

The Effect of Academic Supervision by School Principals, Teachers' Digital Literacy, and Work Culture on the Performance of Junior High School Teachers in Rayon I, Siak Regency

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ABSTRACT

This study analyzes the effects of academic supervision by school principals, teachers' digital literacy, and work culture on the performance of junior high school teachers in Rayon I, Siak Regency. Employing a quantitative ex post facto design with an explanatory survey approach, the research sampled 128 of 187 teachers using proportional cluster random sampling. Data were collected via a closed-ended Likert-scale questionnaire that demonstrated satisfactory content validity ($r > 0.361$) and reliability ($\alpha = 0.887-0.973$). Classical assumption tests confirmed normality, absence of multicollinearity, and homoscedasticity. Findings underscore the need to cultivate a collaborative work culture and enhance digital literacy as primary drivers of teacher performance, and to reform supervision toward a participatory, development-oriented model. The study recommends integrated training programs linking organizational culture strengthening, technological competence development, and clinical supervision practices to sustainably improve teacher quality. Further research should incorporate variables such as facilities, motivation, and leadership to broaden the predictive model of teacher performance.

INTRODUCTION

The role of teacher performance in education today occupies an increasingly vital position in efforts to improve the quality and effectiveness of learning processes in schools, particularly at the junior high school level. Previous studies have identified that key factors strongly influencing the quality of teacher performance include the practice of academic supervision by school principals, teachers' level of digital literacy, and the prevailing work culture within schools (Fitriyanti et al., 2022; Hidayah et al., 2022; Firmansyah et al., 2023). Academic supervision by school principals is not merely a monitoring tool but also an instrument for fostering professionalism through systematic feedback and ongoing mentoring of teaching activities (Herlina et al., 2023). Meanwhile, advances in technology demand digital literacy as a prerequisite for teachers to align learning with the dynamics of the digital era (Hidayah et al., 2022). A conducive work culture contributes to building collaboration, work spirit, and active participation by teachers in every educational process (Harahap et al., 2023). Thus, these three variables simultaneously form the main foundation for strengthening teacher professionalism and performance, especially in public junior high schools in Rayon I, Siak Regency.

Academic supervision carried out by school principals functions not only as an instrument for evaluating teacher performance but also plays a role in enhancing pedagogical capacity and professionalism through structured clinical and instructional supervision strategies (Lahmi et al., 2021; Swandewi et al., 2024). Programmed and continuous academic supervision has been proven to encourage improvements in teacher competence and to have an impact on student learning outcomes, particularly when the supervision is conducted optimally and in a participatory manner (See et al., 2023). In addition, principal leadership in the supervision process can strengthen teacher participation in formulating learning policies, thereby fostering a greater sense of professional responsibility (Swandewi et al., 2024). Therefore, the quality of academic supervision implemented consistently and adaptively makes a significant contribution to improving and strengthening teacher performance across various duties, including facing the increasingly complex challenges of educational globalization.

Digital transformation in education has driven fundamental changes in teaching paradigms, requiring teachers to continually adapt and master comprehensive digital literacy (Swandewi et al., 2024; Wicagsono, 2022). Digital literacy is no longer merely technical proficiency; it also encompasses ethical and pedagogical competence in integrating technology into daily teaching, which significantly affects the creativity and relevance of learning materials (Hidayah et al., 2022). Teachers with high digital literacy can offer interactive and contextual learning that enhances student understanding and addresses the needs of digital natives in public junior high schools in Rayon I, Siak Regency (Swandewi et al., 2024). Accordingly, digital literacy is not only a key to adapting to technological developments but also a primary driver for improving the quality of teacher performance in secondary education. In sum, mastery of digital literacy is an essential foundation for supporting innovative and competitive learning.

Beyond technological strengthening, a positive and productive work culture in schools has an essential role in shaping a work environment conducive to optimizing teacher performance (Firmansyah et al., 2023; Harahap et al., 2023; Indarta et al., 2021). A strong work culture—characterized by cooperation, work ethic, honesty, and high motivation—has been shown to increase teacher loyalty and dedication in carrying out educational tasks on an ongoing basis (Firmansyah et al., 2023). In addition to creating harmonious relationships among school members, work culture values also stimulate innovation and higher-quality educational services in public junior high schools in Rayon I, Siak Regency (Indarta et al., 2021). Therefore, the consistent and continuous cultivation of a work culture can build an institutional character that is adaptive, responsive, and professional. Ultimately, an internalized work culture will encourage teachers to achieve optimal performance in fulfilling their roles as educators.

Previous research has shown that academic supervision, digital literacy, and work culture individually have significant effects on enhancing teacher professionalism and performance, whether through the implementation of clinical or collaborative supervision and the strengthening of instructional leadership (Lahmi et al., 2021; See et al., 2023; Swandewi et al., 2024). However, studies that integratively examine these three factors within one analytical framework—particularly at the junior high level and in Rayon I, Siak Regency—remain very limited (Indarta et al., 2021; Fitriyanti et al., 2022). This research gap needs to be addressed to provide a comprehensive picture of how the three variables together can drive the creation of excellent and professional teacher performance (Harahap et al., 2023). Thus, research integrating academic supervision, digital literacy, and work culture is necessary to produce evidence-based policy recommendations suited to local needs in Siak Regency. In conclusion, a comprehensive analysis of these three variables will enrich the body of knowledge and the practice of education management at the junior high school level.

The local context in Rayon I, Siak Regency, presents its own challenges and dynamics, where the role of the school principal as an instructional leader greatly determines educational success through the implementation of academic supervision responsive to teachers' needs (Fitriyanti et al., 2022; Hidayah et al., 2022; Indri Cahyanti et al., 2025). On the other hand, the implementation of digital literacy in public junior high schools still faces various obstacles, ranging from limited infrastructure to uneven technical training, causing variation in teachers' technological mastery (Hidayah et al., 2022). Meanwhile, efforts to instill a strong school work culture have not yet fully become a strategic priority, even though this factor is crucial to creating a harmonious and productive work environment (Indarta et al., 2021). Given this reality, research highlighting the integration of the three variables—academic supervision, digital literacy, and work culture—within a single empirical framework is urgently needed to formulate effective interventions to improve junior high school teacher performance in this region. In short, a locally data-driven approach is expected to provide concrete solutions for improving the quality of education in Siak Regency.

Based on the literature review and the empirical findings above, it can be concluded that academic supervision by school principals, teachers' digital literacy, and school work culture hold strategic positions in driving improvements in the performance of public junior high school teachers in Rayon I, Siak Regency (Fitriyanti et al., 2022; Swandewi et al., 2024; Hidayah et al., 2022). However, the scarcity of research examining the interrelationships among these three variables simultaneously at the junior high level in this area demands an integrated and comprehensive study using a multiple regression approach (Indarta et al., 2021; Firmansyah et al., 2023; Harahap et al., 2023). This research is expected not only to enrich the body of knowledge in education management but also to make a tangible contribution to data-driven policymaking to sustainably enhance teacher quality and education. Accordingly, the integration of academic supervision, digital literacy, and work culture raised in this study is believed to be a strong foundation for building professionalism and optimal performance of public junior high school teachers in Rayon I, Siak Regency.

METHODS

Research Design

This study used a quantitative ex post facto approach because the data collected were already inherent to the respondents at the time of the study and no treatment was administered to the subjects. Relationships among variables were analyzed using multiple linear regression to test the effects of Academic Supervision by School Principals (X_1), Teachers' Digital Literacy (X_2), and Work Culture (X_3) on Teacher Performance (Y), both partially and simultaneously.

Location and Time

The study was conducted in 13 public junior high schools located in Rayon I, Siak Regency. The locations were selected based on the diversity of academic supervision implementation, levels of digital literacy, and work culture conditions representing public schools in the area. All research activities—including coordination, data collection, analysis, and report writing—were carried out from February to June 2025.

Population and Sample

The population comprised all 187 permanent teachers (civil servants and non-civil servants) in public junior high schools in Rayon I, Siak Regency. Sample size was determined using the Isaac & Michael formula at a 5% significance level, producing a sample of 128 teachers. Proportional cluster random sampling was applied so that the sample composition was proportional to the number of teachers at each school.

Research Variables and Operational Definitions

1. Teacher Performance (Y): measured through four indicators—planning, implementation, evaluation of learning, and professional development—based on Bernardin & Russell (1993).
2. Academic Supervision by School Principals (X_1): referring to the indicators of planning, implementation, follow-up, and evaluation of supervision impact according to Hallinger & Murphy (1985).

3. Teachers' Digital Literacy (X_2): encompassing technology mastery, use of devices/applications, digital ethics and security, and online collaboration/communication.
4. Work Culture (X_3): operationalized through task commitment, teamwork, shared goals, and job satisfaction reflecting Schein's (2010) organizational culture concept.

Data Collection Techniques and Instruments

1. Data Collection Technique: Primary data were collected using a closed-ended Likert scale (1–5) questionnaire. School documentation complemented contextual information such as number of teachers and facilities.
2. Research Instrument: Items were developed based on each variable's indicators and underwent expert judgment. The instrument used closed statements to ensure response consistency.

Validity and Reliability Tests

Content validity was confirmed by two experts using product-moment correlation with a threshold of $r > 0.361$ at $N = 30$ in the try-out. Reliability was measured using Cronbach's alpha; all variables showed coefficients of 0.887–0.973 and were deemed reliable.

Data Analysis Technique

Analysis was performed with SPSS 25. Preliminary steps included classical assumption tests: normality (Kolmogorov–Smirnov), multicollinearity (VIF & Tolerance), and heteroscedasticity (Glejser) to ensure model adequacy. The multiple linear regression model was specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

The t-test assessed the partial effects of each independent variable, while the F-test evaluated their simultaneous effect at the 0.05 significance level. The coefficient of determination (R^2) was computed to determine the proportion of variance in teacher performance explained by X_1 , X_2 , and X_3 .

RESULTS

Descriptive Statistics of Variables

Academic Supervision by School Principals (X_1) showed a maximum score of 72, minimum of 43, and an average of 67.82; the percentage of 86.20% placed it in the very high category. Teachers' Digital Literacy (X_2) recorded an average of 66.16 with a percentage of 82.56%, also in the very high category. All sixteen items of Work Culture (X_3) showed percentages above 88%, indicating a very strong collaborative culture. The Teacher Performance variable (Y) had an average of 67.72 and a percentage of 83.14%, indicating overall performance was very high. These descriptive findings show that respondents already possess sufficient baseline conditions; hence inferential analysis focused on differences in the contribution of each factor.

Model Adequacy and Assumption Tests

Kolmogorov–Smirnov showed residual significance > 0.05 , indicating a normal distribution. Tolerance values > 0.10 and VIF < 10 demonstrated no multicollinearity among predictors. The Glejser test produced significance > 0.05 , so heteroscedasticity was not detected. All three statistical prerequisites were

met, ensuring the multiple linear regression model was valid and reliable for testing the research hypotheses.

Partial Effects of Independent Variables

The coefficient for Academic Supervision ($\beta = -0.214$; $t = -2.620$; $p = 0.010$) was significantly negative. This indicates that inspection-oriented supervision without mentoring can reduce teacher enthusiasm. Digital Literacy had a significant positive effect ($\beta = 0.276$; $t = 3.499$; $p = 0.001$); high technological competence makes teachers more effective in designing interactive learning. Work Culture showed the largest coefficient ($\beta = 0.829$; $t = 14.790$; $p < 0.001$), underscoring the importance of shared values and goals. Overall, only Work Culture and Digital Literacy increased performance, while Academic Supervision needs reorientation to be constructive for teachers.

Simultaneous Effects of the Model

ANOVA yielded $F = 292.022$ with $p < 0.001$; the null hypothesis was rejected and the three predictors collectively had a significant effect on teacher performance. The model obtained $R = 0.936$ and $R^2 = 0.876$, meaning 87.6% of the variance in performance was explained by X1, X2, and X3. The standard error of estimate was 4.086, confirming prediction accuracy. The remaining 12.4% suggests external factors—such as regional policies or ICT facilities—were not captured. These findings affirm the need for a synergistic approach; improving one variable without the other two will not maximize teacher performance.

Relative and Effective Contributions

Work Culture contributed 62.29% relatively and 54.58% effectively, making it the dominant factor. Digital Literacy contributed 20.63% relatively and 18.08% effectively, while Academic Supervision contributed 17.08% relatively and 14.97% effectively. The dominance of X3 is consistent with the highest β , showing that internal values, norms, and collaboration more strongly motivate teachers than control mechanisms or technological skills alone. The data also show that the total effective contribution equals R^2 , so the three variables are positively synergistic. Therefore, interventions to improve teacher performance should prioritize institutionalizing a progressive work culture, followed by strengthening digital literacy and redesigning academic supervision, with numerically consistent evidence across schools.

DISCUSSION

The results indicate that academic supervision by school principals has a significant effect on the performance of public junior high school teachers in Rayon I, Siak Regency, although the effect is negative ($\beta = -0.214$, $p = 0.010$). This finding suggests that supervision is inclined toward administrative monitoring and provides insufficient constructive professional development support (Lahmi et al., 2021; Swandewi et al., 2024; See et al., 2023). This is consistent with interview and observation data showing that supervision is focused more on inspection and reporting than on intensive classroom mentoring. Such conditions lower teacher motivation because they feel closely monitored without opportunities to discuss and develop teaching methods (Saman & Hasanah, 2024). Therefore, although academic supervision has the potential to improve competence, its approach must be oriented toward collaboration and continuous

development to optimally improve performance (Amanda & Mustofa, 2024). In conclusion, academic supervision needs restructuring to become an effective coaching tool that genuinely supports teacher professionalism.

Teachers' digital literacy was proven to have a positive and significant effect on performance with a regression coefficient of 0.276 and a significance of 0.001 (Hidayah et al., 2022; Swandewi et al., 2024; Nugraha et al., 2024). This is consistent with evidence showing that teachers with high digital literacy are able to design and implement more innovative and interactive learning by utilizing technology such as online platforms and multimedia (Rosyid & Mubin, 2024). Digital literacy also helps teachers access a wider range of learning resources and accelerates assessment processes, which impacts work effectiveness (Dewi et al., 2021). In Rayon I, sustained digital literacy training is important given disparities in technological access among schools (Hidayah et al., 2022). Consequently, improving digital literacy not only facilitates instructional management but also increases teachers' enthusiasm and productivity in meeting 21st-century demands. In sum, digital literacy is a key factor for optimizing teacher performance and is highly relevant to today's educational conditions.

School work culture was found to have the most dominant and significant effect on teacher performance with a regression coefficient of 0.829 and $p = 0.000$ (Firmansyah et al., 2023; Harahap et al., 2023; Indarta et al., 2021). Survey and interview data reveal that a supportive, collaborative, and goal-oriented work environment consistently boosts teacher motivation and dedication. A positive work culture strengthens teachers' sense of responsibility and loyalty, which in turn affects productivity and classroom learning quality (Ramadhan et al., 2024). Moreover, a good work culture fosters a professional climate that supports innovation and continuous competency development (Kartini et al., 2024). This aligns with Schein's (2010) theory that internalized values, norms, and habits shape productive work behavior. In the context of Rayon I, instilling a strong work culture is an effective strategy for addressing various local educational challenges. In conclusion, developing a healthy work culture is the main foundation for improving teacher performance and overall educational quality.

The simultaneous analysis of the three variables showed a significant effect on performance with $F = 292.022$ and $p = 0.000$, demonstrating that academic supervision, digital literacy, and work culture jointly influence teacher performance positively (Swandewi et al., 2024; Putri et al., 2023; Rahmadhani et al., 2023). The coefficient of determination (R^2) of 0.876 indicates that 87.6% of the variance in teacher performance can be explained by these three factors, with the remaining 12.4% influenced by factors outside the study (Hidayah et al., 2022). This underscores the importance of a holistic approach to professional development because only by synergizing the three aspects can teacher performance be maximized (Ruhita et al., 2023). The findings also highlight that interventions focused on a single variable are insufficient without support from the others. Accordingly, school and government policies should tailor teacher performance enhancement programs by integrating academic supervision, digital literacy, and work culture on an ongoing basis. In conclusion, the collaboration among these three factors is the key to driving excellent teacher performance.

Academic supervision oriented toward participatory professional development is more effective in increasing teacher performance than supervision that is merely administrative or control-oriented (Amanda & Mustofa, 2024; Saman & Hasanah, 2024; Putri et al., 2023). Based on findings in Rayon I, a supervision approach emphasizing collaboration between principals and teachers and providing constructive feedback can enhance motivation and teacher engagement in instruction (Lahmi et al., 2021). Conversely, rigid and authoritarian supervision models provoke resistance and reduce teachers' work spirit (Swandewi et al., 2024). Therefore, building principals' capacity to implement clinical supervision that is responsive to teachers' needs is crucial to improving the quality of coaching and educator performance. This reinforces the argument that supervision should be viewed as a process of fostering and empowering, not merely monitoring. In conclusion, strategies for academic supervision should be reformulated to focus on collaboration and teacher empowerment so they positively affect performance.

Teachers' digital literacy is a fundamental prerequisite for 21st-century learning, especially amid the Fourth Industrial Revolution, which requires the effective use of technology in teaching (Hidayah et al., 2022; Nugraha et al., 2024; Rosyid & Mubin, 2024). This study shows that teachers with good digital competence can improve the quality of content delivery through digital media such as instructional videos and interactive applications, making learning more engaging and effective (Dewi et al., 2021). Teachers with high digital literacy also tend to manage learning resources independently and innovate with technology-based instruction, which contributes to increased motivation and student achievement (Hani et al., 2024). In Rayon I, improving digital literacy must be accompanied by adequate training and facilities so teachers can optimize technology's potential in learning. In conclusion, sustained development of teachers' digital literacy is an essential prerequisite for improving performance and student outcomes.

A strong and positive work culture contributes greatly to creating a conducive work climate and supporting teacher professionalism (Firmansyah et al., 2023; Harahap et al., 2023; Indarta et al., 2021). This study reveals that the work culture in public junior high schools in Rayon I, emphasizing collaboration, effective communication, and a shared commitment to school goals, can increase work motivation and teacher loyalty in daily tasks (Ramadhan et al., 2024). Interview data corroborate these findings, showing that teachers feel more enthusiastic and productive when working in supportive environments that value sharing experiences and instructional solutions (Indarta et al., 2021). A well-established work culture also drives instructional innovation and continuous competency improvement. Therefore, strengthening work culture should be a primary focus of school management to create a climate conducive to enhancing teacher professionalism. In conclusion, developing a positive work culture is an effective strategy to reinforce teacher performance and overall educational quality.

This research underscores that synergy among academic supervision, digital literacy, and work culture is the main key to enhancing teacher performance in public junior high schools in Rayon I, Siak Regency (Swandewi et al., 2024; Putri

et al., 2023; Ruhita et al., 2023). With relative contributions of 62.29% for work culture, 20.63% for digital literacy, and 17.08% for academic supervision, it is clear that an integrated approach prioritizing internal cultural aspects and technological proficiency is highly effective in improving professionalism and outcomes (Firmansyah et al., 2023). However, academic supervision should be reoriented to better support and empower teachers, rather than remain merely administrative oversight (Amanda & Mustofa, 2024). Therefore, building principals' capacity for collaborative supervision, providing continuous digital literacy training, and strengthening productive work culture are strategic recommendations for improving educational quality in this region. In conclusion, sustainable efforts to improve teacher performance must be based on integration of these three factors to achieve optimal results that positively affect learning quality and student achievement.

CONCLUSION

Based on the data analysis and discussion, this study concludes that academic supervision by school principals, teachers' digital literacy, and school work culture together have a significant effect on the performance of public junior high school teachers in Rayon I, Siak Regency, with $F = 292.022$ and significance of $0.000 (< 0.05)$. Together, the three independent variables explain 87.6% of the variance in teacher performance ($R^2 = 0.876$), while the remaining 12.4% is influenced by factors outside the study. Partially, teachers' digital literacy has a positive and significant effect ($\beta = 0.276$, $t = 3.499$, $p = 0.001$); work culture shows the most dominant and significant effect ($\beta = 0.829$, $t = 14.790$, $p = 0.000$); whereas academic supervision has a significant negative effect on teacher performance ($\beta = -0.214$, $t = -2.620$, $p = 0.010$). These findings indicate that work culture and digital literacy are the primary drivers of improved teacher performance, while academic supervision—which is still administrative and control-oriented—needs to be reoriented into supervision that more effectively nurtures and supports teachers' professional development in a collaborative manner. In short, integrating these three factors is highly strategic for sustainably improving teacher performance in Rayon I, Siak Regency.

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