

## The Urgency of Digital Literacy in Improving Teacher Performance: A Case Study In Lebak Regency

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### ABSTRACT

**Background.** The rapid development of information and communication technology has transformed the educational landscape, requiring teachers to possess adequate digital literacy skills to optimize the learning process. In Lebak Regency, the diversity of geographical conditions and technological infrastructure raises questions about the extent to which digital literacy affects teacher performance. This study aims to analyze the effect of digital literacy on junior high school teachers' performance in the region.

**Methods.** Using a quantitative, correlational survey, data were collected from 120 purposively sampled teachers across three geographical zones. The research instrument was validated and tested for reliability before use. Data analysis employed descriptive statistics and simple linear regression.

**Results.** The results showed that digital literacy had a significant and positive effect on teacher performance, contributing 48.6%. Teachers with high digital literacy demonstrated better abilities in planning, implementing, and evaluating learning activities. Most respondents were in the high digital literacy category, although a small portion remained at a low level, particularly in areas with limited technological access.

**Conclusion.** This study provides novelty by quantitatively analyzing this relationship within a specific subnational context (Lebak Regency) characterized by significant geographical and infrastructural disparities, a gap often overlooked by previous national-level or urban-focused research. The findings imply a critical need for a dual intervention policy that requires local governments not only to improve equitable ICT infrastructure but also to design adaptive professional development programs focused on contextual digital pedagogy to bridge the persistent competency gap.

## 1. INTRODUCTION

The development of information and communication technology (ICT) over the past two decades has profoundly transformed the way humans interact, communicate, and learn. This digital revolution has led to the integration of technology into almost every aspect of daily life, from economic activities and public administration to education and social interaction. The accelerating penetration of the internet, the affordability of digital devices, and the proliferation of online platforms that provide instant access to information have collectively reshaped the global learning ecosystem. According to the International Telecommunication

Union (2022), over 5.3 billion people, equivalent to 66% of the world's population, are now connected to the internet.

Digitalization offers substantial opportunities for improving educational access and quality. Through technology, learning is no longer limited by time or location; students can engage in self-directed learning, while teachers can utilize diverse multimedia resources to enrich instruction. However, this shift also redefines the professional identity of teachers. No longer mere transmitters of knowledge, teachers are increasingly required to act as facilitators, mentors, and curators of digital content who guide students in navigating complex digital environments (Falloon, 2020). This requires a sophisticated integration of technology, content, and pedagogy (Koehler & Mishra, 2009). Within this context, teachers' digital literacy emerges as a crucial competence (Instefjord & Munthe, 2017).

The concept of digital literacy was first introduced by Gilster (1997) as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers". Over time, this definition has expanded to include cognitive, technical, social, and ethical aspects (Eshet-Alkalai, 2012; Ng, 2012). The scholarly use of these terms often overlaps, encompassing a wide range of skills (Spante et al., 2018), referring not only to the ability to operate digital tools but also to the capacity for critical thinking, decision making, data protection, and the creative use of technology for pedagogical innovation. Empirical studies consistently highlight that digital literacy significantly enhances educational effectiveness. Basilotta-Gómez-Pablos et al. (2022) found that teachers with higher levels of digital competence are more effective at promoting learner engagement and adapting their instruction to diverse technological contexts.

In Indonesia, internet penetration has reached approximately 73.7% of the population, with users spending an average of more than eight hours daily on digital devices, reflecting the nation's deep digital integration and its implications for education (Prasetyo et al., 2023). In Indonesia, teacher performance is formally measured through four core competencies under the Permendikbud Nomor 16 Tahun 2007: pedagogical, professional, social, and personal competencies. Digital literacy is hypothesized to directly influence these competencies, particularly pedagogical and professional skills related to planning, implementing, and evaluating technology-based learning (Fernández-Batanero et al., 2020). Indeed, teachers' pedagogical beliefs and their digital skills are shown to be strong predictors of their actual classroom use of technology (Petko, 2012).

Despite these advances, research also reveals persistent disparities in digital competence among teachers. Rusydiyah et al. (2024) found that teachers in rural Indonesia are generally less prepared for digital transformation than their urban counterparts, primarily due to inadequate ICT infrastructure and limited access to professional training. These factors are recognized globally as significant barriers influencing technology acceptance and adoption among educators (Scherer et al., 2019). A similar conclusion was reached by Zhang

et al. (2022), who emphasized that local infrastructure, technical support, and school leadership significantly influence teachers' readiness for digital transformation.

While existing studies have acknowledged the significance of digital literacy and the digital divide among educators, there remains a notable gap in the literature regarding how local geographical factors, infrastructure availability, and teachers' digital competence interact in specific subnational contexts. Most previous research on teachers' digital literacy in Indonesia has been conducted at the national level or within urban environments, often employing descriptive surveys that fail to capture the nuanced interplay between contextual variables such as connectivity, institutional support, and access to digital learning resources (Zhao et al., 2002). Consequently, there is limited empirical understanding of how these dynamics manifest in less developed regions where educational infrastructure varies substantially.

Lebak Regency in Banten Province provides a compelling case for such an investigation. The region encompasses diverse geographical and infrastructural conditions, ranging from urban centers with stable internet connectivity to remote rural areas facing chronic network instability. This infrastructural disparity reflects a well-documented national challenge, hindering online learning and restricting teachers' participation in virtual professional development programs. Nevertheless, there is still limited research mapping junior high school teachers' digital literacy levels in Lebak Regency and examining their effect on teacher performance.

The urgency of this research is driven by several factors. By focusing on a geographically diverse Indonesian district, this research is expected to provide a comprehensive picture of the relationship between digital literacy and junior high school teachers' performance. First, there is a need to understand the extent to which junior high school teachers' digital literacy contributes to their performance. Second, the results are expected to serve as a basis for formulating local policies and digital literacy training programs that match local conditions. Third, this study can enrich academic literature on digital literacy in areas with ICT infrastructure gaps, which remain underexplored.

## **2. METHODS**

### **2.1 Research Design**

This study employed a quantitative approach using a correlational survey method. The research design was explanatory research, aimed at analyzing and explaining the effect of digital literacy (independent variable) on the performance of junior high school teachers (dependent variable) in Lebak Regency. This method was selected as it permits the researcher to objectively describe the relationships between variables based on numerical measurements and statistical analysis.

## 2.2 Population and Sample

The population for this study comprised all active junior high school teachers in Lebak Regency during the 2024/2025 academic year, totaling 2,801 teachers. The sample size justification was determined using an a priori power analysis to ensure adequate statistical power to detect an existing effect. Using G\*Power software, the justification was based on the following parameters: a simple linear regression analysis (F-test), an assumed small-to-medium effect size ( $f^2 = 0.07$ ), a significance level ( $\alpha$ ) of 0.05, and statistical power ( $1-\beta$ ) of 0.80. Based on these parameters, the minimum required sample size was 113 respondents. This study successfully collected data from 120 teachers; thus, this number exceeds the minimum requirement and is considered sufficient. The sample was selected using purposive sampling based on the following criteria: (1) permanent teacher status (civil servant or non-civil servant), (2) a minimum of two years of teaching experience, and (3) actively using digital technology in the teaching-learning process.

## 2.3 Research Instrument

The research instrument was a closed-ended questionnaire using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). To ensure a comprehensive and valid measurement of the constructs in this study, the research instrument was carefully developed based on the two primary variables: Digital Literacy (X) and Teacher Performance (Y). These variables were operationalized into a set of specific, measurable components derived from a review of relevant theoretical frameworks and prior empirical studies. The complete instrument blueprint is presented in Table 1, which provides a detailed breakdown of each variable into its core indicators and corresponding sub-indicators. This grid served as the foundational guide for formulating the individual questionnaire items used for data collection.

**Table 1.** Research Instrument

Variable	Indicator	Sub-Indicator
X. Digital Literacy	Understanding of Digital Technology	1. Understanding the fundamentals of ICT. 2. Understanding various digital devices used in teaching. 3. Understanding the role of digital media in education.
	Digital Security and Ethics	1. Understanding basic principles of cybersecurity and privacy. 2. Able to identify and avoid false information or hoaxes.
	Information Management Skills	1. Able to search and access digital information effectively. 2. Able to evaluate the credibility of digital information sources. 3. Able to organize digital information for learning purposes.
	Use of Technology in Teaching	1. Able to use digital tools for presentations and interactive learning.

Variable	Indicator	Sub-Indicator
Y. Teacher Performance		Integrating technology into learning activities.
		2. Recommending online resources for student self-directed learning.
		3. Utilizing technology to collect and analyze student learning data.
	Lesson Planning	1. Formulating structured lesson plans. 2. Aligning lesson plans with the applicable curriculum. 3. Adapting lesson plans to student learning needs.
	Lesson Implementation	1. Using varied teaching methods. 2. Building positive interaction with students. 3. Managing the classroom effectively.
	Evaluation of Learning Outcomes	1. Conducting objective and fair assessments. 2. Applying various assessment techniques. 3. Assessing the achievement of learning objectives.
	Follow-up on Learning Evaluation	1. Providing constructive feedback. 2. Making instructional improvements based on assessment results. 3. Preparing follow-up plans for students based on assessments.

The instrument underwent content validation by three educational technology experts, and a pilot test on 32 teachers outside the sample yielded Cronbach's Alpha values of 0,943 (Digital Literacy) and 0.924 (Teacher Performance), indicating high internal consistency

## 2.4 Procedure and Data Analysis

The research was conducted over five months (March-July 2025). Data collection was conducted using a hybrid method (online and printed questionnaires) to accommodate the diversity of internet connectivity at the research locations. The collected data were then cleaned (data cleaning) before analysis. Data analysis was performed in two stages: (1) Descriptive analysis to calculate the mean, standard deviation (SD), and frequency distributions; and (2) Inferential analysis using simple linear regression ( $Y = a + bX$ ) to test the hypothesis. Prior to the regression, classical assumption tests (normality, linearity, and homoscedasticity) were conducted. In accordance with good reporting practices, the effect size for the regression model will be explicitly reported using the Coefficient of Determination ( $R^2$ ). The significance criterion was set at  $p < 0.05$ , and all data analyses were performed using SPSS version 26.

### 3. RESULTS AND DISCUSSION

#### RESULTS

##### 3.1 Descriptive Statistics

The study involved 120 junior high school teachers from 15 public and private schools in Lebak Regency. The respondents consisted of 42 teachers from the northern zone, 38 from the central zone, and 40 from the southern zone.

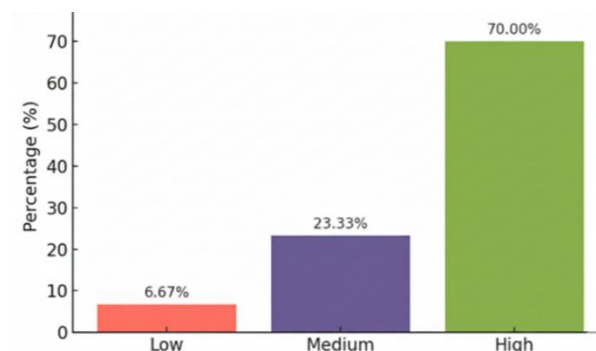
**Table 2.** Descriptive Statistics of Research Variables

Variable	Mean	SD	Min	Max	Dominant Category
Digital Literacy	78.45	8.21	55	95	high
Teacher Performance	81.32	3.56	58	96	high

The results show that the average digital literacy score was 78.45 (high category), and the average teacher performance score was 81.32 (high category). The relatively small SD values indicate limited variation between respondents.

**Table 3.** Digital Literacy Categories

Category	Score Range	Number of Teachers	Percentage (%)
Low	0–59	8	6.67
Medium	60–74	28	23.33
High	≥ 75	84	70.00



**Figure 1.** Distribution of Digital Literacy Categories

Table 3 and Figure 1 illustrate the distribution of digital literacy categories among the 120 respondents. The data indicate that the sample is generally competent, with a significant majority of teachers (70.00%) classified in the 'High' literacy category. While this finding is positive, the visualization underscores a persistent competency gap: 6.67% of teachers, primarily from the southern zone, remain in the 'Low' category, highlighting a specific group that requires targeted intervention.

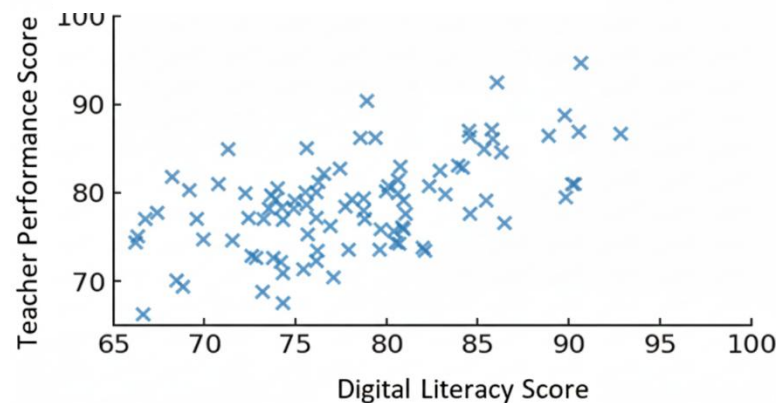
##### 3.2 Inferential Analysis

The effect of digital literacy on teacher performance was tested using simple linear regression. The test results are presented in Table 4.

**Table 4.** Simple Linear Regression Results

Variable	B	SE	Beta	t	Sig.
Constant	35.218	4.112	–	8.567	0.000
Digital Literacy	0.4076	0.047	0.4840	12.560	0.000

The positive regression coefficient ( $B = 0.407$ ) with  $p < 0.001$  indicates that digital literacy has a significant positive effect on teacher performance. The coefficient of determination ( $R^2$ ) value was 0.486, showing that 48.6% of the variation in teacher performance can be explained by digital literacy. To further assess the empirical value and practical significance of this finding, the effect size was calculated using Cohen's  $f^2$ . Based on the  $R^2$  value, the effect size  $f^2$  is 0.946  $\{f^2 = R^2 / (1 - R^2) = 0.486 / 0.514\}$ . According to Cohen's (1988) conventions (0.02 = small, 0.15 = medium, 0.35 = large effect), this value indicates a very large effect size. This demonstrates that digital literacy is not only a statistically significant predictor but also a substantially powerful factor in explaining teacher performance within this sample. To provide a visual representation of this positive linear relationship, a scatter plot of the data points and the fitted regression line is presented in Figure 2.

**Figure 2.** Relationship between Digital Literacy and Teacher Performance

The scatter plot visually confirms the positive trend, showing that as digital literacy scores (X-axis) increase, teacher performance scores (Y-axis) also tend to increase. The data points cluster around the upward-sloping regression line, illustrating the significant positive correlation and the relationship strength ( $R^2 = 0.486$ ) identified in the analysis.

## DISCUSSION

The primary finding of this study is that digital literacy significantly and positively influences the performance of junior high school teachers in Lebak Regency. The analysis revealed that digital literacy accounts for a substantial 48.6% of the variance in teacher performance ( $R^2 = 0.486$ ). Furthermore, as noted in the results, the calculated effect size (Cohen's  $f^2 = 0.946$ ) is exceptionally large. This moves beyond mere statistical significance to suggest that in this specific regional context, digital literacy is not merely an auxiliary skill but a

dominant predictor of teacher performance. This underscores the critical importance of digital competence for pedagogical effectiveness in the modern educational landscape.

This central finding aligns with a broad consensus in the literature. It is consistent with Ilomäki et al. (2016), who state that teachers' digital competence fosters creativity, innovation, and collaboration. It also supports recent research showing that digital literacy mediates the relationship between school culture and teacher performance (Rasdiana et al., 2024). The positive correlation can be explained by digital literacy's role in supporting teachers' core pedagogical and professional competencies (Permendikbud Nomor 16 Tahun 2007), enabling them to design adaptive, technology-based learning and utilize platforms such as Learning Management Systems (LMS). This aligns with Redecker's (2017) DigCompEdu framework, which emphasizes pedagogical abilities for meaningful learning. Supporting this, a study in Kazakhstan demonstrated that teacher training in digital literacy can significantly improve teaching effectiveness (Temirkhanova et al., 2024). Our findings also reinforce Hatlevik (2017), which demonstrates that teachers' digital competence positively influences their pedagogical use of ICT.

However, the magnitude of our effect size ( $f^2 = 0.946$ ) is notably high. For comparison, similar studies in educational contexts often report  $R^2$  values in the 0.25 - 0.40 range when linking a single competency to performance (Wang et al., 2023). This large effect may be amplified in a region like Lebak, which is characterized by a stark digital divide. Teachers who possess high digital literacy in such environments (e.g., by developing creative offline interactive media and limited mobile-based materials) likely create a significantly larger performance gap compared to their peers who remain in the 'Low' literacy category (6.67%). This latter group was predominantly found in the infrastructure-limited southern zone, a finding that resonates with Nugroho's (2021) research identifying limited infrastructure and training as major hindrances in disadvantaged regions. This also aligns with Getenet et al. (2024), who found that digital literacy and self-efficacy enhance student engagement.

The findings of this study offer several theoretical implications. First, this research reinforces existing digital literacy models, such as the three-dimensional model (technical, cognitive, social-emotional) proposed by Ng (2012) and Eshet-Alkalai (2012). Teachers with high scores in this study demonstrated strong abilities across all three dimensions, particularly in evaluating information credibility, adapting technology to teaching contexts, and practicing digital ethics. This is also supported by findings from Ma et al. (2022), who found that digital competence plays a significant mediating role in linking teachers' personal traits with their innovative performance. Second, and more significantly, this study extends these foundational frameworks. We argue that global frameworks like DigCompEdu (Redecker, 2017), while relevant, are insufficient on their own to explain the dynamics in regions with severe infrastructural disparities. The large effect size found in this study suggests that the impact of digital literacy on performance is not uniform. Instead, this relationship appears to



be moderated by local contextual factors, specifically infrastructure access. This highlights the need for a contextualized digital literacy model that explicitly incorporates infrastructure and geography as key variables, a dimension largely underexplored by existing theories that often assume a baseline of stable technological access.

The large effect size and the persistent competency gap identified among 6.67% of teachers yield critical policy implications. Local education policy must focus on continuously strengthening teachers' digital literacy. This study suggests a dual-intervention approach is necessary. First, the regional education office must address the infrastructure gap, particularly in the southern zone, to improve equitable school internet access. Second, interventions must move beyond generic training. Policymakers should facilitate needs-based training focused on adaptive pedagogy for low-resource environments, alongside facilitating teacher collaboration through communities of practice. This is supported by Landa et al. (2023), who found that leadership support significantly influences technology integration. Furthermore, as stressed by Fernández-Otoya et al. (2024), this requires long-term systemic support. Addressing readiness and resistance to change through structured, supportive interventions is essential for success (Yulin & Danso, 2025).

This study has several limitations. First, the use of purposive sampling, a non-probability technique, restricts the statistical generalizability of the descriptive findings to the entire population of 2,801 teachers in Lebak Regency, although the regression analysis remains valid for this sample. Second, the reliance on self-report questionnaires introduces a potential for social desirability bias, where respondents might have reported higher competence levels than their actual practice. Finally, while digital literacy was a dominant predictor ( $R^2 = 0.486$ ), 51.4% of the variance in teacher performance remains unexplained by this single-variable model. Future research should employ mixed-methods approaches, such as classroom observations, to validate self-reported skills. Additionally, future models should investigate other factors, such as school leadership, work motivation, or training access, as predictors or moderators of teacher performance.

#### **4. CONCLUSION**

This study concludes that digital literacy functions as a foundational competency, not merely an auxiliary skill, that significantly and positively predicts teacher performance in Lebak Regency. The findings confirm that fostering digital literacy is essential for enhancing pedagogical effectiveness in the modern educational landscape.

The conceptual implication is that professional development must evolve beyond basic technical training. It must strategically integrate digital pedagogy and ethical technology use as core components of teacher competency. Furthermore, the study underscores a critical policy implication: addressing digital disparities requires systemic intervention. Local governments and educational stakeholders must design adaptive strategies that combine

contextually relevant training with tangible improvements in equitable ICT infrastructure and school management support. This dual approach is essential for narrowing the competency gap between regions and ensuring all teachers are adequately prepared for the demands of the digital era.

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