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Strategies for Realizing Teacher Creativity in Utilizing AI-Based Learning Media in Elementary Schools

Yunita Nur Rahmawati[1], Achadi Budi Santosa[2], Dian Hidayati[3]
Magister Manajemen Pendidikan, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Ahmad Dahlan

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Abstract
Utilization of Artificial Intelligence(AI) in learning demands teacher creativity so that learning media are more effective and appropriate to the characteristics of elementary school students. This study aims to analyze strategies for realizing teacher creativity in utilizing AI-based learning media in elementary schools. This study used a qualitative approach with a case study type conducted in one of the Muhammadiyah elementary schools. The research subjects consisted of four teachers who actively utilize AI in learning. Data were collected through semi-structured interviews, participant observation, and documentation studies. Data analysis was carried out through the stages of data reduction, data presentation, and conclusion. The results show that teacher creativity is manifested through pedagogical understanding of AI as a learning tool, planning contextual AI use, implementing AI-based active learning, and continuous evaluation of student responses and engagement. The use of AI-based learning media has a positive impact on increasing student learning motivation, learning variation, and teacher work efficiency, although obstacles are still encountered, such as limited devices, internet networks, and teacher competencies. Therefore, school managerial support is needed through continuous training and the provision of supporting infrastructure so that the use of AI in learning can run optimally.

Corresponding Author:
Yunita Nur Rahmawati
Universitas Ahmad Dahlan, Yogyakarta, Indonesia
Email Correspondent: 2408046063@webmail.uad.ac.id

1. INTRODUCTION

In the era of digital transformation, the world of education faces new challenges in adapting the learning process to the rapid development of technology. The use of artificial intelligence (*Artificial Intelligence* (or AI) is one of the innovations that has great potential to improve the quality of learning in elementary schools. Through the use of AI in learning media, teachers can present a more innovative, engaging learning process that aligns with the demands of 21st-century competencies. AI technology helps teachers design teaching materials, adapt learning to students' learning styles, and foster students' critical and creative thinking skills (Dwi Mukti, 2023; Hikmawati et al., 2023; Jamilah et al., 2025). In line with this, the use of digital technology in learning has been proven to create a more active, creative, and participatory learning atmosphere through the use of various learning support applications such as Canva, PowerPoint, and Quizizz (Nuzuliana & Santosa, 2024). Thus, the use of AI is not only oriented towards learning effectiveness but also plays a vital role in strengthening teachers' creativity as learning designers.

In practice, most elementary school teachers in Indonesia still face difficulties in optimizing the use of AI technology. These obstacles include limited digital competency,

minimal training related to AI use, and inadequate technological infrastructure support in schools (Puspita Vivi et al., 2023; Rofiq & Iswatiningsih, 2025). This situation leads teachers to continue to use conventional learning media that do not encourage active student participation and the development of creativity in learning. Research shows that the main obstacles to developing teachers' digital pedagogical competencies lie in teacher paradigms, low motivation for self-development, and limited infrastructure supporting technology-based learning (Patajangan et al., 2024). However, other research has shown that the use of AI in learning can help teachers design interactive teaching modules while creating adaptive learning processes tailored to students' abilities and interests (Kartipah, 2025; Wildanah et al., 2025).

If these conditions are not addressed immediately, they have the potential to hinder the digital-based educational transformation process at the elementary school level. Teachers will struggle to develop creativity in designing innovative learning media, while students will not gain learning experiences relevant to developments in the digital world. The gap between the potential of AI technology and classroom learning practices can lead to stagnation in educational innovation. Research findings on digital technology-based classroom management indicate that without systematic planning, resource support, and ongoing teacher training, the use of technology cannot optimally impact learning quality (Nuzuliana & Santosa, 2024; Patajangan et al., 2024). This condition ultimately impacts students' low interest in learning and limited creative thinking skills (Adnyana et al., 2025; Santosa et al., 2025).

From a theoretical perspective, the need for such a strategy aligns with educational innovation theory, which emphasizes the importance of adapting to technological changes and the demands of the times. Teachers, as agents of change, play a strategic role in realizing creative and relevant learning innovations in the digital era. The theory of creativity and educational technology emphasizes that teacher creativity will thrive when supported by adequate pedagogical understanding, visionary school leadership, the availability of facilities, and a learning environment open to the exploration of new learning media, including AI (Hindra Kurniawan et al., 2024; Musytaharuddin, 2024). This is reinforced by findings that the involvement of principals, teachers, parents, and the community is a key supporting factor in the successful development of teachers' pedagogical competence (Patajangan et al., 2024).

The use of AI in learning also has the potential to help teachers design more personalized and adaptive teaching media, tailored to individual student needs, and provide faster and more effective feedback. This can enrich students' learning experiences and encourage active, innovative, and collaborative learning (Fajriati et al., 2024; Rahmayantis et al., 2025; Sabariah et al., 2024). Previous research has shown that digital technology-based learning strategies can create a more creative classroom atmosphere and increase student engagement in the learning process (Nuzuliana & Santosa, 2024). However, for this potential to be optimally realized, the use of AI needs to be supported by a systematic strategy, focusing not only on technical training but also on developing teachers' creativity and reflective skills in managing learning.

Based on this description, this research focuses on an in-depth study of systematic and sustainable strategies for realizing teacher creativity through the use of AI-based learning media in elementary schools. This strategy is understood as a cycle that includes strategy formulation, learning planning, monitoring, and analysis of the learning process, and data-based follow-up and adjustments. This research is expected to provide theoretical contributions to enrich the study of teacher creativity and the use of AI technology, as well as practical contributions for schools and educational policymakers in designing teacher

professional development programs that encourage effective and sustainable AI integration in elementary schools.

2. RESEARCH METHODS

This research uses a qualitative approach with a case study type to analyze learning management strategies in realizing teacher creativity through the use of learning media based on *Artificial Intelligence* (AI) in elementary schools. The case study was chosen because this research focuses on a single bounded system (*bounded system*), namely the practice of managing and implementing AI in learning in an elementary school, thus allowing for in-depth exploration of strategies, policies, and managerial dynamics in a real-life context.

The research was conducted in November–December 2025 at Muhammadiyah Condongcatur Elementary School, Depok, Sleman, D.I. Yogyakarta. This school was selected randomly. *Purposive* for initiating the integration of AI technology as part of efforts to improve the quality of learning. The research subjects consisted of four elementary school teachers who actively use AI in their learning. Subject selection was conducted through *purposive* sampling and reinforced with snowball sampling. Snowball sampling was used to ensure that informants had direct experience in planning, implementing, and evaluating AI-based learning. In this study, the researcher acted as the primary instrument in the data collection and analysis process.

The data used included primary and secondary data. Primary data were obtained through semi-structured interviews focused on strategies for planning, organizing, implementing, and evaluating AI-based learning, as well as through participant observation of classroom learning implementation. Secondary data were obtained through document review, including school policies, teacher professional development programs, teaching materials, and AI-based learning media. The research instruments included interview guidelines, observation sheets, and documentation formats.

The research procedure was carried out through several systematic stages. The first stage was problem identification and context mapping of AI implementation in schools. The second stage was data collection in a natural *setting* without special treatment to obtain an authentic picture of the strategies implemented by teachers. The third stage is data analysis using an interactive analysis model (Miles et al., 2014), which includes data condensation, data presentation, and drawing and verifying conclusions. The fourth stage is verification of findings through triangulation of sources and methods to ensure the credibility and reliability of the research results.

Through these stages, this research not only describes the practice of utilizing AI in learning but also identifies learning management strategies that can provide solutions for developing teacher creativity systematically and sustainably. Conclusions are drawn inductively based on field findings to generate strategic recommendations for managing AI-based learning in elementary schools.

3. RESEARCH RESULTS AND DISCUSSION

3.1.Research result

Based on the results of the analysis of interview data with four informants using ATLAS.ti 9 software, four main themes were obtained, namely: (1) Teachers' understanding and attitudes towards AI, (2) Creative strategies for utilizing AI, (3) Impacts of utilizing AI, and (4) Constraints and implementation support. These four themes not only describe pedagogical practices but also show patterns of technology-based learning management that contribute to the development of teacher creativity in elementary schools. This is as shown in Figure 1.

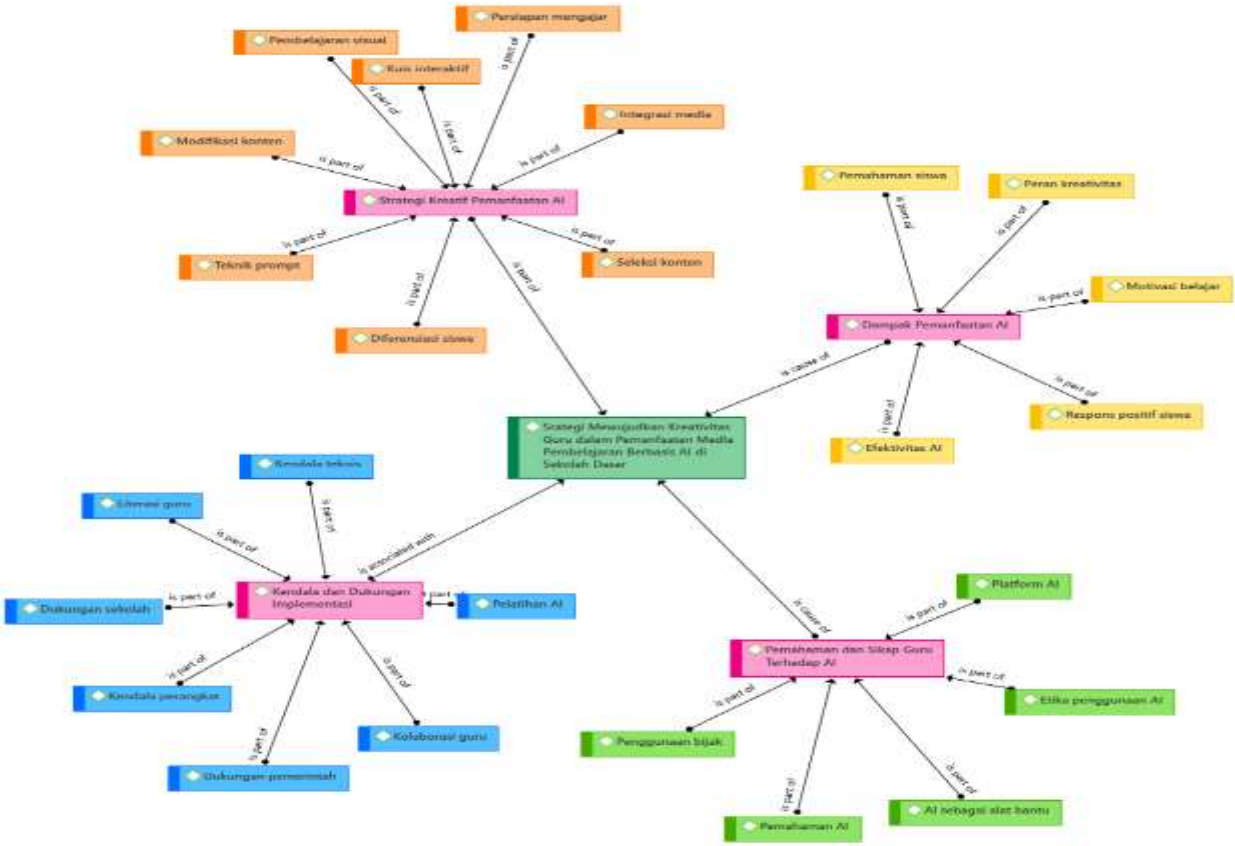

Figure 1. Strategy for Realizing Teacher Creativity in Utilizing AI-Based Learning Media in Elementary Schools

3.1.1. Teachers' Understanding and Attitudes towards AI-Based Learning Media

Figure 2. Teachers' Understanding and Attitudes Towards AI

Teachers' understanding and attitudes toward AI are the main foundation for adopting learning innovations in elementary schools. This understanding reflects how teachers interpret AI as part of the learning process, while teacher attitudes determine how the technology is used responsibly and pedagogically. Specifically, teacher understanding and attitudes include the view that AI is a learning tool, familiarity with various AI platforms, ethical awareness in the use of AI, and the application of wise attitudes in managing the results generated by AI. From an educational management perspective, this cognitive readiness and professional attitude indicate the initial stages of change management (*change management*) in the implementation of technology-based innovation in the school environment.

The interpretation of AI as a learning aid is a crucial aspect of teachers' professional attitudes. Teachers view AI not as a substitute for teachers, but rather as a supporting tool to improve the quality of learning. This view demonstrates that teachers continue to prioritize their role as primary facilitators and managers of the teaching and learning process. This is reinforced by the following statement from resource person 1 (N1):

> *"I understand AI-based learning media as a learning support tool that utilizes technology to assist teachers and students in the learning process. The use of AI is not to replace the role of teachers, but rather as a tool to make learning more effective."*(N1)

This view emphasizes that teachers still function as learning managers who control the direction, goals, and quality of the learning process, while AI is positioned as a supporting resource in the learning system.

Furthermore, teachers also demonstrated an understanding of various AI platforms that can be utilized in learning. Mastery of these applications demonstrates that teachers possess sufficient digital literacy to utilize technology as a learning medium. This was conveyed by resource person 3 (N3):

> *"I utilize ChatGPT, Canva AI, Google Gemini, and Gamma to prepare learning materials and media."*(N3)

Understanding these AI platforms allows teachers to select applications that align with learning objectives and student characteristics, thus ensuring more targeted use. From an educational management perspective, this mastery reflects efforts to increase human resource (HR) capacity in the face of digital transformation in schools.

Furthermore, ethical awareness in the use of AI is an essential part of a teacher's professionalism. Teachers recognize that not all AI output can be used immediately, so a selection process is necessary to ensure it does not violate applicable values and norms. This was expressed by resource person 4 (N4):

> *"The results of AI must be selected, as long as they do not violate religious norms, morality, or SARA."* (N4)

This statement demonstrates that teachers have a moral responsibility to ensure that the use of AI remains aligned with educational and cultural values. This selective attitude also reflects a supervisory function (*controlling*) in learning management, where teachers carry out quality control on content before it is implemented to students.

Beyond ethical aspects, teachers also demonstrate a wise approach to using AI by filtering and adjusting AI results before presenting them to students. This approach reflects teachers' critical thinking in maintaining the quality of learning. This was conveyed by resource person 1 (N1):

> *"I don't give the AI results directly to the students, but I study them first and adjust them to the students' conditions."*(N1)

This reflective attitude shows that teachers are not passive towards technology, but rather actively manage and adapt content to suit students' needs. In the context of learning management, this action demonstrates the existence of a continuous evaluation and adjustment process to ensure the relevance and effectiveness of AI-based learning.

3.1.2. Creative Strategies for Utilizing AI

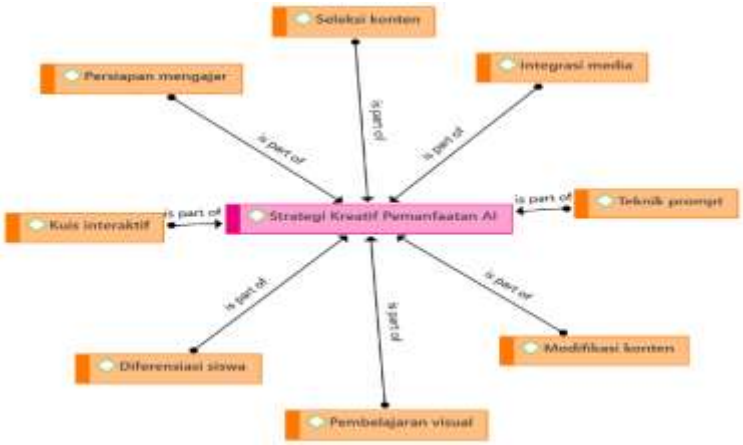

Figure 3. Creative Strategies for Utilizing AI

Creative strategies for utilizing AI are a concrete manifestation of teachers' efforts to implement technology pedagogically in elementary schools. These strategies demonstrate how teachers not only use AI technically but also creatively manage it to align with learning objectives and student characteristics. Specifically, these creative strategies include utilizing AI in lesson preparation, content selection and modification, integration with other learning media, and the application of techniques. *prompt*, visual learning, student differentiation, and the use of interactive quizzes. From a learning management perspective, this series of strategies reflects a structured process of planning, implementation, and control in managing technology-based learning.

Utilizing AI in lesson preparation is a teacher's first step in designing lessons. Teachers use AI to generate ideas, organize materials, and create practice questions. This was expressed by resource person 1 (N1):

> *"I use ChatGPT as a personal aid in preparing lessons, finding ideas for explaining the material, and creating sample questions."*(N1)

This statement shows that AI helps teachers save time while enriching the variety of teaching materials. From a management perspective, this step reflects the planning function (*planning*), which is effective in optimizing digital resources to improve teacher work efficiency.

In addition to preparation, teachers also select content to ensure that the AI results align with learning objectives and student developmental levels. This selective attitude was demonstrated by resource person 2 (N2):

> *"Teachers must continue to research the validity of the information generated by AI."*(N2)

This shows that teachers are not passive towards technology, but still play a role as the main controller in learning. This action reflects the supervisory function (*controlling*) in learning management, where teachers validate and guarantee the quality of the materials used.

The next creative strategy is integrating AI with other learning media, such as PPT, videos, and LCD projectors. This integration aims to make learning more engaging and varied. This was conveyed by resource person 3 (N3):

> *"I combine AI results with interactive PPTs and learning videos."*(N3)

The integration of various media shows the existence of an organization (*organizing*) learning resources to create systematic and structured learning. Teachers manage various learning components into a single unit that supports the achievement of learning objectives.

In addition, teachers also realize the importance of techniques*prompt*in producing AI output that meets learning needs. Resource person 4 (N4) stated:

"Creating prompts that are correct and detailed as we want." (N4)

Mastery of techniques *prompts* shows that teachers' creativity is also reflected in the way they communicate with AI systems. In the context of learning management, this ability reflects professional competence in controlling quality *output* technology to comply with established planning.

The teacher then modified the content to match the language and difficulty level of the material to the students' characteristics. This was conveyed by resource person 2 (N2):

"I simplified the language so that it is easy for children to understand."(N2)

This action demonstrates the adjustment of learning strategies based on an analysis of student needs. From a management perspective, this step reflects context-based classroom decision-making to ensure effective learning.

Additionally, teachers are leveraging AI to support visual learning, such as through the use of images or illustrations. This was conveyed by resource person 4 (N4):

"If you want to explain, I ask AI to help me create a picture." (N4)

The use of visualization demonstrates innovation in managing learning media to enhance student engagement and understanding. This strategy also demonstrates teachers' ability to optimize technology as part of managing the learning experience.

Another strategy implemented by teachers is learning differentiation, which involves adapting the use of AI to students' abilities and needs. Resource person 1 (N1) stated:

"I always adapt the use of AI media to the characteristics of the students."(N1)

This approach shows that teachers consider the variation in students' abilities in designing learning, which in educational management reflects needs-based planning (*needs-based planning*).

Finally, teachers developed AI-based interactive quizzes to increase student engagement. This was expressed by resource person 1 (N1):

"I turn my training into a quiz so that the children are more enthusiastic."(N1)

The use of interactive quizzes indicates the existence of an implementation strategy (*actuating*) aimed at increasing participation and motivation in learning. Thus, creative strategies for utilizing AI not only demonstrate pedagogical innovation but also illustrate a systematically planned, organized, and controlled learning management process.

3.1.3. Impact of AI Utilization

Figure 4. Impact of AI Utilization

The impact of AI utilization is an indicator of the success of teachers' strategies in integrating technology into learning. This theme describes the various positive changes experienced by both teachers and students after using AI-based learning media. Specifically, these impacts include improved student understanding, learning effectiveness, increased motivation to learn, the emergence of positive student responses, and the role of teacher creativity in optimizing the use of AI. From an educational management perspective, these impacts can be understood as the result of planned and controlled technology-based learning management.

The use of AI has been proven to improve students' understanding of learning materials. The visual media and varied explanations generated by AI help students understand more easily the concept conveyed by the teacher. This was expressed by resource person 1 (N1):

"Students seem to understand the material more easily because the explanations are more interesting and varied."(N1)

These findings indicate that AI-based media management contributes to improving the quality of the learning process. In the context of learning management, improved student understanding is an indicator of the effectiveness of implementing pre-planned strategies.

Furthermore, teachers believe that the use of AI makes the learning process more effective. AI helps teachers prepare materials and present lessons more engagingly, preventing monotony. This was conveyed by resource person 3 (N3):

"The use of AI media is very effective because learning is no longer monotonous."(N3)

This effectiveness reflects efficiency in the management of time and learning resources. From an educational management perspective, this efficiency demonstrates the optimization of the planning and implementation functions of technology-based learning.

These positive impacts are inseparable from the role of teacher creativity in managing technology. Teachers recognize that AI will provide maximum benefits if used creatively and appropriately within the learning context. This was emphasized by resource person 1 (N1):

"AI is effective if teachers are creative in using it."(N1)

This statement emphasizes that technology is not the primary factor in success, but rather how it is managed. Teacher creativity in this context reflects professional competence as learning managers capable of strategically integrating digital resources.

The use of AI also increases students' motivation to learn. Interactive and varied learning makes students more enthusiastic about participating in learning activities. This was expressed by resource person 2 (N2):

"It really influences children's motivation to participate in learning."(N2)

Increased motivation demonstrates that AI-based learning strategies can create a more participatory learning environment. In learning management, student motivation is one indicator of the quality of the ongoing learning process.

In addition to motivation, students also responded positively to the use of AI media. Students appeared enthusiastic and eager to continue trying AI-based learning activities. This was conveyed by resource person 3 (N3):

"The students were very enthusiastic and wanted to try again."(N3)

These positive responses demonstrate that AI integration impacts not only students' cognitive aspects but also their affective aspects. From a managerial perspective, these findings demonstrate that well-managed AI-based learning strategies can improve the overall quality of the learning experience.

3.1.4. Implementation Constraints and Support

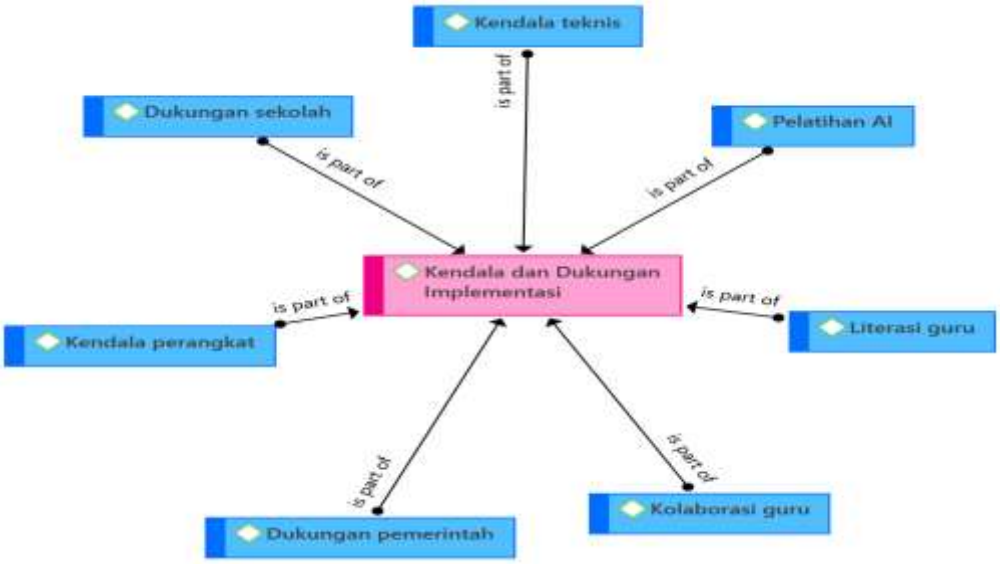

Figure 5. Implementation Constraints and Support

Implementation constraints and support are crucial factors influencing the successful use of AI-based learning media in elementary schools. This theme describes the various obstacles teachers face and the types of support needed for optimal AI implementation. Specifically, these constraints and support encompass technical aspects, device limitations, teacher literacy, training needs, school and government support, and collaboration between teachers. From an educational management perspective, these factors are closely related to resource management, organizational policies, and the ongoing development of professional competencies.

The main obstacle teachers face is technical difficulties, particularly unstable internet connections. This situation hinders the smooth use of AI in learning. This was conveyed by resource person 1 (N1):

"Unstable internet access can hinder the use of AI media."(N1)

These obstacles demonstrate that technological infrastructure is a crucial component of educational facilities and infrastructure management. Without adequate technical support, the consistent implementation of AI-based learning innovations is difficult.

In addition to technical challenges, teachers also face limited and unequal distribution of devices. This results in less than optimal use of AI in the classroom. Interviewee 2 (N2) stated:

"Access to devices is still limited; not all students have them."(N2)

These limitations indicate the need for more systematic planning of resource procurement and distribution in school management so that access gaps can be minimized.

Another obstacle is teachers' limited literacy in AI technology. This impacts their confidence in using AI-based learning media. Interviewee 3 (N3) explained:

"Knowledge about AI is still limited."(N3)

This situation emphasizes that human resource capacity development is a strategic aspect of schools' digital transformation. Without competency development, technology-based innovation will not have an optimal impact.

To overcome these various obstacles, teachers emphasized the importance of ongoing AI training. Training is seen as a means of improving teachers' professional competence. This was conveyed by resource person 4 (N4):

"Training is needed to increase knowledge about AI and how to apply it." (N4)

This training reflects the function of educational human resource development management, which aims to improve the professionalism and readiness of teachers in adopting innovation.

In addition to training, teachers also need school support in the form of facilities and policies that support learning innovation. Resource person 1 (N1) stated:

"Schools need to provide adequate devices and internet networks."(N1)

The school's support demonstrates the importance of leadership and internal policies in creating a conducive digital learning ecosystem.

Teachers also hope for government support, particularly in terms of policies and the provision of infrastructure. This was conveyed by resource person 3 (N3):

"We need support from the government regarding facilities and policies."(N3)

This expectation shows that AI implementation is not only the responsibility of individual teachers but also requires synergy between schools and policymakers in managing technology-based education.

Furthermore, collaboration between teachers is a crucial supporting factor in developing AI-based learning practices. Collaboration allows teachers to share experiences and strategies. Interviewee 2 (N2) explained:

"We often discuss and share experiences with fellow teachers."(N2)

This collaboration reflects the practice *professional learning community,* which plays a role in strengthening innovation through reflection and collaborative learning. In the context of educational management, a collaborative culture is a crucial element in ensuring the sustainable implementation of AI-based learning innovations.

3.2. Discussion

This research shows that the success of strategies to foster teacher creativity in utilizing AI-based learning media in elementary schools is not solely determined by the availability of technology. The primary determinant of success is the role and competence of teachers as key actors in the learning process. From an educational management perspective, these findings emphasize that technology is a supporting resource, while its effectiveness depends heavily on the quality of learning management by teachers as classroom managers. Teachers are no longer positioned as passive users of technology, but rather as learning designers capable of integrating AI pedagogically and strategically. Through this integration, teachers can build both cognitive understanding and character development in students. With adequate professional competence, teachers are able to transform AI technology into a learning tool that is challenging, meaningful, and relevant to students' life contexts.

3.2.1. Teachers' Understanding and Attitudes Toward AI-Based Learning Media

Research findings indicate that teachers perceive AI as a pedagogical tool that supports the planning and implementation of learning, not as a substitute for the teacher's role. This finding is consistent with previous research stating that the integration of AI into education is highly dependent on teachers' perceptions of its value and benefits in the learning context (Revenaya, 2025). Within the framework of learning management, a positive perception of innovation is a prerequisite for the adoption and implementation of technology-based policies in schools.

AI in elementary schools serves to make learning more adaptive, personalized, and interactive, so teachers need to understand the pedagogical role of this technology before implementing it strategically. This understanding reflects a planning process (*planning*) mature, where teachers consider the suitability of technology to learning objectives and student characteristics.

The teacher's selective and reflective attitude towards AI results shows that the teacher's role remains *agentic* in education, not just as a passive user of technology. This role emphasizes the existence of a supervisory function (*controlling*) in learning management, where teachers evaluate and adjust AI output before implementing it in the classroom. Findings from a study in the Indonesian context indicate that teacher readiness and pedagogical adaptation to AI-integrated learning are critical aspects for optimizing the use of this technology in the classroom (Susilowati et al., 2025).

Thus, strengthening teachers' AI literacy competencies is not only a technical requirement but also part of a school's human resource development strategy. This literacy development plays a role in ensuring that AI integration is carried out critically, ethically, and oriented towards improving the quality of learning. In the context of educational management, individual teacher readiness is a key indicator of the success of digital transformation at the elementary school level.

3.2.2. Creative Strategies for Utilizing AI

Creative strategies developed by teachers, such as the use of AI in material preparation, content selection, media integration, techniques *prompt*, as well as interactive quiz design, demonstrate that AI is not merely a technical tool but a means of pedagogical expression. From a learning management perspective, this strategy reflects a conscious and structured process of planning and organizing technology-based learning. This finding aligns with the idea that AI can enhance teacher creativity when combined with strong pedagogical knowledge (Arini Rusda et al., 2025). This suggests that teacher creativity is not simply a spontaneous outcome but a product of systematic learning management.

In the literature, the integration of AI with other learning media has also been associated with increased student engagement and a variety of teaching strategies, which is in line with the approach *blended learning* and *student-centered learning. Studies* show that creatively designed uses of AI can expand learning activities through technology-enhanced personalization and interaction (Garzón et al., 2025). From an educational management perspective, this integration reflects the organizing function (*organizing*) of learning resources to create a more effective, adaptive, and participatory learning experience.

The application of techniques *prompts* explicit practices by teachers that reflect the ability to integrate technology into the learning process in a planned and meaningful manner. This practice demonstrates mastery of *Technological Pedagogical Content Knowledge* (TPACK), namely the competency in integrating aspects of content, pedagogy, and technology. In the context of learning management,

mastery of TPACK represents a teacher's professional capacity as a manager of digital learning innovation. This aligns with the findings of Arini Rusda et al. (2025), who emphasized that the successful use of learning technology is greatly influenced by the teacher's ability to synergistically manage these three components.

Thus, teachers' creative strategies for utilizing AI can be understood as a planned, organized, and oriented implementation of technology-based learning management aimed at improving the quality of the learning process. In this context, teacher creativity is not merely a technical innovation, but rather part of a learning management strategy that supports digital transformation in elementary schools.

3.2.3. The Impact of AI Utilization on Learning

Research findings indicate that the use of AI contributes to improved student understanding, learning motivation, and learning effectiveness. These results align with research suggesting that AI can transform the learning process through adaptive feedback, personalized learning, and the presentation of more contextual learning experiences (Revenaya, 2025). From a learning management perspective, this transformation demonstrates that systematically designed AI integration can enhance the quality of the learning process as part of efforts to improve the quality of education at the elementary school level. Thus, AI functions not only as a technical tool but also as a learning support tool that is responsive to students' learning needs.

Draft *learner engagement* Zhou & Peng (2025) stated that the use of AI can increase student engagement in the learning process, which in turn impacts learning outcomes such as creativity and quality of understanding. The results of this study confirm these findings by showing that positive student responses dominate AI-based learning experiences. High student engagement indicates that AI is able to create a more interactive and meaningful learning environment. Within the framework of educational management, increased student engagement is an important indicator of the successful implementation of learning strategies, as it reflects the effectiveness of implementation (*actuating*) and the relevance of the planning that the teacher has done.

The teacher's emphasis that the positive impact of AI depends heavily on creativity in its use demonstrates that technology cannot automatically provide benefits in learning. Teachers need to manage and direct the use of AI to align with learning objectives and student characteristics. This view aligns with Garzón et al. (2025), who emphasized the importance of *pedagogical orchestration* by teachers in integrating technology contextually and meaningfully in the learning process. In the context of learning management, *pedagogical orchestration*AI can be understood as a form of control and coordination of various learning resources to ensure they align with predetermined objectives. Therefore, the positive impact of AI on learning is not solely a result of technological advancements, but rather the quality of learning management carried out by teachers in a planned and reflective manner.

3.2.4. Implementation Constraints and Support

Technical constraints in the form of limited internet networks and devices are findings that are in line with various studies that identify *infrastructure readiness* as a major inhibiting factor in AI integration in elementary schools (Heung et al., 2025; Revenaya, 2025). From an educational management perspective, infrastructure readiness is part of the management of facilities and infrastructure that determines the sustainability of technology-based learning innovations. Without adequate facility

support, AI-based learning strategies are difficult to implement consistently and equitably.

In addition, the low digital literacy of teachers regarding AI indicates the need for continuous training (*professional development*) so that teachers not only possess technical competence but also can pedagogically integrate AI into the learning process (Tan et al., 2025). Within the framework of human resource management, teacher professional development is a key strategy to ensure the effectiveness of digital transformation. Structured and ongoing training not only improves technical skills but also strengthens teachers' pedagogical and reflective readiness in managing innovation.

School and government support in providing facilities and educational policies act as external factors moderating the success of AI implementation in schools, as demonstrated in a study highlighting the importance of policies and training programs in the use of AI in education (Inggi Turnando et al., 2025). From an educational management perspective, visionary policies and structural support reflect the leadership and organizational functions in creating a conducive digital learning ecosystem.

Furthermore, collaboration between teachers contributes to the development of AI-based learning practices through the exchange of experiences and learning strategies. This finding aligns with research that emphasizes the importance of communities of practice as a platform for sharing knowledge and innovation in the use of educational technology. In the context of school management, this collaborative practice represents the formation of a *professional learning community,* which strengthens an organizational culture based on learning and innovation. This collaboration not only supports individual competency development but also strengthens the sustainability of AI implementation through collective learning.

Thus, the obstacles and supports for AI implementation show that the success of technology integration in elementary schools is not only determined by the creativity of individual teachers, but also by the readiness of the system, leadership, policies, and structured and sustainable resource management.

4. CONCLUSION

Based on the research results and discussion, it can be concluded that teachers' understanding and attitudes toward AI-based learning media are the primary foundation for successful technology integration in elementary schools. Teachers view AI as a pedagogical tool, not a substitute for the role of educators, ensuring its use remains within pedagogical and ethical boundaries. Teachers' selective and reflective attitudes toward AI outcomes demonstrate that technology is managed critically and responsibly in the learning process.

Creative strategies for utilizing AI are reflected through the use of AI in teaching preparation, content selection and modification, integration with other learning media, application of techniques, *prompt*, visual learning, student differentiation, and interactive quiz development. These strategies demonstrate that teacher creativity is not simply technical innovation, but rather the result of planned and structured learning management that integrates AI-based technology.

The use of AI-based learning media has a positive impact on improving student understanding, motivation, learning effectiveness, and positive student responses. These findings confirm that AI can improve the quality of the learning process when managed creatively and contextually by teachers, the primary actors in the learning process.

However, AI implementation still faces challenges such as limited internet access, uneven distribution of devices, and the need to improve teachers' digital literacy. Therefore,

successful AI integration requires ongoing support in the form of professional training, adequate facilities and infrastructure, supportive policies from schools and the government, and strengthened collaboration among teachers to ensure the sustainability of AI-based learning innovations.

This research is still limited to a case study in one elementary school with a limited number of subjects, so the results cannot be widely generalized. Therefore, further research can be conducted with a broader scope and involving various school contexts to obtain a more comprehensive picture of AI integration strategies in learning. Further research can also be directed at developing a more structured and applicable AI-based learning management model as a reference for digital transformation policies in elementary school education.

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