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Digital Literacy, Proactive Personality, Pedagogical Competence, and Instructional Quality among Teachers in Indonesia

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Abstract: This study seeks to evaluate the impact of pedagogic competence on the relationship between digital literacy, proactive personality, and the quality of instructional delivery by teachers. The sample comprises 575 educators from Jakarta, West Java, and Banten in Indonesia. The data was gathered by a questionnaire employing a Likert Scale. The investigation employs Partial Least Squares-based Structural Equation Modeling. The study findings indicate that digital literacy, proactive personality, and pedagogical competence influence instructional quality; furthermore, digital literacy and proactive personality significantly impact teachers' pedagogical competence. This study established a contextual validation of the influence of digital literacy and proactive personality on teachers' instructional quality, mediated by pedagogical competence in the Indonesian context. It substantially contributes to the theoretical study of management, technology, and educational psychology and offers practical applications for educational implementation, particularly in improving the teachers' instructional quality by promoting digital literacy and a proactive personality through the mediation of pedagogical competence. Therefore, this model warrants critical, in-depth discussion among researchers and practitioners before it is used as a reference, adapted, adopted, or modified to support their future work.

Keywords: Digital Literacy, Proactive Personality, Instructional Quality, Pedagogic Competence.

1. Introduction

In the digital era, education is undergoing significant changes to meet the needs of a society increasingly dependent on technology (Milenkova *et al.,* 2022). Instructional quality is a key indicator of educational success, demonstrating the effectiveness of the teaching process, the achievement of learning goals, and the willingness of students to participate in a vibrant learning environment (Baghdadi, 2021). The quality of education relies not solely on conventional teaching methods but also on instructors' capacity to incorporate technology and adjust to the evolving educational landscape (Huda *et al.,* 2019). However, the common phenomenon that occurs is the decline in the quality of education due to the inability of teachers to use technology effectively, the lack of alignment between teaching strategies and student needs, and the lack of teacher initiative in implementing innovative teaching methods (Campoverde López & López López, 2022). This phenomenon is characterized by a lack of student enthusiasm for learning, awkward interactions, and less-than-ideal learning outcomes, especially in educational institutions that have not fully adapted to digital transformation (Aljanazrah *et al.,* 2022). Communication patterns have been significantly affected by the development of information technology, especially among the digital community. The progression of communication devices and applications in the digital age poses problems for individuals in successfully leveraging technology to simplify daily tasks (Arafah, 2023). Literacy is a key ability required in the contemporary society. Proficient literacy abilities enable individuals to resolve issues or identify prudent alternatives. A literate person is a critical thinker who uses knowledge to analyze, integrate, and apply important information to themselves or others (Apuke, 2023). However, the literacy level in Indonesia is still very low. Lack of literacy skills increases vulnerability to hoaxes and weakens critical thinking (Juma *et al.,* 2025).

Instructional quality is influenced by several factors, including digital literacy (Damanik & Widodo, 2024; Purwati & Sukiman, 2024; Herawan *et al.*, 2023), proactive personality (Chen *et al.,* 2021), and pedagogic competence (König *et al.,* 2021; Amaliah *et al.*, 2024). Digital literacy, which underscores the capacity to access, assess, produce, and convey information through digital technology, is crucial for the advancement of creative educational approaches that meet the demands of the digital era (Reddy *et al.,* 2020). Research shows that teachers proficient in digital literacy can create a more interactive learning environment and support student growth in the 21st century (Hassan & Akbar, 2020). On the contrary, proactivity, which is characterized by initiative, the ability to anticipate problems, and a focus on change, also contributes to improving the quality of education through creative and adaptable teaching methods (Kondrashova *et al.,* 2020). Proactive teachers are more responsive to student needs and can develop innovative teaching strategies (Ravi, 2022). In addition, pedagogic competence, including the ability to plan, implement, and assess the teaching process, is crucial in ensuring the best teaching quality (Purnama *et al.*, 2021). Pedagogic competence allows teachers to integrate content, technology, and teaching methods effectively, thereby improving student learning outcomes (Sholikhun *et al.,* 2022; Fatmawada *et al.*, 2020).

In addition to directly influencing instructional quality, pedagogic competencies are also influenced by digital literacy (Sharma & Sharma, 2022) and proactive personality (Chai *et al.,* 2023). Digital literacy improves pedagogic competence by allowing teachers to use technology to support contextual and engaging learning (Torrato *et al.,* 2023; Bećirović, 2023). A teacher with a high level of digital literacy can integrate many technological tools, including interactive media, educational apps, and innovative learning platforms, to enhance the learning experience (Vaskov *et al.,* 2021). In addition, proactivity can also improve pedagogic competence by allowing teachers to actively seek solutions to problems in the classroom, such as developing new teaching methods or adapting lesson plans to students' needs (Ahmed *et al.,* 2019). Proactive teachers pay more attention to students' learning and professional development, improving their pedagogical skills (Chen *et al.,* 2021; Manzano *et al.,* 2023).

Several previous studies have demonstrated the unique position of pedagogic competence among digital literacy, proactive personality, and instructional quality. It is not only a predictor but also a consequence. Under these conditions, pedagogical competence can act as a mediator variable in transmitting digital literacy and proactive personality into instructional quality. However, other research findings have challenged the relationship between these variables. For example, digital literacy does not significantly affect instructional quality (Sangaji & Pribadi, 2023; Muntu *et al.,* 2023). In addition, Hernández Cruz (2023) proves that in some contexts, instructional quality affects digital literacy, contrary to the assumption that digital literacy always supports instructional quality. It creates a research gap that requires further scientific clarification. Given this urgency, this study aims to test the influence of digital literacy and proactive personality on instructional quality through pedagogic competence.

2. Literature Review and Hypothesis Development

2.1 Digital Literacy and Instructional Quality

The quality of instruction is empirically influenced by digital literacy, including students' capacity to proficiently utilize technology for the acquisition, evaluation, and application of information (Sangaji & Personal, 2023). Digital literacy has been significantly proven to impact high instructional quality positively (Ervianti *et al.,* 2023; Prabandari *et al.,* 2024; Qulub & Budiyono, 2022). Digital literacy is crucial for equipping individuals to confront emerging technology issues, particularly in the realms of education and information security. (Murtadho *et al.,* 2023). In addition, digital literacy is essential for students, especially given the rapid transformation of the digital environment, which may result in two opposing viewpoints of the progression of digital literacy (Rahman et al., 2020) and fostering citizenship in the digital realm, encompassing the capacity to use, comprehend, and engage with digital technology proficiently (Marín & Castañeda, 2022). Digital literacy is the ability to understand and use information in various formats from various sources available on digital devices (Baro *et al.*, 2019; Okeji *et al.,* 2020; Junaidi *et al.,* 2023; Solmaz *et al.,* 2023). Zan *et al.* (2021) and Venkatesan (2023) define it as the awareness, attitude, and ability to use digital tools and resources, to carefully assess information using digital technology, to reflect critically on it, to construct new knowledge, to create content, and to disseminate it effectively and appropriately. Thus, digital literacy reflects the understanding, awareness, attitude, and ability to use various digital devices to access the information available on them, process and analyze it critically to discover new knowledge or content, and disseminate it appropriately and effectively.

Mars (2018) identified three indicators of digital literacy: digital competencies (where various skills are acquired), digital utilization (where these competencies are employed in practical contexts), and ultimately digital transformation (where the application of skills fosters innovation and creativity). If digital literacy with various existing indicators can be properly conditioned, it will have implications for improving instructional quality. This means that when the ability and understanding of the community in using digital technology (digital literacy) can be mastered and managed properly, it will positively impact the instructional process and quality. In summary, proficient digital literacy enhances the learning process, rendering it more productive, innovative, and of higher quality, since both students and instructors can utilize digital technology optimally in educational activities (Tang & Chaw, 2016).

Instructional quality is a practical and meaningful educational experience that aligns with set goals, stimulates problem-solving skills, values individual differences, and fosters an environment that supports intellectual and moral growth, ultimately contributing to students' personal and academic development (Mayarisa, 2024). Fauzi *et al.* (2024) assert that instructional quality encompasses a holistic array of classroom interactions influencing student learning, which includes instructor competence, teaching efficacy, and diverse grade-level elements such as perception, attitude, and understanding of academic integrity. The primary components of instructional excellence comprise two elements, specifically: (1) alignment with objectives: a quality learning experience must correspond with the established educational objectives, ensuring that all activities facilitate the attainment of those objectives; and (2) individualized learning: recognizing and accommodating diverse learning styles and needs is essential to improve instructional quality, as well as encourage personalized educational experiences (Mayarisa, 2024). Meanwhile, Fauzi *et al.* (2024) mention the aspect of classroom interaction, where instructional quality is shaped by the dynamics between teachers and students, including the effectiveness of teaching and classroom management. These aspects can be influenced by digital literacy. The initial hypothesis can be articulated as follows:

H_1: Digital literacy directly affects instructional quality.

2.2. Proactive Personality and Instructional Qualities

Instructional quality are correlated with a proactive personality. Chen *et al.* (2021) illustrate that a proactive personality significantly predicts instructional quality. Proactive personalities typically assume initiative and accountability for their learning process (Chai *et al.*, 2022). This mindset fosters ongoing development and the ability to surmount challenges, hence enhancing the efficacy and significance of the learning process (Okolie *et al.*, 2021). Proactive personality is an individual's tendency to take initiative, anticipate obstacles, and actively adapt to and influence their surroundings (Chen *et al.*, 2021; Mikhalchi, 2022; Zimmermann *et al.*, 2024). When an individual is proactive, they take the initiative to solve problems, overcome obstacles, and change situations, including being future-oriented and questioning the status quo to improve themselves or build a more conducive environment (Obeidat & Al-Rabee, 2025). According to Chai *et al.* (2022), proactive personality is associated with a tendency to be active, goal-oriented, and independent in the face of external obstacles. These conditions can lead to increased personal and professional development (Zimmermann *et al.*, 2024). Din *et al.* (2023) identified several dimensions of proactive personality, including initiative, results-oriented, and adaptability, all of which have the potential to influence the quality of learning. Thus, proactive personality reflects an individual's tendency to consistently take the initiative to solve problems, overcome obstacles, and anticipate future challenges. In relatively stable, solid, and permanent conditions, this tendency can enhance the teachers' instructional quality. Therefore, the second hypothesis can be expressed as follows:

H_2: Proactive personality directly affects instructional qualities.

2.3 Pedagogic Competence and Instructional Quality

Instructional quality can also be influenced by pedagogic competence. The study of König *et al.* (2021) and Amaliah *et al.* (2024) conclusively proves that pedagogic competence is an important predictor of instructional quality. Peláez Henao *et al.* (2020) also claim that the pedagogic competence possessed by teachers greatly influences the improvement of instructional quality. In practice, pedagogic competence is one of the important aspects that every educator must possess to support the success of the learning process. Pedagogic competence is essential because it allows teachers to plan, implement, and evaluate learning effectively, improving student learning

outcomes (Prasetyo *et al.,* 2022). Robust pedagogical competence is a crucial basis for teachers to improve the quality of learning (Mekarsari *et al.,* 2025). In addition, with this competence, teachers can create a learning environment that is inclusive and responsive to student needs (Fihol, 2022).

Pedagogic competence refers to teachers' capacity to develop and implement effective learning processes, understand student characteristics, use a variety of appropriate teaching approaches, evaluate student learning outcomes, and make continuous improvements in the teaching process (Hernández-Gamboa *et al.,* 2019; Sonawalkar & Maheshkar, 2021; Milania & Murniati, 2022; Purnama *et al.,* 2021). Teachers' pedagogical competence encompasses their proficiency in comprehensive and innovative learning methodologies, as well as their potential to contribute to learning development through formative strategies (Apostolache, 2023). As a holistic system encompassing scientific knowledge, intellectual and practical skills, abilities, and personal attributes, pedagogical competence can foster teachers' self-actualization, self-preservation, and self-development, and facilitate improved performance in the educational process (Voloshyn *et al.,* 2022; Apostolache, 2023). Thus, pedagogic competence is the capacity or skill of teachers to develop and implement learning processes in a comprehensive, innovative, and effective manner, to understand student characteristics, to use a variety of appropriate teaching approaches, to conduct learning evaluations, and to make continuous improvements.

The dimension of pedagogic competence encompasses several components, specifically: (a) the design and planning of the didactic process, which involves the formulation of coherent and integrated annual plans regarding educational knowledge, didactic projects, and the planning of learning activities in laboratories, workshops, and non-formal settings, among others; (b) Advising and guiding students: assisting them with academic and personal issues, providing counsel for educational and career orientation, settling conflicts, and mentoring fellow professionals in pedagogy. (c) Implementation of the learning process: designing educational tasks, organizing them into categories, formulating assignments, conducting laboratory applications, among others; (d) Assessment of student outcomes: development of evaluation instruments, scheduling assessments, supervising students during assessment tasks, recording grades, and providing concrete, specific feedback, etc.; (e) Management of trainee groups: establishing and upholding school discipline, overseeing material time and resources, fostering relationships for developmental goals at the group level, among other responsibilities; (f) Communication and interaction: vertical communication (with superiors or students) or horizontal communication (with colleagues), management of practical paraverbal and nonverbal communication elements to ensure accurate and comprehensive understanding of the conveyed information; collaboration with all stakeholders in the educational process to address various challenges related to the student's academic journey; and (g) professional development: willingness to engage in training programs (didactic, methodological, scientific), attend conferences and workshops, and compile scholarly articles that assist educators in staying abreast of advancements in these domains (Sulaiman & Ismail, 2020). When a number of these dimensions are in excellent, adequate, and stable condition, there is potential to improve teachers' instructional quality, as reflected in a learning experience that is meaningful, fun, and capable of optimally developing students' potential (Ali & Masih, 2021). The quality learning it self is the implementation of innovative techniques and resources that align with student needs, fostering their creativity and engagement in the learning process (Klimska & Rutkowski, 2022). Consequently, the third hypothesis can be articulated as follows:

H_3: Pedagogic competence directly affects instructional quality.

2.4 Digital Literacy and Pedagogic Competence

Pedagogical competency affects instructional quality and is concurrently shaped by digital literacy. In the digital age, digital literacy has emerged as an essential element of teachers' pedagogical competency. (Yamin, 2018). The study of Tondeur *et al.* (2019) also showed that teachers with high digital literacy tend to design inquiry-based learning, which encourages students' critical thinking. In addition, high digital literacy can also increase the effectiveness of the teaching and learning process by integrating appropriate and innovative technologies (Potasheva *et al.*, 2019; Muntu *et al.,* 2023).

Pedagogic competencies strengthened by digital literacy contribute to the personalization of learning (Sailer *et al.,* 2023). Teachers can conduct learning analysis through digital literacy to monitor student development and provide appropriate interventions (Ifenthaler & Yau, 2023). Research by Cabi (2022) also revealed that using digital

platforms such as *learning management systems* can improve the efficiency of classroom management, even though its effectiveness depends on teachers' readiness to master technological features (Howard *et al.,* 2021). Digital literacy is the modern capability to navigate an information society, encompassing skills such as digital survival, digital security, digital innovation, and practical competencies (Chen, 2024). Digital literacy skills are now a fundamental skill that educators must possess in the era of digital transformation (Monteiro & Leite, 2021). Thus, increasing digital literacy is technical and transformative to pedagogic practices (Engen, 2023). Consequently, the fourth hypothesis may be articulated as follows:

H_4: Digital literacy directly affects pedagogic competence.

2.5 Proactive Personality and Pedagogic Competence

A proactive personality also influences pedagogic competence. Research results in some countries reveal that a proactive personality, characterized by initiative, responsibility, and the ability to anticipate change, plays an important role in improving teachers' pedagogic competence, especially in the face of the challenges of modern educational dynamics (Wu *et al.,* 2018; Parker *et al.,* 2019). Additional research indicates that educators with proactive personalitys are more likely to devise innovative teaching tactics that address students' needs, including the creation of demanding and contextually relevant learning activities (Kong & Li, 2018; Li *et al.,* 2017) and better able to identify students' learning needs and design appropriate interventions (Bakker *et al.,* 2022). Longitudinal research revealed that proactive teachers showed significant improvements in classroom management skills and the use of educational technology (Alasmari & Althaqafi, 2024; Gitelman *et al.,* 2023). Thus, a proactive personality encourages pedagogic innovation and strengthens teachers' resilience in the face of work pressure (Zhu & Li, 2021; Dewi *et al.,* 2023). Badjie & Velankar's (2023) study also reported that teachers with proactive traits were more likely to adopt problem-based learning approaches that improved student engagement, understanding, and academic outcomes. In addition, proactive teachers often utilize self-reflection to improve their teaching practices continuously, an important aspect of continuous professional development (Juma, 2024). In this context, proactive personality is a behavioral tendency to take advantage of opportunities and change one's environment, emphasizing initiative and one's own behavior in various contexts, especially in organizational and career environments (Sari & Wahjoedi, 2022). Pedagogic competencies supported by proactive personalities allow teachers to create innovative and collaborative learning environments (Pangestu *et al.*, 2024). Consequently, the fifth hypothesis may be articulated as follows:

H_5: Proactive personality directly affects pedagogic competence.

2.6 The Role of Pedagogic Competency Mediation

Previous research findings demonstrate the strategic role of pedagogic competence as a mediator in the relationship between digital literacy, proactive personality, and instructional quality. On the one hand, digital literacy and proactive personality affect pedagogic competence, while on the other hand, pedagogic competence affects instructional quality. The study of Potasheva *et al.* (2019) and Muntu *et al.* (2023) shows that high digital literacy can improve the effectiveness of the teaching and learning process by integrating appropriate and innovative technologies. Then, another study revealed that proactive personality improves teachers' pedagogic competence (Parker *et al.*, 2019). Teachers with proactive personalities tend to be more innovative in designing teaching strategies and interventions that suit students' needs, such as developing challenging and contextual learning activities (Kong & Li, 2018; Li *et al.,* 2017; Bakker *et al.,* 2022). Longitudinal studies also show that proactive teachers have good classroom management skills and use of educational technology (Alasmari & Althaqafi, 2024; Gitelman *et al.,* 2023). The two study groups indicate the role of pedagogic competence in mediating the influence of digital literacy and proactive personality on instructional quality, so that two hypotheses can be promoted as follows:

H_6: Digital literacy indirectly affects instructional quality through pedagogic competence.

H_7: Proactive personality indirectly influences instructional quality through pedagogic competence.

3. Research Methods

3.1 Approach and Method

This study utilizes a quantitative approach through a survey method. This strategy emphasizes research involving both large and small populations, utilizing meticulously chosen samples to ascertain the relative prevalence, distribution, and association among variables (Widodo, 2021). In this study, the variables include digital literacy and proactive personality as exogenous variables (independent) as well as pedagogic competence and instructional quality as endogenous (dependent) variables. In the context of this research, pedagogic competence also acts as a mediator, transmitting the potential of digital literacy and proactive personality into teacher instructional quality. Thus, pedagogic competence plays a dual role as both an exogenous and a mediator.

3.2 Population and Sample

The study's population comprises educators from elementary, junior high, and high schools in Indonesia, distributed among the provinces of Banten, Jakarta and West Java. The sample comprises 575 teachers selected through accidental sampling, depending on their voluntary willingness to complete surveys during the study (Widodo, 2021). As indicated in Table 1, the majority are in DKI Jakarta Province (43%), teaching at the junior high school education level (44%), female (71%), aged 26-35 years (32%), last education Bachelor (85%), married (71%), and teaching experience 6-10 years (43%).

Table 1. Participants Profile

Characteristics	Frequency	Percentage (%)
Province		
Jakarta	245	43%
West Java	172	30%
Banten	158	27%
Education Level		
Elementary School	130	23%
Junior High School	255	44%
Senior High School	190	33%
Gender		
Man	165	29%
Woman	410	71%
Age		
≤ 25 Years	98	17%
26 – 35 Years	186	32%
36 – 45 Years	170	30%
46 – 55 Years	88	15%
> 55 years old	33	6%
Education		
Diploma	22	4%
Bachelor (S1)	491	85%
Master (S2)	55	10%
Doctor (S3)	7	1%
Status		
Married	410	71%
Unmarried	165	29%
Teaching experience		
≤ 5 years	135	23%
6 – 10 years	245	43%
11 – 15 years old	65	11%
> 15 years old	130	23%

3.3 Data Collection

The research data collection utilized a Likert scale questionnaire featuring five response options: strongly disagree, disagree, neutral, agree, and highly agree. The researcher himself compiled the questionnaire with reference to indicators from experts. The questionnaire is designed in Google Form format and is distributed through email and WhatsApp applications. Digital literacy variables consist of indicators of digital use, digital competence, and digital transformation (Marsh, 2018); proactive personality includes: exhibit a propensity to see opportunities, demonstrate initiative, take decisive action, and persist until achieving resolution through effecting change (Trifiletti *et al.,* 2009); pedagogic competencies consist of indicators of managing classes, identify student characteristics, encourage students to participate actively, communicatively in explaining subject matter, develop student potential, and carry out humanist actions (Kirchgasler, 2018; Ibragimovich, *et al.,* 2021); and instructional quality encompassing classroom management, student support, and cognitive engagement (Praetorius *et al.,* 2018; Damanik & Widodo, 2024). Each questionnaire consists of 12 items. Prior to its application in research, the questionnaire was administered to 30 participants to evaluate its validity and reliability. The validity assessment employs Pearson's Product-Moment formula, whereas the reliability evaluation utilizes the Cronbach's Alpha formula. For the digital literacy variable, the correlation coefficient (CC) value was obtained between 0.594 – 0.858 and the Cronbach Alpha coefficient (CA) = 0.899; proactive personality with a CC between 0.538 – 0.851 and a CA = 0.879; pedagogic competence with CC between 0.505 – 0.833 and CA = 0.867; and Instructional quality with CC between 0.507 – 0.768 and CA = 0.856. All items have a CC > 0.361 and a CA > 0.7, so all questionnaires are valid and reliable (Widodo, 2021).

3.4 Data Analysis Techniques

The data analysis employs Structural Equation Modeling with Partial Least Squares (SEM-PLS), supplemented with descriptive and correlational statistical analysis. SEM-PLS analysis is used to test hypotheses and model suitability, while descriptive and correlational analyses describe variable conditions and relationships between variables. SEM-PLS uses the SmartPLS 4.0 application, descriptive and correlational analyses utilize SPSS program version 26.

4. Results

4.1 Descriptive and Correlation Analysis

As shown in Table 2, the descriptive statistical analysis of the four research variables revealed that the standard deviation (SD), which ranged from 4.661 to 7.788, was lower than the mean value, which ranged from 47.86 to 55.24. Consequently, the data overall is dependable and indicative. At a significance level of $p < 0.01$, the correlation analysis revealed a significant link between the variables. The correlation coefficient obtained was below 0.8, indicating an absence of multicollinearity symptoms (Widodo *et al.,* 2023).

Table 2. Descriptive and Correlation Analysis Results

Variables	Mean	SD	1	2	3	4
1. Digital literacy (X_1)	47.86	7.788	1.00			
2. Proactive personality (X_2)	48.63	7.223	0.638**	1.00		
3. Pedagogy competence (Y_1)	55.24	4.661	0.397**	0.483**	1.00	
4. Instructional quality (Y2)	51.65	6.286	0.544**	0.615**	0.652**	1.00

** $p < 0.01$

4.2 Measurement Model

The indicators' validity and reliability were evaluated by the outer model measurement test. The measuring model with indicators demonstrates convergent validity through the correlation between the indicator score and the construct. The loading factor, Cronbach Alpha (CA), and Composite Reliability (RA) should above 0.7, while the Average Variance Extracted (AVE) must surpass 0.5 (Hair *et al.,* 2022). As displayed in Table 3, overall, the loading factor value of each item for all variables (digital literacy, proactive personality, pedagogic competence, and

instructional quality) qualified for convergent validity because it was greater than 0.5 with a range of 0.605-0.913. All variables with CA and CR values > 0.7, with a range of CA 0.806 – 0.923 and CR 0.811 – 0.930, and AVE values > 0.5, with a range of 0.690 – 0.761. Thus, the convergent validity is shown to be met by all latent variables in the estimation model (Hair *et al.,* 2022; Widodo *et al.,* 2024).

Table 3. Result of the measurement model

Variables	Indicators	Factor Loading	CA	CR	AVE
Digital literacy (X_1)	a. Digital use ($X_{.1.1}$)	0.765	0.843	0.845	0.761
		0.775			
		0.725			
		0.696			
	b. Digital competencies ($X_{.1.2}$)	0.769			
		0.774			
		0.857			
		0.853			
	c. Digital transformation ($X_{.1.3}$)	0.794			
		0.788			
		0.799			
		0.633			
Proactive personality (X_2)	a. Tend to look for opportunities ($X_{2.1}$)	0.812	0.850	0.853	0.69
		0.861			
		0.817			
	b. Showing initiative ($X_{2.2}$)	0.755			
		0.826			
		0.821			
	c. Take action ($X_{2.3}$)	0.764			
		0.793			
		0.687			
	d. Survive to achieve the goal by bringing about change ($X_{2.4}$)	0.7			
		0.837			
		0.766			
Pedagogic competence (Y_1)	a. Managing classes ($Y_{1.1}$)	0.906	0.923	0.93	0.724
		0.913			
	b. Identifying student characteristics ($Y_{1.2}$)	0.874			
		0.88			
	c. Encourage students to participate actively ($Y_{1.3}$)	0.908			
		0.9			
	d. Communicative in explaining the subject matter ($Y_{1.4}$)	0.907			
		0.92			
	e. Developing students' potential ($Y_{1.5}$)	0.901			
		0.906			
	f. Performing humanist actions ($Y_{1.6}$)	0.888			
		0.868			
Instructional quality (Y_2)	a. Class management ($Y_{2.1}$)	0.794	0.806	0.811	0.721
		0.816			
		0.821			
		0.689			
	b. Student support ($Y_{2.2}$)	0.744			
		0.709			
		0.605			
		0.712			
	c. Cognitive activation ($Y_{2.3}$)	0.783			
		0.875			
		0.881			
		0.82			

4.3 HTMT and Fornell-Larcker Test

Discriminant validity was assessed using both the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). The results presented in Table 4 indicate that the square root of the average variance extracted, shown on the diagonal, exceeds the correlations between constructs. Specifically, digital literacy (0.873), proactive personality (0.831), pedagogic competence (0.851), and instructional quality (0.849) all exceed their respective inter-construct correlations. This confirms that each construct explains more variance than it shares with other constructs, thereby satisfying the Fornell–Larcker criterion.

Furthermore, the HTMT values (marked with an asterisk) are all below the recommended threshold of 0.90, indicating adequate discriminant validity among the constructs. The highest HTMT value is observed between pedagogic competence and instructional quality (0.764), which remains well within acceptable limits. These findings suggest that the constructs are empirically distinct and that the measurement model demonstrates satisfactory discriminant validity.

Table 4. HTMT and Fornell-Larcker test results

Variabel	1	2	3	4
Digital literacy	0.873	0.749*	0.447*	0.646*
Proactive personality	0.630	0.831	0.546*	0.736*
Pedagogic competence	0.400	0.489	0.851	0.764*
Instructional quality	0.536	0.612	0.663	0.849

* HTMT

4.4 Common Method Bias (CMB) Test

CMB is the potential for data bias that arises when data are collected from the same source or using a uniform method. Many academics argue that self-report questionnaires used in cross-sectoral survey studies fail to account for CMB and thus may introduce measurement error (Handayani *et al.*, 2025). It can impact the validity of research findings (Gustari & Widodo, 2025). Therefore, the CMB test was conducted in this study to detect potential data bias. According to Kock (2015), CMB was evaluated using the full collinearity assessment approach through Variance Inflation Factor (VIF) values. All VIF values ranged from 1.339 to 1.866, which were below the recommended threshold of 3.3, indicating that common method bias was unlikely to affect the results of this study.

4.5 Goodness of Fit

This study assessed the model's appropriateness using standardized root mean square residual (SRMR). According to Hair *et al.* (2022), SRMR is less than or equal to 0.08. The SRMR value was 0.061, below the 0.08 criterion. Indicating a high degree of fit. Consequently, the theoretical model articulated in this study aligns with the empirical model derived from the study's data.

4.6. Hypothesis Testing Results

As summarized in Table 5 and visualized in Figure 1, the hypothesis testing results demonstrated that all proposed relationships in the structural model were statistically significant and supported. The findings revealed that digital literacy had a positive and significant direct effect on instructional quality ($\beta = 0.180$, $t = 4.574$, $p < 0.001$), thereby supporting H_1. However, the effect size was relatively small ($f^2 = 0.044$), indicating that although digital literacy contributed significantly to instructional quality, its practical contribution was limited compared to other predictors. This finding suggests that integrating digital skills among educators improves instructional processes, particularly by supporting technology-based teaching and learning activities.

Proactive personality was also found to positively and significantly influence instructional quality ($\beta = 0.276$, $t = 6.234$, $p < 0.001$), supporting H_2. The effect size ($f^2 = 0.094$) indicated a moderate contribution, implying that educators with proactive characteristics tend to demonstrate greater initiative, adaptability, and innovation in delivering effective instruction. This result highlights the importance of individual personality traits in enhancing teaching performance and classroom effectiveness.

Among all predictors, pedagogic competence exhibited the strongest direct effect on instructional quality (β = 0.456, t = 13.443, p < 0.001), supporting H_3. The effect size was substantial (f^2 = 0.358), emphasizing that pedagogic competence was the most influential factor in improving instructional quality. This result indicates that educators' abilities to design learning strategies, manage classrooms, and understand students' learning needs play a critical role in delivering high-quality instruction.

The analysis further demonstrated that digital literacy positively affected pedagogic competence (β = 0.152, t = 3.068, p = 0.002), supporting H_4. Nevertheless, the effect size was relatively weak (f^2 = 0.019), suggesting that digital literacy alone was insufficient to substantially improve pedagogic competence. In contrast, proactive personality exerted a stronger positive effect on pedagogic competence (β = 0.393, t = 8.197, p < 0.001), supporting H5, with a moderate effect size (f^2 = 0.125). This finding implies that proactive educators are more likely to continuously develop their pedagogical capabilities through self-initiative and professional adaptation.

Regarding the mediation effects, pedagogic competence significantly mediated the relationship between digital literacy and instructional quality (β = 0.069, t = 2.969, p = 0.003), supporting H_6. Although the indirect effect was relatively small, the result indicates that digital literacy contributes to instructional quality, at least in part, by enhancing pedagogical competence. Similarly, pedagogic competence significantly mediated the relationship between proactive personality and instructional quality (β = 0.179, t = 7.251, p < 0.001), supporting H_7. The stronger indirect effect suggests that proactive personality improves instructional quality primarily by strengthening educators' pedagogical competence.

Overall, these findings confirm that pedagogic competence serves as the central mechanism in improving instructional quality. While digital literacy and proactive personality directly contribute to instructional quality, their influence becomes more meaningful when mediated through pedagogic competence. Therefore, strengthening educators' pedagogical competence should be a strategic priority for improving instructional quality in educational institutions.

The model showed substantial explanatory power, with instructional quality achieving an R^2 value of 0.567, indicating that 56.7% of the variance in instructional quality could be explained by digital literacy, proactive personality, and pedagogic competence. Meanwhile, pedagogic competence obtained an R^2 value of 0.253, suggesting that 25.3% of its variance was explained by digital literacy and proactive personality. Furthermore, the predictive relevance values (Q^2) for instructional quality (0.404) and pedagogic competence (0.245) confirmed that the model possessed adequate predictive capability.

Table 5. Structural model assessment and hypothesis testing results

Hypotheses	**Path Coefficients**	**T Statistics**	**P value**	**Test results**	**f^2**	**R^2**	**Q^2**
H_1: Digital literacy directly affects instructional quality	0.180	4.574**	0.000	Supported	0.044	0.567	0.404
H_2: Proactive personality directly affects instructional quality	0.276	6.234**	0.000	Supported	0.094		
H_3: Pedagogic competence directly affects instructional quality	0.456	13.443**	0.000	Supported	0.358		
H_4: Digital literacy directly affects pedagogic competence	0.152	3.068**	0.002	Supported	0.019	0.253	0.245
H_5: Proactive personality directly affects pedagogic competence	0.393	8.197**	0.000	Supported	0.125		
H_6: Digital literacy indirectly affects instructional quality through pedagogic competence	0.069	2.969**	0.003	Supported	-	-	-
H_7: Proactive personality indirectly affects instructional quality through pedagogic competence	0.179	7.251**	0.000	Supported	-	-	-

** p < 0.01

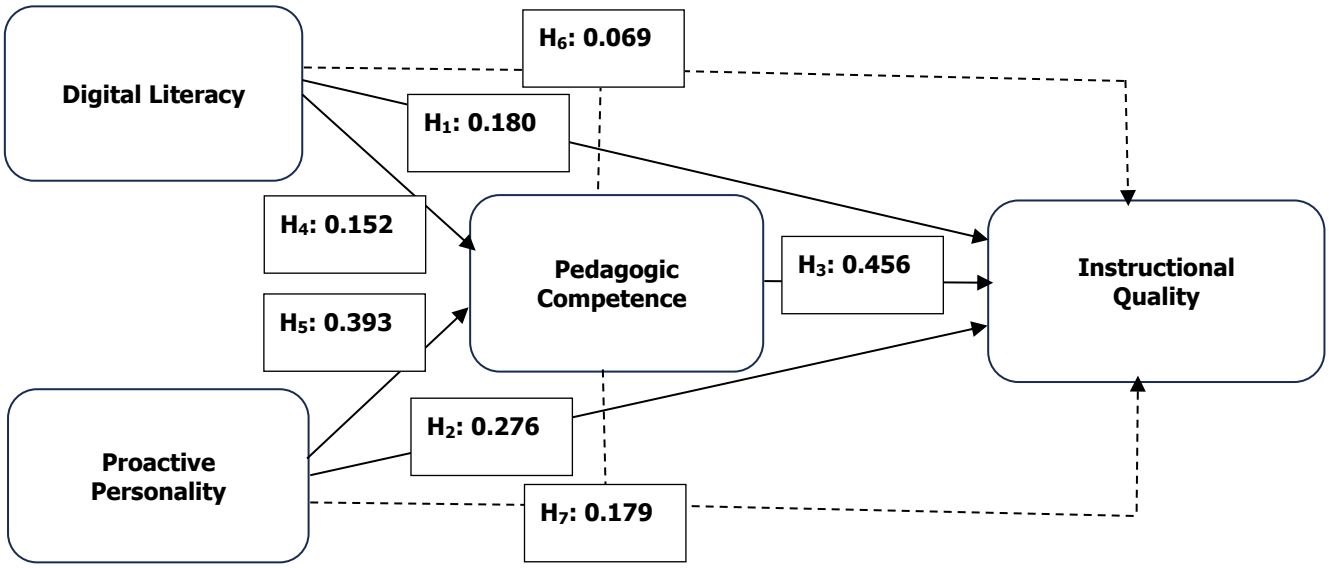

Figure 1. Path diagram of structural model

5. Discussion

This study's results affirm the importance of pedagogic competence in shaping the effects of digital literacy and proactive personality on teachers' instructional quality, at least in terms of classroom management, student support, and cognitive engagement capacities. The results clearly demonstrate the substantial impact of digital literacy on the quality of instructors' instruction. This experiment demonstrates that digital literacy is a crucial prerequisite for educators' instructional quality, hence enhancing instructional quality as teachers' digital literacy improves. These findings validate previous research indicating that digital literacy substantially improves teaching quality (Ervianti *et al.,* 2023; Prabandari *et al.,* 2024; Qulub & Budiyono, 2022), so that the existence of digital literacy needs to be paid more attention to in the context of improving the instructional quality of teachers. At this level, digital literacy can be used as capital in effectively carrying out teaching and learning activities.

The research indicates that proactive personalities substantially influence the instructional quality of teachers. This suggests that a proactive personality is a significant predictor of instructors' instructional quality; hence, enhancing a proactive personality may elevate teachers' instructional quality. These findings corroborate earlier studies demonstrating that proactive personalities significantly influence teaching quality (Chen *et al.,* 2021; Chai *et al.,* 2022; Okolie *et al.,* 2021). Therefore, fundamental aspects of proactive personalities, such as the inclination to pursue opportunities, exhibit initiative, take action, and persist until achieving resolution through change, necessitate heightened attention and improvement to substantially enhance the quality of teacher instruction.

This study's results demonstrate the substantial impact of pedagogic competence on teachers' instructional quality. This empirically shows that pedagogic competence is a predisposition for instructional quality, so when teachers' pedagogic competence is improved, it can positively contribute to their instructional quality. This empirical fact is consistent with previous research results proving that pedagogic competence significantly affects instructional quality (Peláez Henao *et al.,* 2020; Prasetyo *et al.,* 2022; Mekarsari *et al.,* 2025) Consequently, the essential attributes of pedagogic competence, such as managing the classroom, identifying student characteristics, encouraging active student participation, developing student potential, performing humanist actions, and communicating in explaining subject matter, deserve special attention, especially to improve teachers' instructional quality.

Furthermore, the findings of this study indicate that digital literacy and a proactive personality substantially influence teachers' pedagogical competency. This demonstrates that digital literacy and a proactive personality are essential components of instructors' pedagogical competency. It means teachers' pedagogical competency can be enhanced by augmenting digital literacy and fostering a proactive personality. These findings affirm previous studies conducted by Potasheva *et al.* (2019), Muntu *et al.* (2023), and Sailer *et al.* (2023) that digital literacy has a significant effect on pedagogic competence, and the research results of Parker *et al.* (2019), Bakker *et al.* (2022), Alasmari &

Althaqafi (2024), and Gitelman *et al.* (2023), who claim that proactive personality has a significant relationship with teachers' pedagogic competence. Consequently, digital literacy and a proactive personality need to be highlighted and developed to enhance pedagogic competencies, which are indispensable to improving the quality of education.

Overall, pedagogical competence has a stronger influence than digital literacy and proactive personality. This indicates that pedagogical competence needs to be more strongly emphasized and prioritized to improve teachers' instructional quality. Furthermore, a proactive personality demonstrates a stronger path to pedagogical competence and instructional quality than digital literacy. This condition confirms that teachers' proactive personality is more crucial and dominant than digital literacy in shaping their pedagogical competence and instructional quality. Therefore, at this level, the role of a proactive personality needs to be strategically positioned to improve pedagogical competence and instructional quality.

This study identified empirical evidence of the indirect impacts of digital literacy and proactive personality on teachers' instructional quality, mediated by pedagogical competency mechanisms. This means that pedagogic competence can transpose the role of digital literacy and proactive personality into the teacher's instructional qualities. In other words, when digital literacy and teachers' proactive personalities are improved, pedagogic competence can serve as a medium to translate these improvements into improved instructional quality. These findings not only align with and affirm the results of previous research that prove that digital literacy and proactive personality affect pedagogic competence, as well as pedagogic competence affects teacher instructional quality, but also reflect contextual validation in Indonesian schools regarding the impact of digital literacy and proactive personality on the quality of educator teaching through the mediation of pedagogical competence.

6. Conclusion

This study aims to clarify the role of pedagogic ability in modulating the effects of digital literacy and proactive personality on instructors' instructional quality. The study findings indicate that digital literacy, proactive personality, and pedagogic competence influence the instructional quality of teachers, while digital literacy and proactive personality greatly impact teachers' pedagogical competency. In line with the evidence, this study established a contextual validation of the influence of digital literacy and proactive personality on instructors' instructional quality, mediated by pedagogic competence in Indonesian schools. It contributes positively to the fields of management, technology, and educational psychology, while also offering practical implications for educational implementation, particularly by enhancing teachers' instructional quality through the mediation of pedagogic competence, thereby fostering digital literacy and a proactive personality. Therefore, researchers can discuss this empirical evidence as a finding from Indonesia that may be useful for developing further research in the future. At the same time, education practitioners (schools) can use these findings to gain insight into improving the quality of teacher instruction, particularly in Indonesia. Efforts to achieve this goal need to consider the limitations of this study, particularly its reliance on a single data source (teachers) with accidental sampling, its use of only certain theoretical indicators from the literature, and the absence of control variables that could influence the results.

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Conflict of Interest

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