DIGITAL LITERACY ON THE PEDAGOGICAL COMPETENCE OF ELEMENTARY SCHOOL TEACHERS

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ABSTRACT

This study aims to examine the influence of digital literacy on the pedagogical competence of elementary school teachers in Sayung District, Demak Regency. The research employed a quantitative, ex post facto design. The population consisted of elementary school teachers in Sayung District, with 177 teachers participating as respondents. Data were collected using a five-point Likert-scale questionnaire to measure digital literacy and pedagogical competence. The digital literacy instrument covered technical skills, cognitive abilities, and evaluation of digital information content, while the pedagogical competence instrument included understanding students' characteristics, curriculum development, instructional implementation, assessment and evaluation, and the utilization of learning technology. The instruments were tested for validity and reliability before data collection. Data were analyzed using descriptive statistics and simple linear regression after fulfilling the prerequisite assumptions. The results revealed a strong positive correlation between digital literacy and pedagogical competence ($r = 0.796$, $p < 0.05$). Regression analysis showed that digital literacy significantly influences pedagogical competence ($F = 303.194$, $p < 0.05$), with a coefficient of determination (R^2) of 0.634. This indicates that digital literacy accounts for 63.4% of teachers' pedagogical competence. The regression equation $Y = 64.631 + 1.070X$ demonstrates a positive relationship between the variables. These findings highlight the importance of strengthening teachers' digital literacy to enhance pedagogical competence in the context of educational digital transformation.

Keywords: digital literacy, pedagogical competence, educational technology

INTRODUCTION

Pedagogical competence is a core competence that distinguishes the teaching profession from other professions. This competence includes teachers' ability to manage students' learning, from understanding students' characteristics to designing instruction, implementing educational processes, and evaluating learning outcomes. Pedagogical competence is the foundation for ensuring the effectiveness of the learning process because it directly relates to the quality of interaction between teachers and students in the classroom.

According to Akbar (2021), pedagogical competence requires teachers to master students' characteristics across physical, social, emotional, and intellectual aspects, to understand learning theories, and to design and implement instruction aligned with students' needs. This means that pedagogical competence is not merely a technical teaching skill, but a complex and integrative professional ability. Teachers with high pedagogical competence can foster student-centered learning, adapt to curriculum changes, and respond to the dynamics of students' development.

Along with the development of digital technology, the dimension of pedagogical competence has also expanded. The Regulation of the Directorate General of Teachers and Education Personnel emphasizes that pedagogical competence includes the ability to design and implement student-centered learning and to utilize learning technology effectively. This shows that the use of technology is no longer an additional competence, but has become an integral part of teachers' pedagogical competence in the digital era.

In this context, digital literacy becomes an important prerequisite for teachers to optimize their pedagogical competence. Digital literacy is not only the ability to use

technological devices, but also the ability to understand, evaluate, and use digital information critically and responsibly. (Redhana, 2024) explains that digital literacy includes technical skills, information literacy, critical thinking, ethical use, adaptability, and innovation and creativity. Thus, digital literacy plays a foundational role in helping teachers develop innovative learning strategies that are relevant to contemporary developments.

In line with this, Musiin and Indrajit (2002)state that digital literacy includes the ability to search, evaluate, and use digital information effectively in academic contexts. Teachers with strong digital literacy will be better able to use various online learning resources, utilize digital learning platforms, and integrate interactive learning media into the learning process. This certainly improves the quality of instructional planning and implementation.

Empirically, several studies have shown that digital literacy influences pedagogical competence. (Sulistyarini & Fatonah, 2022) found that understanding digital literacy has a positive and significant effect on teachers' pedagogical competence. The study emphasizes that teachers who can understand and effectively use digital technology tend to have stronger pedagogical skills. Similar findings were reported by Satriani, D. A., Ahmad, D., & Halimah (2022), who showed that digital literacy significantly contributes to teachers' pedagogical competence.

These findings strengthen the assumption that digital literacy is a determining factor in improving pedagogical competence. However, some previous studies still examined digital literacy in general without analyzing specific dimensions in depth, such as technical skills, cognitive skills, and evaluation of information content. In fact, each of these dimensions has a different contribution to the quality of instructional management.

In addition, empirical studies that specifically examine the effect of digital literacy on the pedagogical competence of elementary school teachers in the Sayung District, Demak Regency, remain limited. The heterogeneous characteristics of the region, including technological access and teachers' readiness to integrate technology into learning, have the potential to influence levels of digital literacy and pedagogical implementation. This condition requires more contextual and field-based research.

Based on the description above, it can be concluded that digital literacy plays a strategic role in strengthening teachers' pedagogical competence. However, more specific empirical evidence in the local context is needed to determine the extent to which digital literacy influences the pedagogical competence of elementary school teachers. Therefore, this study aims to analyze the effect of digital literacy on the pedagogical competence of elementary school teachers in Sayung District, Demak Regency.

LITERATURE REVIEW

a. Teachers' Pedagogical Competence

Pedagogical competence is an essential ability that teachers must possess in managing student learning. Based on Government Regulation Number 19 of 2017, pedagogical competence includes the ability to understand students' characteristics, develop curriculum or syllabi, design and implement instruction, utilize learning technology, and evaluate learning outcomes. This competence serves as an indicator of teachers' professionalism in carrying out their duties as learning agents.

Law Number 14 of 2005 concerning Teachers and Lecturers also emphasizes that pedagogical competence is the ability to manage student learning, which reflects the integration of knowledge, attitudes, and skills in educational practice. Thus, pedagogical competence is not only oriented toward the technical aspects of instruction, but also toward reflective and adaptive abilities in responding to students' needs. (Akbar, 2021) emphasizes that pedagogical competence distinguishes the teaching profession from other professions because it requires mastery of learning theories, a deep understanding of students'

characteristics, and the ability to implement effective instructional strategies. In the context of 21st-century education, pedagogical competence also includes the ability to utilize information and communication technology as part of instructional innovation.

In this study, pedagogical competence is measured through several main dimensions, namely: (1) understanding students' characteristics, (2) curriculum or syllabus development, (3) implementation of educational instruction, (4) assessment and evaluation of learning outcomes, and (5) utilization of learning technology. These dimensions serve as operational indicators in measuring the level of pedagogical competence of elementary school teachers.

b. Teachers' Digital Literacy

Digital literacy is an individual's ability to understand, utilize, and implement digital technology effectively and responsibly. In the educational context, teachers' digital literacy plays an important role in supporting technology-based learning processes. (Fitrianti & Safwan, 2025) explains that digital literacy is not merely the ability to use technological devices, but also includes a deep understanding of the scope of technology and its appropriate application in various contexts. (Redhana, 2024) elaborates that digital literacy comprises several main components, including technical skills, information literacy, critical thinking and problem-solving, ethical and responsible use, adaptability, and innovation and creativity. Technical skills serve as the initial foundation in mastering digital devices, while the cognitive and critical dimensions enable teachers to evaluate and manage information selectively.

In line with this, Musiin and Indrajit (2002) argue that digital literacy includes the ability to search for, evaluate, and use digital information effectively for academic purposes. Digital literacy also requires the ability to verify information and distinguish between appearance and substance in digital content.

In this study, digital literacy is measured through three main dimensions, namely: (1) technical skills in using ICT devices and digital services, (2) cognitive abilities in acquiring new knowledge and solving digital problems, and (3) the ability to evaluate digital information content. These three dimensions are used to measure the digital literacy of elementary school teachers comprehensively.

c. The Relationship between Digital Literacy and Pedagogical Competence

Digital literacy plays a strategic role in strengthening teachers' pedagogical competence. The ability to access, evaluate, and use digital technology enables teachers to design learning experiences that are more interactive, innovative, and student-centered. The use of technology in learning is also part of the pedagogical competence indicators as regulated in educational policies.

Previous research has shown a positive relationship between digital literacy and pedagogical competence. (Sulistyarini & Fatonah, 2022) found that understanding of digital literacy significantly influences teachers' pedagogical competence. Similarly, Satriani, D. A., Ahmad, D., & Halimah (2022) proved that digital literacy significantly contributes to improving teachers' pedagogical competence.

Conceptually, the higher the level of teachers' digital literacy, the greater their ability to design digital learning media, integrate technology into instructional strategies, and conduct digital-based assessments. This directly impacts the improvement of the quality of instructional management.

METHODOLOGY

This study used a quantitative, ex post facto design to examine the effect of digital literacy on teachers' pedagogical competence. The research was conducted in elementary schools in Sayung District, Demak Regency, in 2025. The research population consisted of all elementary school teachers in Sayung District, and the sample was determined using the

sampling technique specified in the research design. Data were collected using a five-point Likert scale questionnaire.

The digital literacy instrument was developed based on the dimensions of technical skills, cognitive abilities, and evaluation of digital information content. The pedagogical competence instrument included indicators of understanding students' characteristics, curriculum development, instructional implementation, evaluation of learning outcomes, and the utilization of learning technology. The instruments were tested for validity and reliability before being used. Data were analyzed using descriptive statistics and simple linear regression at the 0.05 significance level after fulfilling the prerequisite tests.

RESULT AND DISCUSSION

Descriptive Analysis

Digital literacy data were obtained from 177 elementary school teachers in Sayung District, Demak Regency. The analysis results showed a minimum score of 93 and a maximum score of 155, with a mean of 130.33 and a standard deviation of 13.125. Based on the frequency distribution, most respondents were in the fairly good (35.6%) and good (31.1%) categories, while 19.8% were in the very good category. This indicates that teachers' digital literacy falls within the fairly good-to-good category.

Meanwhile, teachers' pedagogical competence ranged from 149 to 240, with a mean of 204.12 and a standard deviation of 17.642. The frequency distribution showed that the majority of respondents were in the fairly good (37.3%) and good (31.1%) categories, while 20.9% were in the very good category. In general, teachers' pedagogical competence was in the good category.

1. Prerequisite Tests for Analysis

Table 1. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		177
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	10.15702189
Most Extreme Differences	Absolute	.056
	Positive	.051
	Negative	-.056
Test Statistic		.056
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

The normality of the residuals was assessed using the One-Sample Kolmogorov-Smirnov test. The test results showed an Asymp. Sig (2-tailed) value of 0.200 (>0.05). This indicates that the residual data are normally distributed, so the normality assumption in regression analysis is fulfilled.

Table 2. Linearity Test

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Kemampuan Pedagogik * Literasi Digital	Between Groups	(Combined)	43419.806	47	923.826	10.490	.000
		Linearity	34733.030	1	34733.030	394.391	.000
		Deviation from Linearity	8686.776	46	188.843	2.144	.000
	Within Groups		11360.703	129	88.067		
	Total		54780.508	176			
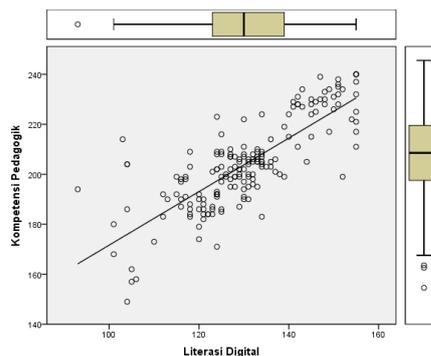
The linearity test was conducted to determine whether the relationship between digital literacy and pedagogical competence was linear. The test results showed a significance value for Deviation from Linearity of 0.000. Although this value is <0.05, the scatter plot results showed that the data distribution consistently followed the regression line and did not exhibit an extreme curvilinear pattern. Thus, the relationship between the two variables remains linear, and the regression model is appropriate.

Table 3. Heteroscedasticity Test

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	14.815	5.472		2.707	.007
	Kepemimpinan Transformasional	.045	.064	.086	.705	.482
	Literasi Digital	-.101	.060	-.203	-1.671	.096

a. Dependent Variable: Abs_RES

The heteroscedasticity test was conducted to ensure that the variance of the residuals was not unequal across groups. The test results showed a significance value of 0.096 (>0.05). This means that the regression model does not exhibit heteroscedasticity and satisfies the homoscedasticity assumption.

2. Hypothesis Testing

Table 4. Correlation Test

Correlations

		Literasi Digital	Kompetensi Pedagogik
Literasi Digital	Pearson Correlation	1	.796**
	Sig. (2-tailed)		.000
	N	177	177
Kompetensi Pedagogik	Pearson Correlation	.796**	1
	Sig. (2-tailed)	.000	
	N	177	177

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation test results showed a Pearson correlation coefficient of 0.796, with a significance level of 0.000. This value falls into the strong category, indicating a strong relationship between digital literacy and teachers' pedagogical competence.

Table 5. Linear Regression Test

ANOVAᵃ

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	34733.030	1	34733.030	303.194	.000ᵇ
	Residual	20047.479	175	114.557		
	Total	54780.508	176			

a. Dependent Variable: Kompetensi Pedagogik
b. Predictors: (Constant), Literasi Digital

The simple linear regression test results showed an F value of 303.194 with a significance of 0.000 (<0.05), so the hypothesis is accepted. Thus, digital literacy significantly affects the pedagogical competence of elementary school teachers in Sayung District, Demak Regency.

Table 6. R Test

Model Summary

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.796ᵃ	.634	.632	10.703

a. Predictors: (Constant), Literasi Digital

The coefficient of determination (R^2) was 0.634, indicating that digital literacy accounts for 63.4% of the variance in teachers' pedagogical competence, while 36.6% is attributable to other factors outside this study.

The regression equation obtained was:

Y = 64.631 + 1.070X

The regression coefficient is positive (1.070), indicating that each increase in digital literacy is associated with an increase in teachers' pedagogical competence.

Discussion

The results of this study show that digital literacy has a positive and significant effect on the pedagogical competence of elementary school teachers in Sayung District, Demak Regency. This finding indicates that the higher the teachers' ability to understand and utilize digital technology, the higher their pedagogical competence in managing learning. Theoretically, digital literacy is not only understood as the technical ability to use technological devices, but also as the cognitive ability to obtain, evaluate, and use digital information effectively. (Redhana, 2024) emphasizes that digital literacy includes technical skills, information literacy, critical thinking, and the ethical and responsible use of technology. With these dimensions, teachers with strong digital literacy will be better able to design technology-based learning, select relevant digital learning resources, and integrate learning media innovatively.

On the other hand, pedagogical competence includes the ability to understand students' characteristics, develop curricula, implement instruction, evaluate learning outcomes, and utilize learning technologies. This means that the use of technology is an inherent part of pedagogical competence indicators. This conceptually explains why digital literacy significantly contributes to pedagogical competence. The findings of this study are also consistent with previous research stating that digital literacy influences teachers' pedagogical competence. Teachers with good levels of digital literacy tend to be more adaptive to changes in learning systems, especially in the context of digital transformation in education.

The contribution of digital literacy, at 63.4%, to pedagogical competence indicates

that this variable plays a dominant role in improving the quality of instructional management. However, 36.6% of other factors influencing pedagogical competence may include teaching experience, professional training, and school environmental factors. This indicates that improving pedagogical competence requires a comprehensive approach, although strengthening digital literacy remains a highly relevant strategy.

CONCLUSION

The results of this study show that digital literacy has a positive and significant effect on the pedagogical competence of elementary school teachers in Sayung District, Demak Regency. The contribution of digital literacy to pedagogical competence reaches 63.4%, indicating that improving teachers' ability to access, manage, and utilize digital technology directly has implications for improving the quality of instructional management. Thus, the hypothesis that digital literacy affects teachers' pedagogical competence is accepted.

Based on these findings, strengthening teachers' digital literacy needs to become a priority in efforts to improve pedagogical competence, whether through training, workshops, or mentoring in technology-based learning. In addition, future research is recommended to examine other factors that influence pedagogical competence in order to obtain a more comprehensive understanding.

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