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ARTIFICIAL INTELLIGENCE UTILIZATION BY TEACHERS IN ELEMENTARY SCHOOL TEACHING AND LEARNING PROCESS AT SCHOOL CLUSTER III, NORTH KUTA DISTRICT

Ni Luh Nita Sari[1]
Universitas Terbuka, Denpasar
E-mail: niluhnitasari7@gmail.com

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Abstract

This study was conducted in response to the continued dominance of teacher-centered instructional methods that limit media variation, teacher creativity, and student engagement. This study aims to identify the profile of teachers' utilization of Artificial Intelligence (AI), its role in the teaching and learning process, its contribution to teachers' competence and creativity, as well as the supporting and inhibiting factors influencing AI utilization. A quantitative approach using a survey method was employed. The population consisted of all elementary school teachers in School Cluster III, North Kuta District, with 58 teachers selected through purposive sampling. Data were collected using a validated and reliable Likert-scale questionnaire and analyzed using descriptive statistics. The results indicate that the profile of AI utilization by teachers is categorized as high. The role of AI in teaching and learning is also high, particularly in lesson planning and implementation, while its utilization in learning evaluation remains moderate. AI contributes positively to teachers' competence and creativity by fostering reflective and innovative teaching practices. Supporting factors are categorized as high, whereas inhibiting factors are moderate. Overall, teachers demonstrate good readiness to utilize AI, although continuous training is necessary to optimize its implementation.

Keywords: Artificial Intelligence (AI), Elementary School, Teaching and Learning.

INTRODUCTION

Learning and teaching are fundamental components of educational practice. Learning is defined as a relatively permanent change in behavior resulting from experience and practice, while teaching refers to a systematic process of facilitating interaction between learners, educators, and learning resources to achieve instructional objectives effectively and efficiently (Hidayat & Juniar, 2020; Syafrin et al., 2023). Within this process, teachers play a central role in designing learning environments, selecting appropriate methods, and utilizing instructional media to enhance student engagement and learning outcomes. From a theoretical perspective, Technology-Enhanced Learning (TEL) emphasizes the integration of digital technology to support interactive, student-centered, and meaningful learning experiences (Kessler, 2021). TEL views technology not merely as a supplementary tool but as an integral component that reshapes learning environments and pedagogical practices (Walker & White, 2021). Through TEL, technology facilitates collaboration, personalization, and authentic learning contexts, thereby shifting instructional focus from teacher-centered to learner-centered approaches.

International assessments such as the Programme for International Student Assessment (PISA) reveal that Indonesian students' literacy performance remains below the OECD average, indicating persistent challenges in instructional quality and learning effectiveness (Santosa et al., 2012). These findings underscore the urgency of strengthening digital literacy and pedagogical innovation among teachers. In response, the Indonesian government has promoted various initiatives, including the National Literacy Movement and digital literacy programs, which encourage the integration of technology into classroom practices (Nashihuddin, 2018). One emerging technological innovation aligned with TEL principles is Artificial Intelligence (AI). Artificial Intelligence refers to computer-based systems capable of simulating human cognitive processes such as learning, reasoning, and decision-making (Russell & Norvig, 2021). In educational contexts, AI enables adaptive learning, automated feedback, learning analytics, and personalized instruction (Goodfellow et al., 2022). AI applications such as intelligent tutoring systems, educational chatbots, and automated assessment tools support teachers in instructional planning, classroom implementation, and

evaluation processes (Rochmawati, 2023; Fitriani, 2024). The integration of AI in education reflects the broader transformation toward data-driven and personalized learning environments.

The adoption of AI in teaching practices can also be explained through the Technology Acceptance Model (TAM), which posits that users' acceptance of technology is influenced by perceived usefulness and perceived ease of use (Davis, 1989). In the context of elementary school teachers, AI is more likely to be utilized when it is perceived as beneficial for improving instructional quality and easy to operate within daily teaching routines (Widaningsih & Mustikasari, 2022). Teachers' digital literacy and attitudes toward technology therefore become critical factors in successful AI integration. Teacher competence and creativity are key determinants of effective learning. According to national education standards, teacher competence includes pedagogical, professional, personal, and social dimensions (Permendiknas No. 16 Tahun 2007). Competent teachers are able to design, implement, and evaluate learning effectively, while creativity enables them to generate innovative instructional strategies and engaging learning media (Sagala, 2011; Susanto, 2013). Previous studies indicate that AI utilization contributes positively to teacher competence and creativity by supporting reflective practice, instructional innovation, and efficient classroom management (Putra, 2023; Wahyuni et al., 2022).

However, the successful integration of AI is influenced by various supporting and inhibiting factors. Based on the Diffusion of Innovation Theory, the adoption of new technology is shaped by individual readiness, social environment, and institutional support (Rogers, 2003). Factors such as infrastructure availability, training opportunities, leadership support, and teachers' motivation facilitate AI adoption, while limited resources, low digital literacy, workload, and resistance to change hinder its implementation (Widodo et al., 2024; Mutmainnah & Anwar, 2025). Despite the growing discourse on AI integration in education, empirical evidence indicates that many teachers still rely on conventional teaching methods with limited use of AI-based learning media. This condition is also observed in elementary schools in School Cluster III, North Kuta District, where the utilization of AI in classroom practice remains suboptimal. Limited variation in instructional media and teaching strategies may negatively affect students' engagement and learning motivation. Therefore, strengthening teachers' competence in utilizing AI-based digital applications is crucial to support innovative, effective, and contextually relevant learning. To provide empirical support for this issue, a preliminary study was conducted to examine teachers' initial knowledge of AI. The results are presented in Table 1.

Table 1. Preliminary Study on Teachers' AI Knowledge in School Cluster III, North Kuta District

No	School	Respondents	Percentage	AI Knowledge Level
1	SDN 1 Kerobokan	27	74.1%	Moderate
2	SDN 2 Kerobokan	11	67.7%	Low
3	SDN 3 Kerobokan	19	73.7%	Moderate
4	SDN 4 Kerobokan	18	65.2%	Low
5	SDN 1 Kerobokan Kaja	27	81.5%	High
6	SDN 2 Kerobokan Kaja	18	72.8%	Moderate
7	SDN 3 Kerobokan Kaja	16	68.7%	Low

As shown in Table 1, teachers' knowledge of Artificial Intelligence is predominantly categorized as moderate, with several schools demonstrating low levels of understanding. These findings indicate that many teachers have not yet fully comprehended the basic concepts, pedagogical benefits, and practical applications of AI in elementary school learning contexts. Therefore, this study aims to investigate the utilization of Artificial Intelligence by elementary school teachers in School Cluster III, North Kuta District, analyze its role in the teaching and learning process, examine its contribution to teacher competence and creativity, and identify the supporting and inhibiting factors influencing its implementation. This study is expected to provide empirical evidence to support effective AI integration in elementary education and contribute to the development of educational technology research in Indonesia.

METHOD

Research Design

This study employed a quantitative descriptive research design using a survey method. The quantitative approach was selected to objectively describe the profile of Artificial Intelligence (AI) utilization by elementary school teachers and to examine its role in the teaching and learning process. Descriptive survey research is appropriate for

systematically capturing respondents' perceptions, experiences, and practices related to technology integration in educational settings.

Population and Sample
The population of this study comprised all elementary school teachers in School Cluster III, North Kuta District, totaling 136 teachers. The sample size was determined using the Slovin formula with a margin of error of 10%, resulting in 58 teachers as research respondents. Sampling was conducted using simple random sampling, as the population was considered relatively homogeneous in terms of educational background and teaching context.

Research Instrument
Data were collected using a structured questionnaire developed based on theories of educational technology integration, teacher competence, and Artificial Intelligence in education. The questionnaire employed a four-point Likert scale, ranging from *Strongly Agree (4)* to *Strongly Disagree (1)*. The instrument was designed to measure teachers' perceptions and experiences regarding AI utilization in elementary school learning contexts.

Data Collection Procedure
Data collection was conducted by distributing the questionnaire directly to the respondents. Teachers completed the questionnaire independently based on their professional experiences in planning, implementing, and evaluating learning activities. The data collection process was carried out within a predetermined time frame to ensure consistency and completeness of responses.

Data Analysis Technique
Data were analyzed using descriptive statistical techniques with the assistance of SPSS version 26. Statistical measures such as mean scores, standard deviation, and percentage distributions were used to describe the level of AI utilization, its pedagogical role, teacher competence and creativity, as well as supporting and inhibiting factors. The results were interpreted using predefined categorical criteria (low, moderate, and high).

Validity and Reliability
Prior to data collection, the questionnaire was subjected to validity and reliability testing. Item validity was assessed to ensure that each statement accurately measured the intended construct. Reliability testing was conducted using the Kuder–Richardson (KR-20) formula through SPSS 26 to evaluate the internal consistency of the instrument. An instrument was considered reliable if it demonstrated a satisfactory reliability coefficient, indicating consistency in measuring the research variables.

RESULTS AND DISCUSSION

Characteristics Of Research Respondents

This study involved 58 elementary school teachers from School Cluster III, North Kuta District. The demographic characteristics of the respondents are presented in Table 2.

Table 2. Characteristics of Research Respondents (n = 58)

Variable	Category	Frequency	Percentage (%)
Gender	Male	12	20.7
	Female	46	79.3
Age	< 30 years	14	24.1
	30–39 years	26	44.8
	40–49 years	9	15.5
	≥ 50 years	9	15.5
Educational Background	Bachelor's Degree (S1)	52	89.7
	Master's Degree (S2)	6	10.3
Teaching Experience	≤ 5 years	10	17.2
	6–10 years	17	29.3
	> 10 years	27	46.6

The data indicate that the respondents were predominantly female teachers with a bachelor's degree and more than ten years of teaching experience. This profile reflects a relatively experienced teaching workforce, providing a relevant context for examining AI utilization in elementary school learning.

Instrument Testing Results

Instrument validity testing was conducted using Pearson Product Moment correlation with a minimum correlation coefficient of 0.30. All questionnaire items across the research variables showed correlation values exceeding the minimum threshold with significance levels below 0.05, indicating that all items were valid. Reliability testing was conducted using Cronbach's Alpha. The reliability results are summarized in Table 3.

Table 3. Validity and Reliability Test Results

Variable	Number of Items	Validity Result	Cronbach's Alpha	Reliability Category
AI Utilization Profile	12	Valid	0.756	Reliable
Role of AI in Learning	10	Valid	0.842	Highly Reliable
Teacher Competence & Creativity	12	Valid	0.969	Highly Reliable
Supporting & Inhibiting Factors	10	Valid	0.811	Highly Reliable

The results indicate that the research instrument demonstrated high internal consistency and was reliable for measuring the research variables.

Results of Descriptive Analysis

Profile of Artificial Intelligence Utilization by Elementary School Teachers

The descriptive analysis results of teachers' AI utilization profiles are presented in Table 4.

Table 4. Profile of Artificial Intelligence Utilization by Teachers

Indicator	Mean Score	Category
Frequency of AI Use	3.78	High
Types of AI Applications Used	3.81	High
Purpose of AI Utilization	3.89	High
Perceived Ease of Use	3.72	High
Perceived Usefulness	4.08	High
Comfort and Familiarity	3.84	High
Total Mean	3.85	High

The overall mean score of 3.85 indicates that teachers have positively and intensively utilized AI-based applications in the teaching and learning process. The highest score was found in perceived usefulness, reflecting teachers' strong recognition of AI's instructional benefits, consistent with the Technology Acceptance Model (TAM) (Davis, 1989). Based on the data analysis presented in Table 4, the overall mean score of AI utilization was 3.85, which falls within the range of 3.68–5.00 and is categorized as high. This result indicates that, in general, elementary school teachers in School Cluster III, North Kuta District, have positively and intensively utilized Artificial Intelligence (AI) applications in the teaching and learning process. The high level of utilization reflects teachers' readiness to adopt AI as part of their instructional practices. The indicator with the highest mean score was the statement *"I perceive significant benefits from using AI to improve the quality of learning"* (mean = 4.08). This finding demonstrates that teachers strongly perceive AI as beneficial in enhancing instructional quality. Teachers reported that AI assists them in preparing teaching materials, developing more engaging learning media, and improving instructional efficiency. These perceptions suggest that AI has been effectively integrated into daily teaching activities.

This finding is consistent with the Technology Acceptance Model (TAM) proposed by Davis (as cited in Hardianto et al., 2025), which emphasizes that *perceived usefulness* is a key determinant of technology acceptance. When users perceive a technology as beneficial to their work performance, they are more likely to adopt and use it consistently. Therefore, the high perceived usefulness of AI among teachers indicates strong acceptance and sustainable utilization of AI in elementary education. Moreover, the strong perception of AI benefits suggests that

teachers view AI not merely as an additional technological tool but as a pedagogical support system. This perspective aligns with Fajriati et al. (2024), who argue that AI in education functions as a *tool to augment teaching*, enhancing teachers' ability to design, implement, and evaluate learning more effectively and innovatively. Similar findings were reported by Syahria and Darlis (2025) and Harefa (2025), who found that teachers with higher perceived benefits of AI tend to demonstrate higher levels of technology adoption and instructional innovation.

Role of Artificial Intelligence in the Teaching and Learning Process
The role of AI across instructional stages is presented in Table 5.

Table 5. Role of Artificial Intelligence in the Teaching and Learning Process

Learning Stage	Mean Score	Category
Lesson Planning	4.08	High
Learning Implementation	3.76	High
Learning Evaluation	3.66	Moderate
Total Mean	3.83	High

AI was most prominently utilized in lesson planning, while its use in learning evaluation was comparatively lower. This supports the TPACK framework (Mishra & Koehler, 2006), emphasizing technology integration in pedagogical practices, while also indicating the need for improved AI use in assessment. The role of AI in this study was examined across three instructional stages: lesson planning, learning implementation, and evaluation. As shown in Table 5, the overall mean score was 3.83, categorized as high, indicating that AI plays a significant role in supporting the teaching and learning process. The highest mean score was found in the lesson planning stage (mean = 4.08), where teachers reported using AI-based applications such as ChatGPT, Canva AI, and Google Gemini to develop lesson plans, teaching materials, and learning media. This finding suggests that AI is predominantly utilized as a planning tool that enhances efficiency, creativity, and instructional variation. This result supports the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra and Koehler (2006), which emphasizes that effective technology integration occurs when technology supports both pedagogical strategies and content mastery. The use of AI in lesson planning indicates that teachers have begun integrating technology into their professional competence.

The implementation stage obtained a mean score of 3.77, indicating that AI has begun to support interactive and adaptive learning. However, its utilization at this stage remains lower than in lesson planning, suggesting that teachers are still adapting to the direct use of AI during classroom instruction. This finding aligns with Jamilah et al. (2025), who argue that effective AI-supported interactive learning requires pedagogical readiness, adequate infrastructure, and a clear understanding of AI's supportive role. The evaluation stage recorded the lowest mean score (mean = 3.66, moderate category), indicating limited utilization of AI for automated feedback and learning analytics. This limitation may be attributed to teachers' concerns regarding accuracy, ethical considerations, and limited digital competence. Similar patterns were reported by Sirozi (2024), who found that teachers tend to use technology more frequently in planning and content delivery than in assessment processes.

Contribution of Artificial Intelligence to Teacher Competence and Creativity
The contribution of AI to teacher competence and creativity is presented in Table 6.

Table 6. Contribution of AI to Teacher Competence and Creativity

Aspect	Mean Score	Category
Teacher Competence Development	3.99	High
Teacher Creativity Development	4.10	High
Total Mean	4.05	High

AI significantly contributed to both competence and creativity development, with creativity showing the strongest impact. AI functioned as a cognitive support tool that stimulated instructional innovation and idea generation.

The findings presented in Table 6., indicate an overall mean score of teacher competence development as 3.99, categorized as high, demonstrating that AI positively contributes to teacher competence development. The highest scores were related to reflective practice, openness to innovation, and digital collaboration (mean = 4.08),

suggesting that AI supports both technical and professional competencies. These results align with Aryana et al. (2022), who emphasize that 21st-century teacher competence includes adaptability, reflective thinking, and collaboration supported by digital technologies. Additionally, AI was found to enhance teachers' mastery of instructional content (mean = 4.05), reinforcing the relevance of the TPACK framework (Mishra & Koehler, 2006). Similar conclusions were reported by Ruja et al. (2026), who found that AI-based technologies significantly improve teachers' professional competence. Regarding the creativity development, as shown in Table 6., AI contribution to teacher creativity obtained an overall mean score of 4.10, indicating a strong positive impact. Teachers reported that AI facilitates the development of more engaging, varied, and innovative learning activities. AI functions as a creative stimulus by supporting idea generation, method modification, and media development. This finding is consistent with creativity theory proposed by Sarina (2024), which defines creativity as the ability to generate, modify, and expand ideas through divergent thinking. The results also support Helmi et al. (2025), who concluded that AI-supported technologies enhance instructional creativity and innovation.

Supporting and Inhibiting Factors of AI Utilization

Supporting Factors

Supporting factors influencing AI utilization are presented in Table 7.

Table 7. Supporting Factors of AI Utilization

Indicator	Mean Score	Category
Infrastructure Availability	3.74	High
Training Opportunities	3.50	Moderate
Institutional Support	3.88	High
Teacher Motivation and Attitude	4.05	High
Peer Collaboration	3.91	High
Total Mean	3.86	High

Teachers' motivation and positive attitudes emerged as the strongest supporting factors, while formal training availability remained moderate. Based on Table 7., supporting factors obtained an overall mean score of 3.86 (high category). Teachers' motivation and positive attitudes toward AI emerged as the strongest supporting factors (mean = 4.08), consistent with the Technology Acceptance Model (TAM) (Davis, as cited in Surat et al., 2025). Institutional leadership support and peer collaboration further reinforced AI utilization, reflecting the importance of organizational culture and professional learning communities (Utami & Yuliana, 2025). However, training availability remained at a moderate level, indicating the need for more structured and continuous professional development programs.

Inhibiting Factors

Inhibiting factors affecting AI utilization are presented in Table 8.

Table 8. Inhibiting Factors of AI Utilization

Indicator	Mean Score	Category
Limited Infrastructure	2.56	Moderate
Low Digital Literacy	2.44	Moderate
Lack of Training	2.51	Moderate
Workload Constraints	2.39	Moderate
Resistance to Change	2.48	Moderate
Total Mean	2.48	Moderate

The inhibiting factors were present at a moderate level, indicating that existing barriers do not severely restrict AI utilization but still require strategic intervention. Inhibiting factors, as shown in Table 8., obtained an overall mean score of 2.48 (moderate category). The main barriers included limited digital competence, insufficient training, heavy workload, and psychological factors such as anxiety and low self-confidence. These findings are consistent with UNESCO (2018), which identifies digital skill gaps as a major challenge in educational technology integration. Similar conclusions were drawn by Adriyansyah et al. (2025), who reported that administrative workload often limits teachers' engagement with instructional innovation. Overall, the findings in this subsection indicate that

while supporting factors outweigh inhibiting factors, sustained capacity-building efforts, continuous training, and supportive institutional policies are essential to ensure optimal and sustainable AI integration in elementary school education.

CONCLUSION

Based on the results of this study on the profile of Artificial Intelligence (AI) utilization in the teaching and learning process of elementary school teachers in School Cluster III, North Kuta District, the following conclusions can be drawn. First, the profile of Artificial Intelligence utilization by elementary school teachers is categorized as high. Teachers have applied AI-based applications in lesson planning, instructional implementation, and learning evaluation, and they perceive AI as providing meaningful benefits in improving the quality and effectiveness of classroom learning.

Second, the role of Artificial Intelligence in the teaching and learning process is also classified as high. AI plays a significant role in assisting teachers in preparing instructional materials and learning media, as well as supporting more interactive learning activities. However, the use of AI in learning evaluation remains relatively limited and requires further development.

Third, the utilization of Artificial Intelligence contributes positively to the development of teacher competence and creativity. AI supports teachers in becoming more reflective, innovative, and creative in designing learning activities that are engaging and aligned with students' characteristics and learning needs.

Fourth, the supporting factors for AI utilization are categorized as high, while the inhibiting factors fall within the moderate category. Teacher motivation, school policies, infrastructure availability, and collaboration among teachers serve as the main supporting factors, whereas limited digital competence, insufficient training, and time constraints remain challenges that need to be addressed.

In conclusion, elementary school teachers in School Cluster III, North Kuta District, demonstrate a good level of readiness to utilize Artificial Intelligence in the teaching and learning process. Nevertheless, continuous professional development and institutional support are necessary to ensure that AI utilization can be implemented more optimally and sustainably in elementary education.

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