundamentally challenging traditional hierarchical supervision paradigms that privilege principal authority as the dominant influence on teaching quality (Hariri et al., 2024). The nearly equivalent path coefficients indicate that peer-based development approaches are equally important as formal leadership, challenging traditional hierarchical models (Hariri et al., 2024). Recent research on professional development effectiveness confirms that combining formal leadership direction with peer collaboration structures significantly enhances teacher learning and performance improvement (Richardson, 2024). Participatory leadership that actively involves teachers in decision-making processes demonstrates equivalent impact to directive instructional leadership, suggesting that sustainable teacher development requires shared ownership of improvement initiatives rather than top-down mandates (Nadeem, 2024).

For practical school operation, these findings necessitate fundamental restructuring of supervision approaches at multiple levels. For principals, this integrated framework requires balancing directive functions with facilitative leadership: communicating school mission and instructional goals consistently to establish transparent direction; actively monitoring curriculum implementation and instruction quality to maintain accountability; while simultaneously building a positive school climate through recognition programs, supportive relationships, and deliberate creation of psychological safety enabling risk-taking and innovation. For teachers and peer supervisors, schools must establish structured mechanisms for peer observation, including observation protocols and rubrics; develop clear procedures for constructive feedback emphasizing growth rather than judgment; and create safe collaborative environments explicitly valuing collegial contributions to professional learning. This multi-level coordination creates synergistic effects where formal leadership authority and peer-based learning reinforce each other rather than operating in isolation.

The integrated supervision approach generates synergistic effects exceeding single-approach implementation. Although the R^2 reflects the multifactorial nature of teacher performance, the large effect sizes for both constructs demonstrate meaningful practical significance when combined (Hair et al., 2022). Consistent with Systems Theory, coordinated action among organizational components creates emerging properties exceeding individual contributions (Ruben & Gigliotti, 2021). The mediation analysis particularly illuminates how instructional leadership translates into concrete teaching improvements through collegial supervision mechanisms. When principals articulate clear instructional expectations and establish accountability systems, teachers collaboratively interpret these expectations, observe each other's implementations, provide mutual feedback, and collectively refine practices. This translation process from leadership intent to classroom reality occurs substantially through collegial interaction rather than through direct principal influence, highlighting the essential bridging function of peer-based supervision. The partial mediation effect reveals that collegial supervision serves as a significant pathway through which instructional leadership influences teacher performance, aligning with Social Learning Theory, where peer interaction enhances professional development through modeling and feedback (Phuong, 2023). The principal's capacity to function simultaneously as communicator (establishing transparent channels for shared decision-making), counselor (providing emotional and professional support), and consultant (facilitating innovative pedagogical approaches) amplifies the effectiveness of both instructional oversight and collegial learning mechanisms (Gamaliel & Widodo, 2024). This demonstrates that leadership impact is amplified when principals strategically establish collegial supervision structures and norms while maintaining accessible, supportive relationships with teachers.

The model's robustness across urban and rural contexts, with consistent cross-validation results, demonstrates universal applicability with local adaptation potential. Urban schools possessing greater resource capacity and access to professional development opportunities can establish formal supervisory structures with dedicated coordinators, regular inter-school collaborative networks, and structured peer observation schedules. Rural schools operating with limited resources can prioritize online collaboration platforms enabling virtual peer observation and asynchronous collaborative reflection, adapt supervisory timelines to accommodate geographic constraints, and emphasize simplified but systematic observation protocols accessible without extensive training infrastructure. District-level support proves critical across both contexts through the development and dissemination of training modules addressing observation and feedback skills, creation of resource guides and tools adapted to local contexts, provision of technical assistance for implementation challenges, and facilitation of inter-school networks enabling cross-school collegial learning. This differentiated yet principle-based approach ensures that integrated supervision models enhance teaching quality regardless of resource constraints or geographic context. District support is critical through training modules, resource guides, technical assistance, and inter-school networks. The variance explained reflects that teacher performance is multifactorial, influenced by factors beyond supervision, including teacher expertise, resources, student characteristics, curriculum, and classroom management (Menda & Dwikumaningsih, 2024). This realistic assessment indicates that integrated supervision must complement other professional development strategies within comprehensive school improvement initiatives. The distributed

leadership pathway underscores that modern school leadership involves mobilizing multiple organizational sources of influence, particularly critical for resource-constrained systems (Bush, 2024; Corcelles-Seuba et al., 2024).

The balanced path coefficients challenge traditional hierarchical assumptions and support democratic distributed leadership models (Liu & Yin, 2024; Nguyen et al., 2024). Effective teacher development requires a strategic combination of directive leadership, providing clear direction, and facilitative leadership, empowering collaboration. This study's methodological rigor establishes standards for educational research using structural equation modeling (Hair et al., 2022). Furthermore, the integrated supervision model emphasizes leadership coherence, where school principals systematically align supervisory practices with school-wide instructional priorities rather than allowing fragmented initiatives. When leadership behaviors, supervision routines, and peer collaboration mechanisms reinforce one another in consistent directions, teachers experience a clearer sense of direction and greater professional consistency in understanding performance expectations. This coherence creates organizational alignment where structures, culture, and leadership actions converge around shared educational goals amplifying improvement effectiveness compared to situations where separate initiatives operate independently or conflict (Leithwood, Harris, et al., 2020). Such alignment reduces the confusing multiplicity of fragmented initiatives and enhances teachers' capacity to internalize expectations, improving instructional decision-making and classroom implementation fidelity. The findings, therefore, suggest that instructional leadership should not operate in isolation but must be embedded within a supportive supervisory ecosystem, ensuring continuity across all levels of teacher support.

In addition, the demonstrated mediation effect indicates that collegial supervision is not merely a complementary mechanism but a central driver translating leadership intentions into observable teaching improvements. This reflects the principle of "leadership enactment," where policy directives materialize through daily professional interactions among educators. When teachers collaboratively interpret leadership expectations, exchange evidence-based strategies, observe each other's practice systematically, and provide constructive feedback grounded in shared standards, supervision becomes a dynamic learning process through which teachers collectively construct professional knowledge rather than a compliance-oriented activity focused on evaluation. Such peer-based learning accelerates diffusion of effective practices throughout the school, promotes collective efficacy teachers' shared beliefs about their capacity to positively affect student learning, an essential predictor of sustained school improvement. Therefore, strengthening collegial supervision mechanisms serves as a strategic lever for amplifying leadership impact, particularly critical in schools seeking sustainable and scalable improvements in teaching quality that persist beyond individual leaders' tenure. Such peer-based learning accelerates the diffusion of effective practices and promotes collective efficacy, an essential predictor of school improvement. Therefore, the study suggests that strengthening collegial supervision can serve as a lever for amplifying leadership impact, particularly in schools seeking sustainable and scalable improvements in teaching quality.

Moreover, the findings emphasize the strategic role of data-informed decision-making in strengthening the integrated supervision model. When principals and peer supervisors jointly examine instructional data assessment outcomes, classroom observation patterns, students' learning progress indicators, and engagement metrics they can design targeted interventions matching teachers' specific developmental needs. This data-informed approach prevents supervision from devolving into general exhortations about "improving instruction" by grounding feedback in concrete evidence. Data-driven professional development significantly improves instructional precision and reflective practice by creating a shared reality on which teachers and supervisors can base improvement discussions. In integrated supervision systems, data becomes a shared reference point, reducing subjectivity and fostering professional accountability, enabling teachers to engage in continuous improvement cycles grounded in evidence of student learning outcomes. Consequently, supervision effectiveness is determined not solely by leadership style or collaboration quality but fundamentally by the extent to which schools institutionalize systematic data use as organizational practice, creating cultures where evidence informs instructional decisions at all levels.

Finally, the study's implications extend to policy-level reform, highlighting the need for supervisory frameworks that formally integrate instructional leadership and collegial supervision in national and district-level guidelines. Current supervision policies in Indonesia and many developing country contexts remain fragmented, emphasizing administrative compliance and periodic evaluation rather than instructional coaching and continuous improvement. Government Teacher Competency Development programs emphasize individual teacher assessment without creating systematic supervisory structures integrating peer-based learning. The findings indicate that future policy should prioritize capacity-building programs that develop both principal leadership competencies and teachers' collaborative supervision skills, recognizing these as complementary rather than competing functions. Investment in professional learning community structures, teacher mentorship systems, and digital platforms enabling peer coaching will strengthen the integrated model's sustainability across diverse school contexts. By institutionalizing these structures through policy mandates, professional development requirements, and resource allocation mechanisms, educational systems can ensure that supervision transforms from episodic administrative evaluation toward continuous, collaborative, and instructional improvement processes, ultimately contributing to long-term teacher quality enhancement and school effectiveness.

CONCLUSION

This study confirms that instructional leadership and collegial supervision, both individually and in integration, significantly contribute to improving elementary school teacher performance, with integrated supervision proving more effective than single approaches. The findings show that both variables have comparable contributions, while collegial supervision also acts as a key mediating factor, indicating that teacher performance improves more optimally when formal leadership is reinforced by collaborative, peer-based practices. The results further reveal that instructional leadership influences performance not only directly but also through professional collaboration among teachers, supporting the view that effective supervision must go beyond hierarchical control to include collegiality, reflection, and shared responsibility. Theoretically, this study enriches Systems Theory and Distributed Leadership Theory by demonstrating that supervision is most effective when leadership is distributed across formal and informal structures, creating synergistic effects. Practically, schools are encouraged to implement integrated supervision systems that combine principal leadership with structured peer collaboration, while policymakers should support this through relevant training, policies, and resources. Overall, the study highlights the strong potential of integrated supervision as a comprehensive model for school improvement and suggests further research to develop operational frameworks, test its application across contexts, and examine its long-term impact on teaching and learning outcomes.

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