

Supervision and School Wellbeing: The Role of Information Technology-Based Learning

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ABSTRACT

School wellbeing is an important indicator of educational quality, reflecting the extent to which schools provide safe, supportive, and engaging learning environments. Although supervision and information technology-based learning have been widely discussed in educational management, their integrated relationship with school wellbeing remains underexplored. This study examined the relationships among administrative supervision, academic supervision, information technology-based learning, and school wellbeing. A quantitative cross-sectional survey design was employed. The participants were 256 junior high school teachers in Boyolali Regency, Central Java, Indonesia, selected through random sampling. Data were collected using a structured questionnaire measuring administrative supervision, academic supervision, information technology-based learning, and school wellbeing. Instrument validity and reliability were examined using Exploratory Factor Analysis and Cronbach's alpha. Confirmatory Factor Analysis and Structural Equation Modeling were conducted using AMOS, with bootstrapping applied to address multivariate non-normality. The findings showed that information technology-based learning was positively and significantly associated with school wellbeing ($\beta = 0.595$, $p < .001$). In contrast, administrative supervision and academic supervision were not significantly associated with school wellbeing. The results also indicated that information technology-based learning did not significantly mediate the relationships between supervision and school wellbeing. The study suggests that digital learning practices may play a more central role in supporting school wellbeing than conventional supervision practices. These findings imply the need to reorient supervision from procedural compliance toward instructional support that strengthens teachers' digital pedagogical capacity and promotes more supportive learning environments.

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1. INTRODUCTION

School wellbeing is a fundamental prerequisite for creating a conducive and high-quality educational environment, encompassing students' sense of safety, comfort, and fulfillment of basic needs that support learning engagement and satisfaction (Ernawati et al., 2022; Putri & Dewi, 2023; Rahayu, 2022). Data from the 2023 National Education Report Card indicate that while the safety climate in Indonesian junior high schools remains in the "good" category, inclusiveness and learning quality are still rated as "moderate," suggesting that key dimensions of school wellbeing have not yet been optimally achieved (Kemdikbud, 2023). These findings highlight the need for systemic strategies that extend beyond physical safety toward holistic educational quality.

Interpersonal relationships and teacher support constitute core components of school wellbeing, influencing students' engagement, academic success, and psychological development (Saastamoinen et al., 2023; Waters & White, 2015). Schools are therefore expected to function as positive institutions that foster supportive climates and prevent adverse experiences such as bullying and academic stress (Moussi et al., 2024; Pascoe et al., 2020). Empirical evidence consistently shows that low levels of wellbeing undermine motivation and increase stress, ultimately impeding learning outcomes (Ade et al., 2023; Jalal, 2022).

From an educational management perspective, academic supervision plays a strategic role in shaping instructional quality and teacher professional growth (Renata et al., 2018; Fatimah & Triyanto, 2024). Effective supervision enhances pedagogical competence, instructional planning, and professional discipline, thereby contributing indirectly to students' learning experiences (Mardalena et al., 2020; Rusdiana et al., 2023). However, the effectiveness of supervision increasingly depends on how it is translated into contemporary teaching practices.

In this context, Information and Communication Technology (ICT)-based learning has emerged as a critical mechanism through which supervisory practices can be operationalized in classrooms. ICT integration supports student-centered learning, increases engagement, and enhances instructional relevance, all of which are closely associated with school wellbeing (Kossakowska et al., 2023; Ritonga et al., 2024). Teachers' effective use of ICT not only improves learning quality and motivation but also contributes to a more adaptive and supportive learning climate (Setiahati et al., 2023; Zalnika, et al., 2023).

Despite extensive research on academic supervision and ICT-based learning as separate determinants of educational quality, their integrated role in promoting school wellbeing remains underexplored. In particular, prior studies have largely focused on teacher performance or student achievement outcomes, leaving a notable gap regarding how ICT-based learning mediates the relationship between supervision and school wellbeing (Halirat, 2022; Zulianto et al., 2023; Murdani, et al., 2024). This gap limits understanding of the mechanisms through which supervisory practices translate into students' holistic wellbeing.

Addressing this gap, the present study examines the direct effect of academic supervision on school wellbeing and investigates the mediating role of ICT-based learning in this relationship. By positioning ICT-based learning as a strategic mediator, this study responds to the evolving educational paradigm that emphasizes digital integration as a pathway to sustainable school wellbeing. The findings are expected to contribute to the literature on educational management and inform policy and practice in similar educational contexts.

2. METHODS

This study employed a quantitative cross-sectional design involving four primary variables. School wellbeing was treated as the dependent variable, while administrative supervision and academic supervision served as independent variables. Information technology-based learning was conceptualized as a mediating variable, representing the mechanism through which supervisory practices are translated into classroom processes that influence school wellbeing. The proposed research model is illustrated in Figure 1.

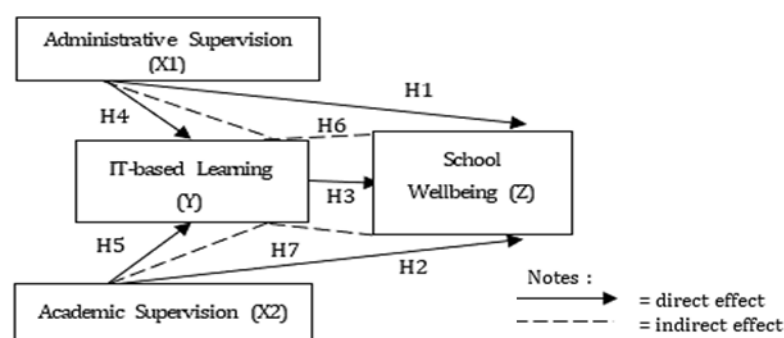


Figure 1. Research Model

The study was conducted in Boyolali Regency, Central Java, Indonesia, which was selected due to its representative semi-urban educational characteristics, including heterogeneous school types, varying levels of ICT infrastructure, and diverse teacher professional backgrounds. The region has also actively implemented national policies related to academic supervision and digital learning transformation, making it a relevant context for examining the interaction between supervision, ICT-based learning, and school wellbeing.

The population consisted of 401 junior high school teachers from the sub-districts of Simo, Sambu, Nogosari, and Ngemplak. Using random sampling and the Slovin formula with a 5% margin of error, a minimum sample size of 200 teachers was required. However, 256 teachers participated in the study, exceeding the minimum requirement and thereby enhancing the statistical power and reliability of the findings.

While the results provide meaningful insights, generalization beyond Boyolali Regency should be approached with caution, as contextual factors such as local educational governance, technological readiness, and school culture may influence the observed relationships. Future research is encouraged to replicate this model in different regions or educational contexts to strengthen external validity.

Data were collected using a structured questionnaire employing a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was designed to measure administrative supervision (X1), academic supervision (X2), IT-based learning (Y), and school wellbeing (Z).

Administrative supervision was measured through indicators of planning, implementation, evaluation, feedback, and follow-up (e.g., "The principal provides follow-up actions based on administrative supervision results"). Academic supervision included scheduling, classroom observation, evaluation, and follow-up (e.g., "The principal conducts classroom observations"). IT-based learning captured the use of digital media and platforms, while school wellbeing reflected safety, social relationships, support services, and resource adequacy (e.g., "The school provides a safe and supportive learning environment").

Validity and reliability were assessed using Exploratory Factor Analysis (EFA) through SPSS version 24, followed by Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) using AMOS version 22.0. Sampling adequacy was confirmed (KMO = 0.921), and Bartlett's Test of Sphericity was significant ($p < 0.001$), indicating sufficient correlations among variables. All factor loadings exceeded 0.40, and Cronbach's alpha values ranged from 0.731 to 0.892, indicating satisfactory reliability. Confirmatory Factor Analysis (CFA) confirmed that all constructs achieved acceptable goodness-of-fit indices after minor modifications. Model fit was evaluated using multiple indices, including Chi-square, RMSEA, CFI, and TLI, following established SEM criteria (Hu & Bentler, 1999; Hair et al., 2010; Kline, 2016).

Structural Equation Modeling (SEM) was employed to test the hypothesized relationships among variables, and the final model demonstrated acceptable fit after minor modifications. Direct effects were assessed using regression weights, while indirect effects were tested using the Sobel test based on unstandardized regression coefficients.

Preliminary data screening indicated multivariate non-normality. Multivariate normality is a key assumption in SEM, as violations may lead to biased parameter estimates and model fit indices (Kline, 2016; Brosseau-Liard et al., 2012). To address this issue, bootstrapping with 2,000 resamples was applied in the SEM analysis using AMOS 22.0. This approach provides robust standard errors and bias-corrected confidence intervals, thereby improving the accuracy and stability of parameter estimates under non-normal conditions (Bollen & Stine, 1992; Nevitt & Hancock, 2001; Arbuckle, 2014).

3. FINDINGS AND DISCUSSION

3.1 Findings

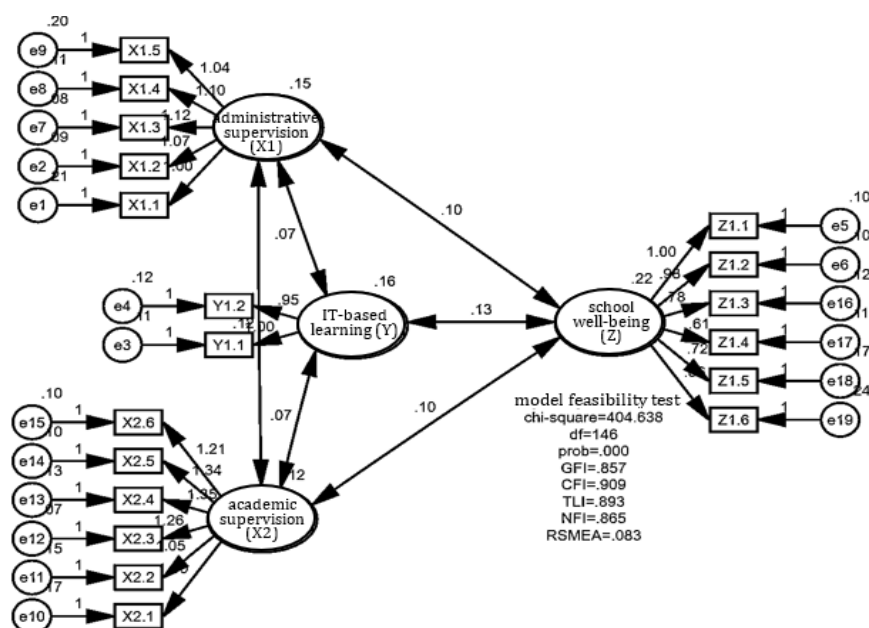


Figure 2. Analysis Results Confirmatory Factor Analysis results of the first stage of the research model

The results of the first stage of Confirmatory Factor Analysis (CFA) are presented in Figure 2, a number of indicators related to the feasibility of the research model were obtained. Goodness of fit model shows that some criteria have not met the expected standards. Specifically, the P-value of 0.000 is less than 0.05, indicating that the model does not meet the eligibility criteria. The Chi-square value of the model (404.638) exceeds the critical Chi-square value from the table (175.198), which also indicates that the model is not feasible. Additionally, the RMSEA value is 0.083, which is greater than the cut-off of 0.08, indicates that the model has not met the eligibility criteria. Other indicators such as GFI (0.857), AGFI (0.814), TLI (0.893), CFI (0.909), and CMIN/df (2.771) are all smaller than the required cut-off value, which indicates that the model has not fully met the goodness of fit criteria. Based on these findings, the research model is not currently appropriate for further testing without undergoing modifications. Therefore, it is necessary to reduce or simplify the construct variables so that the model can meet the required eligibility criteria, as stipulated in the relevant literature (Waluyo, 2016, p. 61). To enhance the model's validity, future modifications should focus on refining the constructs and ensuring that the selected indicators align closely with theoretical expectations. Implementing these adjustments will likely improve the model's overall fit and facilitate more reliable outcomes in subsequent analyses.

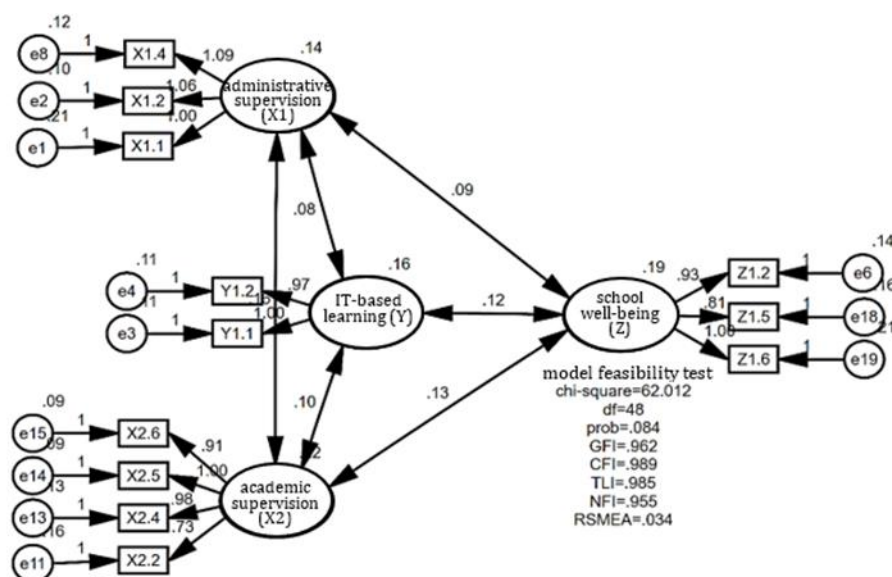


Figure 3. Confirmatory Factor Analysis Results of the second stage of the research model

According to Figure 3's results from the second stage of Confirmatory Factor Analysis (CFA), the research model significantly improves its ability to meet the goodness of fit requirements. The model has satisfied the eligibility requirements, as evidenced by the P-value of 0.084, which is higher than 0.05. Furthermore, the model's Chi Square value (62.012) is less than the table's Chi Square value (65.171), suggesting that the model is both significant and workable. Other indicators, such as RMSEA (0.034), which is smaller than the cut-off of 0.08, as well as the CMIN/df (1.292), TLI (0.985), CFI (0.989), AGFI (0.938), and GFI (0.962) values, which all exceed the required cut-off values, show that the model as a whole has satisfied the goodness of fit requirements. Thus, this model is declared suitable for use in further testing, in accordance with recognized analytical standards. These findings highlight the effectiveness of the adjustments made to the model, demonstrating its enhanced reliability and validity. Moving forward, the confirmed model can be employed in subsequent research to explore additional variables and their relationships, thus contributing valuable insights to the field.

Table 1. Confirmatory Factor Analysis Results of the second stage of the research model

Goodness of fit	Cut-off	Results in the model	Description
P value/prob	≥0.05	0.084	Good
Chi Square	Small and insignificant	62.012	Good
RMSEA	≤ 0.08	0.034	Good
GFI	≥ 0.90	0.962	Good
AGFI	≥ 0.90	0.938	Good
CMIN/Df	≤ 2	1.292	Good
TLI	> 0.95	0.985	Good
CFI	> 0.95	0.989	Good
Chi square table	65.171		

The study model demonstrates a satisfactory fit with the goodness of fit criterion according to the findings of the Structural Equation Modeling (SEM) analysis displayed in Table 1. The model satisfies the eligibility conditions since the P-value of 0.084 is higher than 0.05. In addition, the model Chi Square value of 62.012 is smaller than the table Chi Square value of 65.171, so the model is considered feasible. RMSEA value of 0.034 is also lower than the set cut-off limit, reinforcing the feasibility of the model. The model has satisfied all of the goodness of fit requirements since other indicators like CMIN/df (1.292), TLI (0.985), CFI (0.989), AGFI (0.938), and GFI (0.962) all surpass the cut-off values. Thus, the

overall research model is deemed valid and appropriate for further testing. These findings highlight the model's resilience and indicate that it is a good fit for furthering studies in this field.

Table 2. Normality Test Results

Variable	Univariate				Description Normality
	skew	c.r.	kurtosis	c.r.	
Z1.6	-0.476	-3.108	0.228	0.745	Normal
Z1.5	-0.12	-0.783	-1.176	-3.842	Normal
X2.6	0.214	1.401	-0.876	-2.86	Normal
X2.5	-0.238	-1.554	0.064	0.208	Normal
X2.4	-0.393	-2.565	0.706	2.306	Normal
X2.2	-0.085	-0.557	-1.29	-4.214	Normal
X1.4	0.137	0.894	-0.637	-2.08	Normal
Z1.2	-0.27	-1.766	-0.921	-3.009	Normal
Y1.2	0.202	1.317	-1.174	-3.833	Normal
Y1.1	-0.261	-1.708	-1.373	-4.483	Normal
X1.2	0.16	1.047	-1.741	-5.685	Normal
X1.1	-0.406	-2.652	-0.03	-0.097	Normal
Multivariate			62.293	27.187	Not

The data normality test was conducted using the skewness critical ratio (CR) with a limit of ± 2.58 , as displayed in the AMOS output on the assessment of normality. Data is considered normally distributed if the CR values for skewness and kurtosis are within this range. All construct variables satisfy the assumption of normalcy, according to Table 2's univariate normality test findings, with skewness and kurtosis CR values falling between -2.58 and +2.58. However, because the multivariate CR value of 62.293 is beyond the permitted boundary of ± 2.58 , the data does not meet the assumption of normality multivariately.

Table 3. Research Hypothesis Test Results

Hypothesis	Path analysis model	Coefficient β	S.E.	P Value	Description
H1	Administrative Supervision X1 → School Wellbeing Z	-0.248	0.514	0.629	Not Significant
H2	Academic Supervision X2→ School Wellbeing Z	0.507	0.401	0.206	Not Significant
H3	IT-based Learning Y → School Wellbeing Z	0.595	0.114	***	Significant
H4	Administrative Supervision X1→ IT-based Learning Y	0.329	0.511	0.519	Not Significant
H5	Academic Supervision X2→ IT- based Learning Y	0.193	0.401	0.630	Not Significant
H6	Administrative Supervision X1→ IT-based Learning Y → School Wellbeing Z	0.196	0.306	0.523	Not Significant
H7	Academic Supervision X2→ IT- based Learning Y→ School Wellbeing Z	0.115	0.240	0.632	Not Significant

The hypothesis testing results indicate that administrative supervision (H1) does not significantly affect school wellbeing ($\beta = -0.248$; $p = 0.629$), while academic supervision (H2), although positive, is also not significant ($\beta = 0.507$; $p = 0.206$). Likewise, neither administrative supervision (H4: $\beta = 0.329$; $p = 0.519$) nor academic supervision (H5: $\beta = 0.193$; $p = 0.630$) significantly influences IT-based learning. The indirect effects are also insignificant, as shown in H6 ($\beta = 0.196$; $p = 0.523$) and H7 ($\beta = 0.115$; $p =$

0.632), confirming that IT-based learning does not mediate the relationship between supervision and school wellbeing. In contrast, IT-based learning (H3) demonstrates a strong and significant direct effect on school wellbeing ($\beta = 0.595$; $p < 0.001$).

These findings suggest that current supervisory practices remain largely procedural and compliance-oriented, limiting their capacity to influence the psychosocial dimensions of school wellbeing. The results also reflect a decoupling between supervisory policies and classroom practices, where supervision is implemented as a routine evaluative activity rather than a transformative process that drives pedagogical change. Consequently, supervision fails to significantly affect both IT-based learning and school wellbeing.

The non-significant mediation effects further indicate that supervision has not been effectively translated into ICT-based pedagogical practices. The adoption of IT-based learning appears to operate independently of supervisory influence, likely shaped by individual teacher initiative, resource availability, and contextual factors such as digital infrastructure and competence disparities. This explains the absence of both direct and indirect effects of supervision within the model.

Table 4. R Square Test Results Research Model

Variable	R Square
IT-based Learning Y	0.274
School Wellbeing Z	0.610

The structural model demonstrates moderate explanatory power. The R-square value for IT-based learning is 0.274, indicating that administrative and academic supervision jointly explain 27.4% of its variance, while the remaining 72.6% is influenced by external factors beyond the model. Meanwhile, school wellbeing shows a higher R-square value of 0.610, suggesting that supervision and IT-based learning together explain 61.0% of its variance. This highlights that, although supervision is not directly significant, the model—particularly through IT-based learning—provides substantial explanatory capacity for school wellbeing.

Importantly, these findings position IT-based learning as a central driver of school wellbeing, rather than merely a complementary instructional tool. The significant effect of ICT integration suggests that enhancing student engagement, flexibility, and learning relevance is critical for improving students' motivation and emotional comfort. However, the relatively moderate explanatory power of IT-based learning also indicates that school wellbeing is shaped by multiple interconnected factors, including school climate, leadership practices, teacher collaboration, and student support systems.

From a practical standpoint, these results call for a strategic shift at both school and policy levels. At the school level, leaders should move beyond administrative supervision toward transformative instructional leadership that actively promotes ICT integration in teaching practices. This includes embedding digital pedagogy in professional development programs, strengthening reflective feedback cycles, and fostering collaborative learning cultures among teachers.

At the policy level, the findings highlight the need for systemic support to ensure effective ICT implementation. This involves improving digital infrastructure, reducing disparities in technological access, and establishing clear standards for teachers' ICT competencies. Without such structural support, the potential of IT-based learning to enhance school wellbeing may remain uneven across contexts.

In conclusion, the findings reveal a misalignment between supervisory practices and their intended outcomes. Addressing this gap requires an integrated approach in which supervision is repositioned as a catalyst for digital pedagogical transformation, aligned with broader efforts to strengthen school climate and support students' holistic well-being.

3.2 Discussion

The initial stage of Confirmatory Factor Analysis (CFA) indicated that the proposed model did not meet the required goodness-of-fit criteria, as reflected by a significant p-value ($p < 0.05$), a high Chi-

square value, and an RMSEA exceeding the recommended threshold. Following model refinement, the second-stage CFA demonstrated substantial improvement, with all fit indices meeting the acceptable thresholds, indicating that the modified model was statistically adequate.

The Structural Equation Modeling (SEM) results further confirmed that the final model achieved satisfactory goodness-of-fit, supporting its suitability for hypothesis testing.

Interestingly, the findings reveal that administrative and academic supervision do not have a significant direct effect on school wellbeing. This result contrasts with prior studies that reported significant effects of supervision on educational outcomes, particularly teacher performance (Halirat, 2022) and instructional quality (Gordon, 2023). One possible explanation for this discrepancy lies in the shifting nature of supervision practices in contemporary educational settings. While previous studies primarily linked supervision to teacher performance, this study focuses on school wellbeing, a broader and more complex construct that encompasses emotional, social, and environmental dimensions.

In this context, traditional supervision practices—often administrative and compliance-oriented—may not directly translate into improvements in school wellbeing. Instead, supervision may exert its influence indirectly through pedagogical processes, particularly through the integration of information technology in teaching and learning. This suggests that the effectiveness of supervision is contingent upon its ability to foster innovative instructional practices rather than merely ensuring procedural compliance.

This interpretation is supported by the finding that IT-based learning has a significant positive effect on school wellbeing ($\beta = 0.595$, $p < 0.001$). Technology-enhanced learning environments can promote student engagement, flexibility, and inclusivity, which are critical components of school wellbeing (Panasi et al., 2020; Llurba et al., 2024). The integration of digital tools not only facilitates academic achievement but also supports students' emotional and social development, thereby reinforcing a more holistic conception of wellbeing.

From a theoretical perspective, this study contributes to the existing literature by extending the conceptual understanding of supervision beyond its direct effects. Specifically, the findings suggest that supervision should be reconceptualized as an enabling mechanism that operates indirectly through instructional innovation, particularly IT-based learning. This study also integrates three previously fragmented domains—supervision, digital learning, and school wellbeing—into a unified structural model, thereby offering a more comprehensive framework for understanding how institutional practices influence educational outcomes in the digital era.

Despite its contributions, this study has several limitations. First, the presence of multivariate non-normality, although this issue was addressed through bootstrapping. Second, the model explains 61.0% of the variance in school wellbeing, indicating that other important factors remain unexamined.

Future research should explore additional variables such as transformational school leadership, school climate, and teacher collaboration to provide a more comprehensive explanation of school wellbeing. Moreover, qualitative approaches are recommended to gain deeper insights into how supervision practices are perceived and implemented in real school contexts. Investigating the role of leadership styles in shaping the effectiveness of supervision and technology integration would also be particularly valuable. Longitudinal studies are further encouraged to examine causal relationships and the dynamic evolution of school wellbeing over time.

4 CONCLUSION

The results indicated that the initial research model did not meet the required goodness-of-fit criteria in the first stage of Confirmatory Factor Analysis (CFA), necessitating model modification. After refinement, the second-stage CFA demonstrated a substantial improvement, with the model meeting all acceptable fit indices, thereby confirming its validity and suitability for further analysis.

The findings reveal that information technology-based learning has a significant positive effect on school wellbeing, whereas administrative and academic supervision do not show a significant direct

effect. This suggests that conventional supervision practices may not be sufficient to directly enhance school wellbeing unless they are aligned with innovative instructional approaches.

From a practical perspective, these findings highlight the need for policymakers and schools to adopt more targeted strategies to strengthen the integration of IT-based learning. First, schools should invest in adequate digital infrastructure and ensure equitable access to learning technologies. Second, continuous professional development programs should be provided to enhance teachers' digital competencies and pedagogical use of technology. Third, supervision practices should be reoriented to emphasize instructional support, mentoring, and the effective integration of digital tools in classroom practices, rather than focusing solely on administrative compliance. Finally, schools should develop policies that encourage collaborative learning environments supported by technology, fostering both academic achievement and student wellbeing.

At a broader level, this study contributes to the evolving discourse on educational supervision by suggesting a shift from traditional, compliance-based supervision toward a more transformative and innovation-oriented approach. In global or similar educational contexts, particularly in developing or semi-urban regions, the findings imply that the effectiveness of supervision depends on its ability to facilitate meaningful pedagogical change, especially through digital learning integration. Thus, supervision should be positioned not merely as an evaluative mechanism, but as a strategic driver for improving both instructional quality and holistic school wellbeing.

Despite its contributions, this study has several limitations. Although the issue of multivariate non-normality was addressed through bootstrapping, it may still affect the robustness of the estimates. In addition, the model explains 61.0% of the variance in school wellbeing, indicating that other influential factors remain unexplored.

Future research is therefore encouraged to incorporate additional variables such as school leadership, school climate, and student motivation to provide a more comprehensive understanding of school wellbeing. Moreover, qualitative approaches could be employed to explore in greater depth how supervision practices are implemented and experienced in real educational settings. Longitudinal studies are also recommended to examine causal relationships and the dynamic development of school wellbeing over time.

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Conflicts of Interest: The authors declare no conflict of interest.

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