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An Analysis of The Relationship Between E-Supervision, Digital Literacy, and Teacher Performance in Online Learning in The Era of Education 5.0

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Abstract

Rapid digital advancement following COVID-19 requires teachers to continuously upgrade their technological skills to deliver effective learning. Digital literacy such as the ability to create, share, collaborate, and use digital tools responsibly, has become an essential 21st-century competency that contributes significantly to teacher performance. Instructional supervision has similarly evolved into e-supervision, a digital tool supporting real-time feedback and collaborative reflection, which prior studies link to improved teacher performance. This study examined how e-supervision and digital literacy jointly influence the performance of high school teachers in online learning, using a quantitative analytical design. A sample of 193 teachers was randomly selected from a population of 373 who had experienced e-supervision. Data were collected via questionnaire and analyzed through simple and multiple linear regression in SPSS. Results confirmed that e-supervision (sig.=0.000), digital literacy (sig.=0.000), and their combined effect (sig.=0.000) each significantly and positively influenced teacher performance. These findings highlight that strengthening both digital supervision practices and teachers' digital competency is essential to improving the quality of online instruction in the Education 5.0 era.

Keywords: *E-Supervision, Digital Literacy, Teacher Performance, Online Learning, Education 5.0.*

Abstrak

Kemajuan digital yang pesat pasca pandemi menuntut guru untuk terus meningkatkan keterampilan teknologinya agar mampu menghadirkan pembelajaran yang efektif. Literasi digital seperti kemampuan menciptakan, berbagi, berkolaborasi, dan menggunakan alat digital secara bertanggung jawab, kini menjadi kompetensi abad ke-21 yang sangat berkontribusi terhadap kinerja guru. Supervisi pembelajaran pun turut berkembang menjadi e-supervisi, sebuah alat digital yang mendukung umpan balik secara langsung dan refleksi kolaboratif, yang menurut penelitian sebelumnya berkaitan dengan peningkatan kinerja guru. Penelitian ini bertujuan mengkaji bagaimana e-supervisi dan literasi digital secara bersama-sama memengaruhi kinerja guru SMA dalam pembelajaran daring, menggunakan pendekatan kuantitatif dengan desain analitik. Sampel sebanyak 193 guru dipilih secara acak dari populasi 373 guru yang telah menerima e-supervisi. Data dikumpulkan melalui kuesioner dan dianalisis menggunakan regresi linear sederhana dan
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berganda dengan SPSS. Hasil penelitian menunjukkan bahwa e-supervisi (sig.=0,000), literasi digital (sig.=0,000), serta pengaruh gabungan keduanya (sig.=0,000) masing-masing berpengaruh signifikan dan positif terhadap kinerja guru. Temuan ini menegaskan bahwa penguatan praktik supervisi digital dan kompetensi digital guru sangat penting untuk meningkatkan kualitas pembelajaran daring di era Pendidikan 5.0.
Kata Kunci: *E-Supervisi, Literasi Digital, Kinerja Guru, Pembelajaran Daring, Pendidikan 5.0.*

INTRODUCTION

The accelerated advancement of technology, notably during the post-pandemic era, has triggered a profound transformation in global education systems. Traditional face-to-face classroom methods have largely shifted toward online or hybrid (blended learning) models.[1] Many schools are now integrating e-learning platforms, Google Meet, Zoom, and even messaging applications such as WhatsApp for discussions and assignment submissions.[2] This shift aligns with the vision of Education 5.0, in which technology is used to support human-centered, personalized, and collaborative learning.

In line with the demands of the Age of Industry 4.0, student characteristics have also evolved, favoring instant access to information through digital devices.[3] Often, students demonstrate higher digital competency than teachers, which presents a challenge in delivering technology-integrated learning that meets student needs.[4] Therefore, teachers are required to adapt and upgrade their technological skills to deliver effective and engaging digital learning experiences.

To successfully integrate digital technology into instruction, teachers must possess strong digital literacy. According to Mishra and Singh (2019)[5] digital literacy refers to the ability to invent, share, work together, communicate proficiently, and use digital tools responsibly and efficiently.[6] These competencies are part of 21st-century skills that are essential for teachers to design creative and relevant digital learning activities.[7] Digital literacy significantly contributes to teacher performance in online

[1] T. M. Adriansyah and T. Elfira Rahmayati, "Analisis Pengaruh Tingkat Literasi Digital Terhadap Produktivitas Kerja Pada Dosen Dalam Menghadapi Pendidikan Era Society 5.0 Di Kota Medan," *Jurnal Sains Dan Teknologi* 5, no. 1 (2023): 360–65, https://doi.org/10.55338/saintek.v5i1.1645.

[2] Nadia Fairuza Azzahra, "Mengkaji Hambatan Pembelajaran Jarak Jauh Di Indonesia Di Masa Pandemi Covid-19," in *Center for Indonesian Policy Studies*, vol. 19, no. 2, preprint, 2020, https://doi.org/DOI:%2010.35497/309163.

[3] Dwi Astutik et al., "Guru Dan Proses Pendidikan Dalam Pembelajaran Daring Di Masa Pandemi Covid-19," *Scholaria: Jurnal Pendidikan Dan Kebudayaan* 12, no. 1 (2022): 46–54, https://doi.org/https://doi.org/10.24246/j.js.2022.v12.i1.p46-54.

[4] Mita Domi Fella Henanggil et al., "Pemanfaatan Literasi Digital Dalam Optimalisasi Keterampilan Menulis Artikel Ilmiah Guru SDN 20 Koto Gaek Guguk Kabupaten Solok," *Jurnal Pendidikan Tambusai* 7, no. 3 (2023): 26333–40, https://doi.org/https://doi.org/10.31004/jptam.v7i3.10837.

[5] Pramod Mishra and Shiwali Singh, "DIGITALIZATION IN THE 21st CENTURY," *International Journal of Advanced Research (IJAR)* 7, no. 6 (2019): 994–97, https://doi.org/10.21474/IJAR01/.

[6] Ahmad Shidiqi et al., "Reconstructing Islamic Religious Education Methodology through Instructional Technology to Strengthen Digital Ethics among Generation Z," *Pelita: Jurnal Studi Islam Mahasiswa UII Dalwa* 4, no. 1 (2026): 33–52, https://doi.org/10.38073/pelita.v4i1.5650; Halwa Hasnia Noor, "The Dynamics of the Islamic Religious Education Curriculum in Responding to Social and Technological Changes," *Pelita: Jurnal Studi Islam Mahasiswa UII Dalwa* 4, no. 1 (2026): 53–71, https://doi.org/10.38073/pelita.v4i1.5652.

[7] Zainuddin Notanubun, "Pengembangan Kompetensi Profesionalisme Guru Di Era Digital (Abad 21)," *Jurnal Bimbingan Dan Konseling Terapan* 03, no. 1 (2019): 54–64, https://doi.org/https://doi.org/10.30598/jbkt.v3i2.1058; Veronica Sianturi et al., "Pengembangan

teaching.[8] Similarly, Asari et al. (2019)[9] emphasized the significance of digital literacy for teachers, as it enhances their understanding and application of technology in educational settings.

In addition to improving teachers' digital literacy, instructional supervision must also evolve. E-supervision, or electronic supervision, serves as a digital tool that facilitates communication between supervisors and teachers regardless of geographical barriers, enhancing real-time feedback and collaborative reflection.[10] E-supervision is considered a form of virtual oversight where supervisors connect with dispersed teachers through internet-based systems.[11]

Evidence from various studies converges on the conclusion that e-supervision contributes positively to teacher performance in online instructional settings.[12] For instance, Guntoro et al. (2016)[13] found that e-supervision effectively enhances teachers' ICT competencies and is highly recommended by supervisors. Improved teacher competency is directly correlated with the quality of learning. Similarly, Andani et al. (2017)[14] tested e-supervision among vocational school teachers and found it significantly improved their performance, suggesting broader implementation. Furthermore, Habibi (2020)[15] reported positive teacher responses toward e-supervision, citing its flexibility, enhanced interaction, and reduced misunderstandings between teachers and supervisors.

Instead of fully substituting traditional supervision, digital supervision is frequently integrated with face-to-face methods, forming what is referred to as blended

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[8] Adriansyah and Rahmayati, "Analisis Pengaruh Tingkat Literasi Digital Terhadap Produktivitas Kerja Pada Dosen Dalam Menghadapi Pendidikan Era Society 5.0 Di Kota Medan"; Nur Ahyani et al., "Pengaruh Literasi Digital Terhadap Kinerja Guru," *Edusaintek: Jurnal Pendidikan, Sains Dan Teknologi* 11, no. 3 (2024), https://doi.org/10.47668/edusaintek.v11i3.1283.

[9] Andi Asari et al., "Kompetensi Literasi Digital Bagi Guru Dan Pelajar Di Lingkungan Sekolah Kabupaten Malang," *Bibliotika : Jurnal Kajian Perpustakaan Dan Informasi* 3, no. 2 (2019): 98–104, https://doi.org/http://dx.doi.org/10.17977/um008v3i22019p98-104.

[10] Sermal and Muhammad Yunus, "Bridging Technology and Pedagogy: A Study on Virtual Academic Supervision for Teacher Professional Growth," *Al-Ishlah: Jurnal Pendidikan* 17, no. 2 (2025): 1844–53, https://doi.org/10.35445/alishlah.v17i2.7207.

[11] Sutrisno et al., "Peningkatan Kompetensi Guru Melalui Supervisi Pembelajaran Berbasis Digital: Upaya Membangun Mutu Sekolah," *Abdimas Pedagogi: Jurnal Ilmiah Pengabdian Kepada Masyarakat* 7, no. 1 (2024): 38–50, https://doi.org/10.17977/um050v7i12024p38-50; Sahrul Adi Amanatulloh et al., "Model Pengembangan Supervisi Akademik Melalui E-Visionary Bebrasis Komunikasi Interpersonal Di Madrasah Aliyah," *Js (Jurnal Sekolah)* 10, no. 1 (2025): 268–75, https://doi.org/https://doi.org/10.24114/js.v10i1.70343.

[12] Indang Rusmini et al., "E-Performance-Based Educational Supervision : Efforts to Improve Learning Quality at SMPN 3 Muara Wis, East Kalimantan," *Indonesian Journal of Education and Psychological Science (IJEPS)* 3, no. 4 (2025): 499–504, https://doi.org/https://doi.org/10.59890/ijeps.v3i4.105; Ayu Asmarani et al., "Pemanfaatan Teknologi Dalam Pelaksanaan Supervisi Pembelajaran Di Smp," *Edutainment : Jurnal Ilmu Pendidikan Dan Kependidikan* 9, no. 2 (2021): 83–91, https://doi.org/https://doi.org/10.35438/e.v9i2.509.

[13] David Guntoro et al., "Pengembangan Model Supervisi Akademik Berbantuan E-Supervision Berbasis Web Info Artikel," *Educational Management* 5, no. 2 (2016): 122–28.

[14] Yan Septio Bintoro Andani et al., "Model Supervisi Klinis Berbasis Teknologi Informasi Dan Komunikasi Untuk Menigkatkan Kinerja Guru Produktif Di Smkn 1 Kota Bima Info Artikel," *Educational Management* 6, no. 2 (2017): 163–69.

[15] G. Habibi et al., "E-Supervision Using Web: Elementary School Teachers' Reaction," *Global Conferences Series: Sciences and Technology (GCSST)*, April 15, 2020, 25–30, https://doi.org/10.32698/tech3230.

supervision. This approach provides valuable experiences for teachers, enabling them to engage in direct consultations with supervisors.[16] Nevertheless, empirical investigations into the application of e-supervision within online learning environments are still scarce. Existing studies have largely examined e-supervision and digital literacy as separate determinants of teacher outcomes, like e-supervision has been studied mainly in relation to teachers' ICT competencies or in specific school types such as vocational schools, while digital literacy has been examined independently as a predictor of teacher performance. Few studies have tested how these two variables operate together, so it remains unclear whether supervision practices and teachers' own digital competence complement each other in explaining performance in online learning.

Building on this gap, the present study offers three novel contributions. First, it examines e-supervision and digital literacy simultaneously, testing both their partial and combined effects on teacher performance within a single model. Second, it focuses on high school teachers who have directly experienced e-supervision in online learning, so the findings reflect actual implementation rather than perceptions or planned adoption. Third, it situates the analysis in the Education 5.0 context, where technology is expected to support human centered and collaborative learning. Thereby extending the discussion of supervision and digital competence beyond the emergency-remote-teaching focus of earlier studies. The results are expected to provide empirical evidence for school leaders and policymakers to design supervision programs and digital competency training in an integrated way.

METHOD

A quantitative approach with an analytical design was employed in this research,[17] with the aim of exploring the relationships that exist between the independent and dependent variables under investigation. E-Supervision (X1) and Digital Literacy Skills (X2) were positioned as the independent variables in this study, whereas Teacher Performance (Y) was treated as the dependent variable.

Participants were drawn from five schools with established e-supervision practices, comprising school principals, vice principals, and classroom teachers. Given the relatively homogeneous characteristics of the population, a simple random sampling procedure was applied,[18] and the sample size of 193 teachers was calculated using Yamane's (1973) formula at a 5% error tolerance.

Figure 1 illustrates the conceptual framework adopted in this study, in which a structural model is used to capture causal relationships among the variables under investigation. Within this quantitative design, the independent variables are E-Supervision (X1) and Digital Literacy (X2), whereas Teacher Performance (Y) functions as the dependent variable. Three pathways of influence are embedded in the model. The partial effect of e-supervision on teacher performance is tested through Hypothesis 1

[16] Dagrunn Nåden Dyrstad et al., "The Value of a Blended Learning Supervision Course at the Advanced Level: Supervisors' Experiences," *Nordisk Tidsskrift i Veiledningspedagogikk* 9, no. 1 (2024): 1–15, https://doi.org/10.15845/ntvp.v9i1.3968.

[17] Sugiyono, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, Dan Kombinasi (Mix Methods)* (Alfabeta, 2018).

[18] Sugiyono, *Metode Penelitian Tindakan Komprehensif* (Alfabeta, 2021).

(H1), while Hypothesis 2 (H2) addresses the partial effect of digital literacy. Meanwhile, the combined or simultaneous influence of both independent variables on teacher performance is explored under Hypothesis 3 (H3).

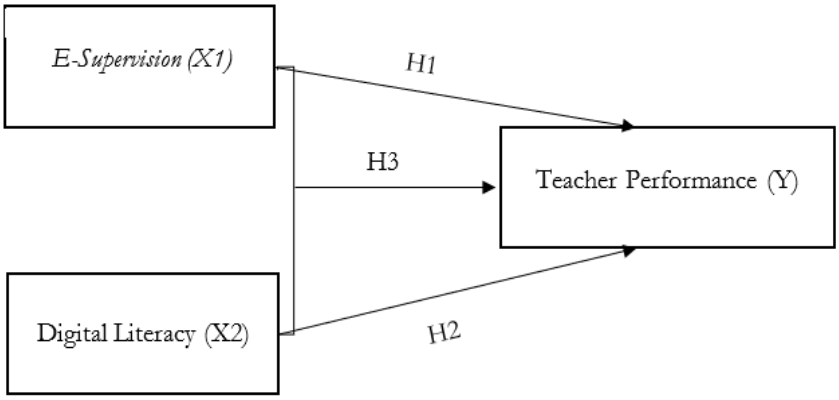


Figure 1. Research Design

Prerequisite and hypothesis testing were employed to analyze the data.[19] Normality, linearity, and multicollinearity were assessed as prerequisite tests, and this was followed by simple and multiple linear regression analyses aimed at establishing whether e-supervision and digital literacy significantly and positively predict teacher performance.

To test the first and second hypothese, simple regression analysis (t-test) was employed.[20] Meanwhile, to test the third hypothesis, which concerns the joint influence of e-supervision and digital literacy on teacher performance, multiple regression analysis (F-test) was utilized.

The following hypotheses were proposed and subsequently tested in this research:
H1: E-supervision significantly influences teacher performances
H2: Teachers' digital literacy skills significantly influence teacher performances
H3: The combined application of e-supervision and digital literacy skills significantly influences teacher performances

RESULTS AND DISCUSSION

In managing the research data, two stages of data analysis were conducted: prerequisite testing followed by hypothesis testing. Prerequisite testing was carried out prior to hypothesis testing, involving normality and linearity assessments. Using the one-sample Kolmogorov-Smirnov test in SPSS version 20, the normality of each variable's data distribution was assessed, with an Asymp. Sig. (2-tailed) value above 0.05 taken as the criterion for normal distribution. Corresponding results are set out in the table 1.

[19] Riduwan, *Skala Pengukuran Variabel-Variabel Penelitian* (Alfabeta, 2015).
[20] Aprilinda Ummi Cholilah et al., "Pengaruh Non-Performing Financing (NPF) Dan Inflasi Terhadap Return on Assets (ROA) Perbankan Syariah Di Indonesia," *Pelita: Jurnal Studi Islam Mahasiswa UII Dalwa* 2, no. 1 (2024): 106–18, https://doi.org/10.38073/pelita.v2i1.2047.

Table 1. Normality test results (one-sample Kolmogorov-Smirnov test)

One-Sample Kolmogorov-Smirnov Test				
		E-Supervision	Digital Literacy	Teacher Performance
N		193	193	193
Normal Parameters[a,b]	Mean	46.0570	45.1088	89.3161
	Std. Deviation	6.43816	7.25815	7.22615
Most Extreme Differences	Absolute	.098	.086	.091
	Positive	.082	.086	.043
	Negative	-.098	-.079	-.091
Kolmogorov-Smirnov Z		1.355	1.201	1.264
Asymp. Sig. (2-tailed)		.051	.112	.082
a. Test distribution is Normal.				
b. Calculated from data.				

Based on the table 1, the significance values for the e-supervision variable, digital literacy variable, and teacher performance variable during the pandemic are 0.051, 0.112, and 0.082, respectively. Therefore, it can be concluded that all three variables are normally distributed, as their significance values exceed 0.05.

The linearity test was conducted to determine whether the relationship between variables was linear. If the data demonstrated linearity, linear regression analysis could be validly applied in hypothesis testing. Data are considered linear if the significance value is ≥ 0.05. The linearity analysis in this study was also performed using SPSS version 20 and showed the following results for the relationships between the variables:

Table 2. Linearity test results (teacher performance on e-supervision)

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Teacher Performance * E-Supervision	Between Groups	(Combined)	3951.631	25	158.065	4.346	.000
		Linearity	2574.573	1	2574.573	70.785	.000
		Deviation from Linearity	1377.058	24	57.377	1.578	.051
	Within Groups		6074.089	167	36.372		
	Total		10025.720	192			

Based on the linearity test presented in Table 2, the regression line between teacher performance (Y) and academic supervision through e-supervision (X1) shows a deviation from linearity value of 1.578 with a significance level of 0.051, which is greater than 0.05. Therefore, it can be concluded that teacher performance (Y) has a linear relationship with e-supervision (X1).

The results of the linearity test in Table 3 indicate that the regression line between teacher performance (Y) and teachers' digital literacy ability (X_2) yields a deviation from linearity value of 0.944 and a significance value of 0.545, exceeding the 0.05 threshold. This finding confirms a linear relationship between teacher performance (Y) and teachers'

digital literacy ability (X_2). After completing the prerequisite tests, the next step was hypothesis testing. This analysis was conducted to evaluate the hypotheses proposed earlier.

Table 3. Linearity test results (Teacher Performance on Digital Literacy)

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Teacher Performnace * Digital Literacy	Between Groups	(Combined)	4063.826	26	156.301	4.352	.000
		Linearity	3215.943	1	3215.943	89.543	.000
		Deviation from Linearity	847.883	25	33.915	.944	.545
	Within Groups		5961.894	166	35.915		
	Total		10025.720	192			

Hypothesis 1: The Effect of E-Supervision (X1) on Teacher Performance (Y)

A simple linear regression analysis was carried out using SPSS version 20, with the resulting output summarized in Table 4.

Table 4. Coefficient of Simple Linear Regression (X1 – Y)

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	63.120	3.256		19.387	.000
	E-Supervision	.569	.070	.507	8.124	.000
a. Dependent Variabel: Teacher Performance						

At the 5% significance level ($\alpha = 0.05$), a probability value of 0.000 was obtained for the effect of e-supervision (X1) on teacher performance (Y). As this value lies below the 0.05 cut-off, Ho is rejected and Ha is accepted, from which a positive and significant effect of e-supervision on teacher performance can be inferred. A regression coefficient of 0.569 was also recorded, meaning that each one-unit increase in e-supervision is associated with a 0.569-unit rise in teacher performance.

Table 5. Coefficient of Determination (R^2) for E-Supervision on Teacher Perform

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.507[a]	.257	.253	6.24590
a. Predictors: (Constant), E-Supervision				

The percentage contribution made by e-supervision toward variance in teacher performance is captured through the coefficient of determination (R^2). An R^2 of 0.257 (25.7%) is reported in Table 5, from which it is understood that just over a quarter of the variability in teacher performance during online learning can be attributed to e-

supervision, while the remaining 74.3% is explained by factors that fall outside the scope of this study.

Hypothesis 2: The Effect of Digital Literacy Skills (X2) on Teacher Performance (Y)

Whether teachers' digital literacy (X2) exerts a significant effect on teacher performance (Y) was examined through the second hypothesis, the corresponding output is displayed in Table 6.

Table 6. Coefficient of Simple Linear Regression (X2 – Y)

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	63.881	2.712		23.551	.000
	Digital Literacy	.564	.059	.566	9.497	.000
a. Dependent Variabel: Teacher Performance						

A significance value of 0.000 was yielded by the t-test for the effect of digital literacy on teacher performance, a figure that falls below the 0.05 threshold and therefore leads to the acceptance of H2. A positive and significant relationship between digital literacy and teacher performance is thus supported.

Table 7. Coefficient of Determination (R^2) for Digital Literacy Skills on Teacher Performance)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.566[a]	.321	.317	5.97104
a. Predictors: (Constant), Digital Literacy				

How much of the variance in teacher performance is accounted for by digital literacy skills is reflected in the R^2 value presented in Table 7, which was found to be 0.321, or 32.1%. Roughly a third of the variability in teacher performance is therefore explained by teachers' digital literacy, whereas the remaining 67.9% is attributable to variables not covered by this research.

Hypothesis 3: The Effect of X1 and X2 on (Y)

The third hypothesis tested whether there is a simultaneous influence of e-supervision and digital literacy skills (X1 and X2) on teacher performance (Y) during online learning. The resulting output is presented in Table 8:

Table 8. F-Test Regression Analysis

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4348.706	2	2174.353	72.772	.000[b]
	Residual	5677.014	190	29.879		
	Total	10025.720	192			
a. Dependent Variabel: Teacher Performance						
b. Predictors: (Constant), Digital Literacy, E-Supervision						

A significance value of 0.000 was obtained for the combined effect of X1 and X2 on Y, which, being lower than 0.05, results in H3 being accepted. A significant and positive joint effect of e-supervision and digital literacy on teacher performance during online learning is thereby confirmed, with an F-value of 29.879 reflecting the magnitude of this combined influence.

Table 9. Coefficient of Determination and Adjusted R Square

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.659[a]	.434	.428	5.46617
a. Predictors: (Constant), Digital Literacy, E-Supervision				
b. Dependent Variabel: Teacher Performance				

For models with more than one predictor, the Adjusted R Square is the preferred measure of explanatory power. An Adjusted R Square of 0.428 (42.8%) is reported in Table 9, from which it is inferred that e-supervision and digital literacy jointly account for close to 43% of the variation in teacher performance, leaving the residual 57.2% to be explained by variables not covered in this study.

Discussion

E-Supervision (X1) emerged as a significant positive predictor of teacher performance, accounting for roughly a quarter of its variance (25.7%). Such a result points toward the value of moving supervisory practice away from conventional paper-based routines and toward platforms that support more immediate, responsive engagement between supervisors and teachers. As noted by[21], e-supervision transcends geographical barriers, allowing for real-time feedback and collaborative reflection.

Our results align with researcers befor that e-supervision models are highly efficient because they allow supervisors to monitor instructional activities remotely and without the constraints of physical distance[22]. Furthermore, the integration of tools such as WhatsApp, Zoom, and Google Forms into the supervisory process as highlighted by [23] streamlines administrative tasks, thereby allowing teachers to focus more on instructional quality. This digital oversight acts as a continuous support mechanism rather than a periodic inspection, which reduces misunderstandings and fosters a professional culture of transparency.

Digital Literacy (X2) was found to have an even stronger individual impact than supervision, explaining 32.1% of the variance in teacher performance. The significance value of 0.000 underscores that technical proficiency is no longer optional but a core

[21] Sermal and Yunus, "Bridging Technology and Pedagogy: A Study on Virtual Academic Supervision for Teacher Professional Growth."

[22] Meliadi and Badrun, "Pemanfaatan Teknologi Informasi Dalam Model Supervisi Jarak Jauh Untuk Guru Di Daerah Terpencil," *Irfani* 21, no. 2 (2025): 699–715, https://doi.org/https://doi.org/10.30603/irfani.v21i2.6819.

[23] Ikhwanul Muslimin, "Meningkatkan Profesionalisme Guru Dengan Model, Pendekatan, Dan Teknik Supervisi Pendidikan Di Era Society 5.0," *TA'LIM: Jurnal Pendidikan Agama Islam Dan Manajemen Pendidikan Islam* 2, no. 1 (2023): 33–49, https://doi.org/https://doi.org/10.59098/talim.v2i1.877.

requirement for 21st-century educators. Teachers with high digital literacy can effectively create, share, and collaborate using digital tools, which is essential for designing engaging online activities.

This study supports the findings of [24], asserting that teachers must adapt to digital technologies to remain effective facilitators of learning. Beyond mere technical operation, digital literacy involves critical thinking and digital safety management. When teachers possess these competencies, they can better bridge the competency gap where students often display higher digital fluency than their instructors. As [25] suggests, internal factors specifically the teacher's own skills and abilities are primary drivers of performance.

The most compelling finding is the simultaneous influence of both variables, which explains 42.8% of teacher performance variance. This synergy indicates that neither advanced supervision tools nor individual teacher skills are sufficient in isolation. A high-tech supervisory system (E-Supervision) cannot be effective if the teachers lack the skills to navigate the digital feedback loop. Conversely, highly literate teachers may see their potential stifled if the school's management remains tethered to outdated, manual supervision methods.[26]

This joint effect underscores the paradigm shift required for Education 5.0. It requires a holistic digital ecosystem where instructional leadership (supervision) and individual competency (literacy) are synchronized. This study reinforces the notion that improving the quality of online teaching requires a dual-track strategy: institutional investment in digital monitoring infrastructure and continuous professional development for teachers to refine their technological pedagogical content knowledge.

Research Implications

Within the context of Education 5.0, this study's theoretical implication points to a shift in what determines teacher performance that pedagogical mastery, while still relevant, is no longer the sole factor, as digital integration now plays a substantial role. This research reinforces the Dual-Track Strategy model, which posits that institutional infrastructure (E-Supervision) and individual competency (Digital Literacy) must be developed in tandem to optimize educational outcomes. Practically, school administrators should prioritize the institutionalization of e-supervision platforms while simultaneously providing structured digital professional development programs. This approach ensures

[24] Yentri Anggeraini et al., "Literasi Digital : Dampak Dan Tantangan Dalam Pembelajaran Bahasa," *Prosiding Seminar Nasional Pascasarjana UNNES*, 2019, 386–89.
[25] Madjid, *Pengembangan Kinerja Guru Melalui : Kompetensi, Komitmen Dan Motivasi Kerja*, 1st ed., ed. M. Si. Miftachul Huda (Penerbit Samudra Biru, 2016).
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that the digital transformation of education is supported by both robust leadership and competent human resources.

CONCLUSION

Consistent with the research objective outlined earlier, two variabels independent influence on teacher performance within the online learning environments of the Education 5.0 era. This research contributes to the advancement of educational management science by empirically validating that the synergy between institutional digital leadership (e-supervision) and individual technological competency (digital literacy) creates a more robust pedagogical ecosystem, explaining 42.8% of the variance in teacher effectiveness. Practically, these findings suggest that improving the quality of online instruction requires a dual-track strategy involving continuous digital literacy training and the institutionalization of tech-based supervisory platforms. For future research, it is recommended to employ qualitative or mixed-method approaches to explore deeper psychological and environmental factors such as internet infrastructure and teacher motivation that may influence the remaining 57.2% of performance variables not covered in this study.

Several limitations warrant acknowledgment despite the meaningful findings. First, the quantitative approach, while capable of establishing a significant relationship, does not capture underlying qualitative dimensions such as teacher motivation or psychological resistance to digital oversight. Second, the research was confined to high school teachers in a single region, which limits how far the findings can be generalized across educational levels or geographic settings. Third, the limited number of independent variables leaves 57.2% of the variance in teacher performance unexplained by other potentially relevant factors, such as school culture, internet infrastructure, or teacher workload.

Given these limitations, several suggestions are offered for future research. Researchers are encouraged to employ a mixed-methods approach, combining surveys with interviews or classroom observations, to explore teachers' motivation and their responses to digital supervision in greater depth. Future studies should also broaden the sample to include teachers from other educational levels (elementary, junior high, vocational) and from multiple regions to strengthen generalizability. In addition, subsequent research should incorporate a wider set of variables, such as school culture, internet infrastructure, teacher workload, and teacher motivation, potentially as mediating or moderating variables, so that a more comprehensive picture of teacher performance in digital-era education can emerge.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author used Claude to translate the manuscript from Indonesian into English and to assist in revising the manuscript in response to reviewers' comments. After using this tool, the author reviewed and edited the content as needed and take full responsibility for the content of the published article.

AUTHOR CONTRIBUTION STATEMENT

Author was responsible for the conceptualization, methodology, software, formal analysis, investigation, data curation, writing original draft, review & editing, and project administration.

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The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request, subject to applicable ethical considerations and confidentiality requirements.

DECLARATION OF INTERESTS

The author declares that there are no financial, personal, or professional competing interests that could have influenced the research, findings, or publication of this article.

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