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Teachers' Pedagogical Adaptation to Artificial Intelligence-Enhanced Learning: Practices and Challenges in an Islamic Senior Secondary School

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Abstract

This study aims to analyze teachers' pedagogical adaptation to the use of Artificial Intelligence (AI) in learning at MAN 1 Lubuklinggau, focusing on teachers' understanding and utilization of AI, the challenges encountered, and pedagogical adaptation strategies for integrating AI ethically, pedagogically, and contextually. This study employed a qualitative approach using an instrumental case study. Participants were selected through purposive sampling and consisted of the head of the madrasah, the vice principal for curriculum, teachers who use AI, and students as supporting informants. Data were collected through observation, interviews, literature study, and documentation. Data were analyzed using the Miles and Huberman interactive model and validated through source and technique triangulation. The findings indicate that teachers' understanding of AI varies, and AI is primarily utilized as a supporting tool for preparing learning materials, finding references, developing learning media, and designing evaluation instruments. Pedagogical adaptation occurs during the planning, implementation, and evaluation stages, with teachers continuing to verify and adapt AI-generated outputs to learning objectives and students' characteristics. The challenges include differences in digital competence, limited prompt-writing skills, difficulties in selecting appropriate AI applications, limited time, the need to verify information, and inadequate supporting facilities. Teachers respond through training, workshops, self-directed learning, and collaboration. Institutional support from the madrasah is also essential for sustaining adaptation. These findings demonstrate that AI utilization is a process of professional adaptation that maintains the teacher's role as a designer, facilitator, guide, and evaluator of learning.

Keywords: Artificial Intelligence; Learning; MAN 1 Lubuklinggau; Pedagogical Adaptation; Teachers

INTRODUCTION

The rapid development of digital technology has brought significant changes to various aspects of social life, including education. The 21st century is characterized by complex and accelerated technological transformations that require educational institutions to continuously adapt to changing learning needs. One of the most influential technological developments in recent years is artificial intelligence (AI), which has increasingly been integrated into educational practices. AI provides opportunities for educators to support lesson planning, develop learning materials, design instructional media, conduct assessments, and provide feedback to students. Consequently, the integration of AI into education is no longer merely a technological innovation but has become part of the broader transformation of teaching and learning practices (Destiana et al., 2025; Efendi et al., 2025).

The utilization of AI offers considerable potential for improving the efficiency and effectiveness of learning. Teachers can use AI-based applications to develop instructional materials, generate learning media, prepare assessment instruments, and provide learning resources that are more responsive to students' needs. AI can also support differentiated learning by helping teachers develop materials and instructional strategies based on students'

abilities, interests, and learning needs (Kadri & Achyar, 2024; Sinaga et al., 2025). In addition, AI can assist teachers in preparing formative and summative assessments, developing questions, providing feedback, and analyzing students' learning outcomes (Hanis & Wahyudin, 2024). These developments indicate that AI has the potential to strengthen teachers' pedagogical practices when its utilization is aligned with learning objectives and students' characteristics.

However, the integration of AI into education also requires teachers to develop new competencies and adapt their pedagogical practices. Teachers are not only expected to possess technical skills in operating digital technologies but also need to understand how technology can be meaningfully integrated with pedagogy and subject matter. Digital competence is therefore closely related to pedagogical competence because the effective use of technology depends on teachers' ability to select, modify, and apply appropriate technological tools to support learning (Sitompul et al., 2022; Sujarwati et al., 2025). In the context of AI, pedagogical adaptation involves changes in how teachers plan, implement, assess, and interact with students while maintaining the essential role of teachers as facilitators and learning guides. Previous studies have indicated that teachers' adaptation to AI is influenced by perceived benefits, challenges, adaptation strategies, and institutional support (Susandi et al., 2025).

The need for pedagogical adaptation becomes increasingly important because the use of AI also presents ethical and pedagogical challenges. Although AI can facilitate various teaching activities, excessive dependence on AI may reduce students' critical thinking, creativity, and learning independence. The use of AI may also raise concerns regarding academic integrity, information accuracy, data privacy, and the quality of interaction between teachers and students (Paramita et al., 2025; Harahap & Irdayani, 2026). From the teachers' perspective, excessive reliance on technology may also affect the humanistic dimensions of education, including empathy, pedagogical intuition, and creativity (Sucipto, 2024). Therefore, AI should function as a supporting technology rather than a substitute for teachers' professional judgment and interpersonal roles. Teachers need to maintain a balance between technological utilization and pedagogical considerations so that AI contributes to meaningful, ethical, and student-centered learning (Hadi et al., 2025; Khoiril et al., 2026).

These challenges are particularly relevant in madrasahs, which have distinctive institutional, cultural, and educational characteristics. Madrasahs combine general education with religious education and operate within values and norms that need to be maintained alongside technological developments. Therefore, the integration of AI in madrasah learning cannot be understood solely from the perspective of technological readiness. It also needs to be examined through teachers' pedagogical understanding, ethical considerations, institutional support, and their ability to maintain the values and characteristics of the madrasah. Previous research has shown that teacher readiness for AI-based learning encompasses not only technical aspects but also reflective, ethical, and pedagogical dimensions (Susilowati et al., 2025). Furthermore, teachers' digital competence in madrasahs still requires continuous development through training and institutional support (Hanifah et al., 2025).

This condition can be observed at MAN 1 Lubuklinggau, where AI has begun to be introduced and utilized as part of digital learning development. The madrasah has facilitated teacher training in the use of AI-based applications, including Canva AI and Gemini AI, to support the development of instructional materials, learning media, and lesson planning. Several teachers have also begun to use applications such as ChatGPT, Gemini AI, Canva AI, Gamma AI, and Claude AI for various instructional purposes. However, an initial survey conducted by the researcher on June 5, 2026, involving 68 teachers showed that only 19 teachers (27.94%) had utilized AI in learning, while 49 teachers (72.06%) had not yet utilized it optimally. Teachers also reported several challenges, including limited time to learn AI, difficulties in creating effective prompts, difficulties in integrating AI into classroom learning, concerns about the accuracy of AI-generated information, and limited digital skills.

Previous studies have examined various aspects of AI integration in education. Research has discussed teacher readiness for AI-based learning, the use of AI applications to improve pedagogical competence, teacher training, technological adaptation, and the psychological readiness of educators (Susilowati et al., 2025; Sarah et al., 2024; Wildanah et al., 2025; Wagio & Zailani, 2026). Other studies have highlighted the challenges teachers face in integrating technology and the importance of institutional support, collaboration, and continuous professional development (Sinlae et al., 2026; Susandi et al., 2025). Nevertheless, much of the existing research focuses on technological readiness, training outcomes, or the use of particular AI applications. Relatively limited attention has been given to the process through which teachers adapt their pedagogical practices when integrating AI into the overall learning process, particularly within the distinctive context of a madrasah. Therefore, this study focuses on the pedagogical adaptation of teachers in utilizing Artificial Intelligence in learning at MAN 1 Lubuklinggau. The study examines teachers' understanding and forms of AI utilization in lesson planning, learning implementation, and assessment, as well as the challenges and strategies involved in the adaptation process. The study also seeks to understand how teachers integrate AI in ways that are ethical, pedagogically appropriate, and contextual to the characteristics of the madrasah. This focus is important because effective AI integration depends not merely on whether teachers use AI, but on how they adapt their pedagogical competencies and practices to ensure that technology supports learning objectives without diminishing the role of teachers or the humanistic values of education.

To analyze this process, the study employs Talcott Parsons' structural functionalism, particularly the AGIL framework consisting of Adaptation, Goal Attainment, Integration, and Latency. The framework is used to examine how teachers adapt to technological changes, utilize AI to achieve learning objectives, integrate AI use with institutional rules and the culture of the madrasah, and maintain educational values, ethics, and teacher professionalism. Through this perspective, pedagogical adaptation to AI can be understood not only as an individual technological response but also as part of a broader process of maintaining the effectiveness, integration, and continuity of the educational system.

Based on this background, the present study aims to analyze teachers' pedagogical adaptation to the utilization of artificial intelligence in learning at MAN 1 Lubuklinggau, including the forms of adaptation, challenges encountered, and strategies developed by teachers in integrating AI into learning practices. The study contributes to the growing discussion on teacher adaptation, digital transformation, and AI integration in education, particularly within the context of madrasah education in Indonesia.

METHODS

This study employed a qualitative approach using an instrumental case study design. The qualitative approach was selected to obtain an in-depth understanding of teachers' pedagogical adaptation to the use of artificial intelligence (AI) in learning within its real-life context. A case study is appropriate for investigating contemporary phenomena in real-life settings, particularly when the research focuses on how and why questions and the researcher has limited control over the phenomenon being examined (Yin, 2014). The study specifically adopted an instrumental case study because the selected case was used as a means to gain a deeper understanding of the broader phenomenon of teachers' pedagogical adaptation to AI. In this study, MAN 1 Lubuklinggau served as the case through which the researchers examined how teachers adapted their pedagogical practices in lesson planning, learning implementation, and assessment, as well as the challenges and adaptation strategies associated with AI integration.

The research was conducted at MAN 1 Lubuklinggau, located on Jalan Jenderal Sudirman No. 02 RT.001, Kali Serayu Village, Lubuk Linggau Utara II District, Lubuklinggau City, South Sumatra. The site was purposively selected because the madrasah had begun integrating AI into learning through the development of digital classrooms and the implementation of teacher

training related to AI utilization. An initial survey involving 68 teachers also indicated differences in the level of AI utilization among teachers, with some teachers already using AI in learning while others had not yet utilized it optimally. These conditions made MAN 1 Lubuklinggau a relevant setting for examining the process of pedagogical adaptation to AI in an educational institution.

The participants were selected using purposive sampling. This technique was employed because the informants were required to possess relevant knowledge, experience, and information concerning the phenomenon under investigation. Informants consisted of the head of MAN 1 Lubuklinggau, one vice principal responsible for curriculum, six to ten teachers who had used AI in learning, and six to ten students who served as supporting informants. The teacher informants were selected based on several criteria, including being actively involved in teaching during the research period, having used AI in learning for at least one semester, having utilized AI in one or more stages of learning such as lesson planning, learning media development, assessment preparation, or teaching-material development, being willing to provide or discuss relevant learning documents, and being willing to participate as research informants. Student informants were selected based on their experience participating in AI-supported learning, active participation in learning activities, ability to explain their learning experiences, and willingness to participate in the study. The selection of informants was consistent with the principle that qualitative informants should be individuals who are capable of providing relevant and in-depth information about the research phenomenon (Rany & Yunita, 2022).

Data were collected through observation, semi-structured interviews, and documentation. Observation was conducted to examine teachers' pedagogical adaptation in the actual learning context, particularly their use of AI in preparing teaching materials, developing AI-assisted learning media, implementing learning activities, and conducting learning assessment. In qualitative research, observation involves systematic processes of observing and remembering phenomena occurring in the research setting (Sugiyono, 2017). Semi-structured interviews were conducted with the head of the madrasah, the vice principal for curriculum, teachers who used AI in learning, and students as supporting informants. The interviews explored teachers' understanding and experiences of AI, forms of AI utilization, challenges encountered, ethical considerations, and strategies used to adapt pedagogically. Interviews with students were conducted to obtain supporting information regarding their experiences, responses, and perceptions of AI-supported learning. Interviews continued until the information obtained was considered adequate and no substantially new information emerged.

Documentation was used to complement and verify the data obtained through observation and interviews. The documented materials included lesson plans, teaching modules, assessment questions, learning media, students' work, and madrasah policies related to AI utilization. Documentation can provide supporting information in the form of written records, archives, reports, numerical data, and visual materials relevant to the research process (Aruan et al., 2022). In this study, documents were not merely collected as supplementary evidence but were analyzed to identify concrete evidence of AI utilization in learning.

The data sources and collection techniques were aligned with the research questions. Information regarding teachers' understanding of AI was obtained primarily from AI-using teachers and the vice principal for curriculum through interviews and documentation. Data concerning the implementation of AI in lesson planning, learning activities, and assessment were obtained from teachers and learning documents through interviews, observations, and documentation. Information concerning challenges was obtained from AI-using teachers and the head of the madrasah, while data concerning teachers' pedagogical adaptation strategies were obtained from teachers, the head of the madrasah, and the vice principal for curriculum. Students were involved as supporting informants to provide information concerning their experiences with AI-supported learning.

The trustworthiness of the data was established through source triangulation and technique triangulation. Source triangulation was conducted by comparing information obtained from different informants, including the head of the madrasah, the vice principal for curriculum, teachers who used AI, and students. This process was intended to examine the consistency of information obtained from different perspectives. Technique triangulation was conducted by comparing information obtained through interviews with findings from observations and documentation. For example, teachers' statements concerning the use of AI in developing teaching modules, learning media, and assessments were compared with classroom observations, learning documents, and information provided by the vice principal for curriculum. Triangulation is used in qualitative research to strengthen the credibility and validity of findings by comparing information obtained from different sources and data collection techniques (Nurfajriani et al., 2024).

Data analysis was conducted using the interactive model developed by Miles and Huberman (2022). The analysis was carried out continuously throughout the research process, beginning during data collection and continuing until the formulation of the final conclusions. The analytical process consisted of data reduction, data display, and conclusion drawing and verification. During data reduction, interview recordings were transcribed verbatim and the collected data were read and examined comprehensively. Relevant information was then coded according to the research focus, including teachers' understanding of AI, the use of AI in lesson planning, learning implementation and assessment, supporting and inhibiting factors, and teachers' pedagogical adaptation strategies. Codes with similar meanings were subsequently grouped into categories and themes to identify patterns of pedagogical adaptation.

Following data reduction, the data were displayed in narrative form according to the themes identified during the analysis and were supported by relevant statements from informants. Data displays also took the form of matrices, categorization tables, and thematic relationships to facilitate the identification of patterns and connections among the findings. The final stage involved drawing and verifying conclusions. Preliminary conclusions were continuously examined through source triangulation, technique triangulation, member checking, and re-examination of interview, observation, and documentation data. The final conclusions represented interpretations of consistent patterns identified in the field and verified throughout the research process (Miles & Huberman, 2022).

RESULT AND DISCUSSION

Results

The findings of this study reveal that teachers' pedagogical adaptation to the use of artificial intelligence (AI) at MAN 1 Lubuklinggau is a gradual process influenced by institutional support, teachers' understanding of AI, practical experience, and the ability to maintain pedagogical and ethical principles. The data were obtained through interviews, observations, and documentation involving the head of the madrasah, the vice principal for curriculum, teachers who had implemented AI in learning, and students as supporting informants. The findings indicated that AI has increasingly become part of teachers' instructional practices, although its implementation has not been evenly distributed across all teachers and classes.

The first finding concerns the institutional support provided by MAN 1 Lubuklinggau for AI implementation. The madrasah demonstrates a positive attitude toward the development of AI and provides opportunities for teachers to develop their digital competencies. This support is manifested through training, workshops, the development of digital classes, and encouragement for teachers to utilize AI in preparing instructional materials, learning media, and assessment instruments. The madrasah has also facilitated teachers through training activities involving Canva AI and Gemini AI. Nevertheless, the institutional policy emphasizes that AI functions as a supporting technology rather than a replacement for teachers. Teachers remain responsible for verifying AI-generated information and determining whether it is

appropriate for the learning objectives, curriculum, students' characteristics, and the values upheld by the madrasah. The institutional support therefore operates not merely as technological provision but also as a mechanism for guiding responsible and pedagogically appropriate AI use.

The second finding relates to teachers' understanding of AI. The participating teachers generally understand AI as a technological tool that can assist them in finding references, preparing teaching materials, developing learning media, designing learning activities, and preparing assessment instruments. However, the level of understanding varies among teachers. Teachers who have more experience using AI or have participated more frequently in training tend to demonstrate a broader understanding of its functions. In contrast, teachers with less experience tend to use AI for relatively basic purposes, particularly information searching and material preparation. An important finding is that teachers do not regard AI-generated information as automatically valid. They recognize the necessity of checking, modifying, and contextualizing AI-generated content before using it in classroom learning. This indicates that teachers' understanding has developed beyond technical proficiency toward a more critical understanding of the role and limitations of AI.

The third finding concerns the forms of pedagogical adaptation demonstrated by teachers in the planning, implementation, and evaluation stages of learning. At the planning stage, teachers utilize AI to assist in preparing teaching modules, formulating learning activities, finding additional references, developing learning ideas, and creating instructional media. AI enables teachers to accelerate several routine aspects of lesson preparation. However, the materials generated by AI are not directly transferred into classroom practice. Teachers select, modify, and validate the generated content to ensure its relevance to learning objectives and students' needs. Thus, AI functions as an additional resource in lesson planning, while pedagogical decisions remain under the control of teachers.

During the implementation stage, teachers use AI to enrich learning resources and provide students with more varied forms of information. AI-supported materials can make classroom activities more interactive and provide students with additional explanations and examples. Nevertheless, teachers continue to function as facilitators and guides. They clarify information, correct inaccurate content, and encourage students not to accept AI-generated answers without understanding the concepts behind them. This adaptation is particularly visible in the Budaya Gemar Membaca (BGM) activity, in which students in Grade X were given opportunities to use Canva AI and available templates to create infographics. Teachers did not take over the production process but provided consultation and guidance throughout the activity. The role of the teacher consequently shifted from being primarily an information provider toward becoming a facilitator who helps students select, use, evaluate, and take responsibility for technology.

At the evaluation stage, teachers utilize AI to generate variations of questions, develop assessment rubrics, and design alternative forms of evaluation. Although AI can produce assessment materials efficiently, teachers continue to adjust the difficulty level, content relevance, and alignment with learning objectives. In the BGM infographic activity, assessment was not limited to the final visual product. Students were also required to explain the process of creating their infographics, the sources of information used, and the technologies or applications involved. This practice demonstrates an adaptation of assessment toward evaluating both the learning process and the final product. Such an approach enables teachers to determine whether students genuinely understand and can account for the work they produce rather than merely assessing an AI-assisted final product.

The fourth finding concerns students' experiences with AI-supported learning. Students generally perceive AI integration positively. They consider AI useful because it provides broader access to information, offers additional explanations, increases the variety of learning resources, and makes learning activities more interesting. Students also demonstrate greater opportunities to explore learning materials independently. However, students continue to rely

on teachers when AI-generated information is unclear, too lengthy, difficult to understand, or inconsistent with the explanation provided in class. Some students also experience difficulties resulting from limited internet connectivity and access to digital devices. These findings indicate that AI contributes to changes in students' learning experiences but does not eliminate the need for teacher guidance.

The fifth finding concerns the challenges and strategies associated with teachers' pedagogical adaptation. Teachers experience difficulties in creating effective prompts, selecting appropriate AI applications, verifying AI-generated information, and integrating AI into existing instructional practices. Differences in teachers' digital competencies and the uneven availability of technological facilities across classes also influence the process. The preliminary survey conducted by the researcher showed that 19 of 68 teachers, or 27.94%, had utilized AI in learning, while 49 teachers, or 72.06%, had not yet utilized it optimally. The most frequently reported challenges included limited time to learn AI, difficulties in developing effective prompts, difficulties integrating AI into classroom learning, concerns regarding information accuracy, and limited digital skills. These challenges, however, did not stop the adaptation process. Teachers responded by engaging in independent learning, participating in institutional training and workshops, discussing AI use with colleagues, and repeatedly practicing AI-supported learning activities.

Discussion

The findings demonstrate that pedagogical adaptation to AI at MAN 1 Lubuklinggau should be understood as a professional and organizational process rather than merely the acquisition of technical skills. Teachers are not simply learning how to operate AI applications; they are also reconstructing aspects of their instructional practices while maintaining control over learning objectives, content, classroom interaction, and assessment. This finding is consistent with the view that digital transformation requires teachers to continuously adjust their professional competencies to technological development (Suryani, 2026). In this context, AI becomes meaningful pedagogically when teachers are able to connect technological capabilities with pedagogical considerations and subject matter.

Institutional support emerges as one of the most important factors facilitating this adaptation. The training, workshops, digital learning facilities, and encouragement provided by MAN 1 Lubuklinggau create an organizational environment in which teachers can gradually develop their competencies. This finding corresponds with Susandi et al. (2025), who found that teachers' adaptation to AI is influenced not only by perceived benefits and challenges but also by adaptation strategies and support from the school environment. Similarly, Wildanah et al. (2025) demonstrated that AI training can improve teachers' understanding and ability to develop learning content, while Budiarti et al. (2024) emphasized the contribution of AI training to teachers' ability to innovate learning media. Therefore, institutional support should be understood as a structural condition that enables individual teachers to engage in technological adaptation.

From the perspective of Talcott Parsons' structural-functional theory, institutional support reflects the function of Integration within the AGIL framework. A social system requires coordination among its different components so that individual actions remain consistent with shared norms, values, and organizational expectations (Ritzer, 2012). In this study, MAN 1 Lubuklinggau functions as a social system that integrates AI into teachers' professional practices through policies, training, digital learning environments, and professional guidance. AI is therefore not introduced as an isolated technological innovation but as part of an existing educational structure. This finding is consistent with Efendi et al. (2025), who argue that the effectiveness of AI implementation depends on the ability of educational institutions to align technological development with educational principles.

The findings concerning teachers' understanding of AI further demonstrate that pedagogical adaptation depends strongly on teachers' ability to critically evaluate technology.

Teachers' recognition that AI-generated information must be verified indicates that they do not treat AI as an unquestionable source of knowledge. This finding is important because AI-generated information may not always correspond to the curriculum, students' needs, or the specific learning context. Hermaul et al. (2025) similarly emphasize the importance of understanding the use of AI in classroom learning, while Hanifah et al. (2025) indicate that teachers in the digital era require continuous competency development to optimize technological use in education. The findings also support Susilowati et al. (2025), who emphasize that teacher readiness for AI-integrated learning involves not only technical dimensions but also reflective, ethical, and pedagogical dimensions.

The gradual differences in teachers' understanding can also be explained through the Adaptation function of Parsons' AGIL framework. Adaptation refers to the ability of a system and its members to respond to changes in the surrounding environment while maintaining their capacity to function effectively (Ritzer, 2012). The emergence of AI represents a significant environmental change within the educational system. Teachers respond to this change by learning different AI applications, participating in training, experimenting with AI, and gradually incorporating it into instructional practices. The process is not instantaneous because adaptation requires experience, learning opportunities, and continuous interaction with the changing environment.

The forms of pedagogical adaptation identified in this study demonstrate that AI influences the entire instructional cycle. During planning, AI contributes to efficiency by assisting teachers in preparing modules, learning activities, references, and instructional media. This finding supports Malau et al. (2026), who show that AI can assist teachers in preparing lesson plans, teaching modules, and assessment instruments. Sinaga et al. (2025) likewise emphasize the potential of AI-based learning models to support teachers in lesson planning. Nevertheless, the findings of the present study show that efficiency does not mean the transfer of pedagogical authority to AI. Teachers continue to select, modify, and validate AI-generated materials. This is consistent with the principle of digital pedagogical competence, which requires teachers not only to possess technological skills but also to make appropriate pedagogical decisions regarding technology use (Khairani, 2025).

During classroom implementation, AI provides teachers with opportunities to diversify learning resources and create more interactive experiences. This finding is consistent with Kadri and Achyar (2024), who highlight the potential of AI-based learning media to support differentiated learning. The use of Canva AI in the BGM infographic activity further demonstrates that AI can be incorporated into student-centered learning without eliminating teacher involvement. Rather than producing the students' work for them, teachers provide opportunities for students to use technology while maintaining their role as facilitators and mentors. This finding is also consistent with Hadi et al. (2025), who emphasize the importance of human-machine collaboration in education and the continuing role of teachers in guiding students' learning processes.

The findings regarding assessment are particularly important in the context of AI-assisted learning. AI can facilitate the production of questions, rubrics, and assessment materials, but the study shows that teachers continue to determine whether these materials are appropriate. This finding supports Hanis and Wahyudin (2024), who found that AI can be utilized in the preparation of formative and summative assessments. However, the present study extends this finding by demonstrating that AI-assisted assessment requires teachers to pay attention not only to the final product but also to the learning process. The BGM activity illustrates this approach because students were required to explain how their infographics were produced, where their information came from, and what technologies they used. Such an assessment strategy helps teachers evaluate students' actual understanding and responsibility rather than merely assessing the appearance of an AI-assisted product.

The role of teachers in maintaining control over pedagogical decisions can also be interpreted through the Goal Attainment function of AGIL. Parsons' framework emphasizes that

social systems must mobilize available resources to achieve established goals (Ritzer, 2012). In this study, AI is treated as one of the resources available to teachers to achieve educational objectives. Teachers use AI to save time, broaden learning resources, develop instructional media, and create more varied assessment instruments. Therefore, AI is not treated as the objective of learning itself. Instead, its value is determined by its contribution to the achievement of learning objectives.

Students' positive experiences further demonstrate the goal-oriented nature of AI integration. Students report that AI makes learning more interesting, provides broader information, and offers additional explanations. These findings are consistent with Sarah et al. (2024), who found that AI-supported learning technologies can encourage student participation, independent learning, and easier understanding of learning materials. However, the present findings also demonstrate that students continue to depend on teachers when AI-generated information is unclear or inconsistent with classroom explanations. This confirms that technological accessibility does not automatically eliminate the pedagogical function of teachers.

The continued importance of teacher guidance is closely related to the Latency function of AGIL, which concerns the preservation of values, norms, and patterns within a social system (Ritzer, 2012). Although AI changes the way information is produced and accessed, teachers at MAN 1 Lubuklinggau continue to maintain academic integrity, responsibility, critical thinking, and professional judgment. Students are encouraged not to copy AI-generated answers directly but to analyze and understand the information they obtain. This finding is important because excessive dependence on AI may reduce students' critical thinking and potentially weaken meaningful interaction between teachers and students. Sucipto (2024) argues that excessive dependence on technology may reduce teachers' pedagogical sensitivity if learning is excessively delegated to technological systems. Similarly, Rima et al. (2023) emphasize the importance of ethical technology use, information validation, data protection, and teacher supervision.

The challenges encountered by teachers indicate that pedagogical adaptation is a continuous process. Difficulties in creating effective prompts, evaluating AI-generated information, selecting suitable applications, and dealing with uneven digital competencies show that technological adaptation cannot be completed through a single training activity. This finding is consistent with Sinlae et al. (2026), who found that teachers' technology integration is affected by differences in individual competencies and institutional conditions. Rifian et al. (2025) also emphasize that both pedagogical and technological readiness are important factors in teachers' adoption of AI. Furthermore, Wagio and Zailani (2026) demonstrate that technical training combined with psychological readiness can strengthen educators' confidence and preparedness to utilize AI.

The strategies developed by teachers in response to these challenges demonstrate that adaptation occurs through continuous professional learning. Independent learning, participation in workshops, collaboration with colleagues, and repeated experimentation enable teachers to gradually improve their ability to formulate prompts, select appropriate applications, and integrate AI into classroom activities. This finding is consistent with Susandi et al. (2025), who emphasize the importance of adaptation strategies and school support in teachers' integration of AI. It also supports Wildanah et al. (2025), who demonstrate the importance of continuous training in improving teachers' competence in using AI.

Overall, the findings indicate that pedagogical adaptation at MAN 1 Lubuklinggau can be understood as a dynamic interaction between individual teacher competencies and the institutional environment. The Adaptation function is reflected in teachers' efforts to learn and adjust to AI; Goal Attainment is reflected in the use of AI to improve the effectiveness of learning; Integration is reflected in the alignment of AI use with madrasah policies, curriculum, and organizational culture; and Latency is reflected in the preservation of professionalism, academic integrity, ethical responsibility, and the human dimension of education. Thus, the

AGIL framework provides a comprehensive explanation of why AI integration can function within the madrasah without eliminating the central role of teachers.

The central contribution of this study is therefore the finding that AI-related pedagogical adaptation is not equivalent to technological adoption. The essential process occurs when teachers transform technological possibilities into pedagogically meaningful practices. Teachers remain responsible for determining learning objectives, selecting and validating information, guiding students, designing meaningful learning experiences, and evaluating students' understanding. AI functions as an enabling resource that can increase efficiency and expand learning possibilities, while teachers remain the primary actors responsible for pedagogical judgment. This finding is consistent with Khoiril et al. (2026), who emphasize that AI should function as a supporting instrument rather than replace the primary role of teachers.

Consequently, the adaptation of teachers at MAN 1 Lubuklinggau can be characterized as gradual, critical, contextual, and human-centered. It is gradual because teachers possess different levels of technological experience; critical because AI-generated information must be verified; contextual because its application must correspond to curriculum, students, and the madrasah environment; and human-centered because teachers continue to guide learning and maintain educational values. This pattern demonstrates that successful AI integration depends not simply on the availability of technology but on the interaction between teacher competence, institutional support, pedagogical judgment, and ethical responsibility.

CONCLUSION

Based on the findings of this study, pedagogical adaptation among teachers toward the use of artificial intelligence (AI) in learning at MAN 1 Lubuklinggau is a gradual professional process influenced by teachers' understanding, experience, digital competence, and institutional support. The findings indicated that teachers have different levels of understanding of AI, but generally recognize AI as a supporting technology that can improve the effectiveness and efficiency of learning. Teachers utilize AI to assist in preparing learning materials, finding references, developing instructional media, and designing assessment instruments. However, AI is not positioned as the primary source for pedagogical decision-making. Teachers continue to verify AI-generated information, adjust it to the curriculum and learning objectives, and consider the characteristics and needs of students. This demonstrates that AI functions as a complementary tool that supports teachers' professional roles rather than replacing teachers' pedagogical authority.

The study also indicates that teachers' pedagogical adaptation to AI occurs throughout the stages of learning planning, implementation, and evaluation. In the planning stage, AI is used to develop learning plans, identify relevant references, and generate ideas for learning activities, while the resulting information is still selected and adapted to the intended learning objectives and students' needs. During the implementation stage, AI is utilized to enrich learning resources and create more interactive learning experiences. Nevertheless, teachers remain actively involved as facilitators, guides, and mentors. This adaptation can be observed in the Budaya Gemar Membaca (BGM) activity, in which students were given opportunities to use Canva AI to create infographics while teachers provided guidance and consultation throughout the process. In the evaluation stage, teachers utilize AI to develop variations of questions, assessment instruments, and rubrics, while continuing to examine and modify AI-generated outputs. The evaluation process also emphasizes students' learning processes by examining the sources of information, the process of creating their work, and the applications used by students.

Despite these developments, the pedagogical adaptation process still faces several challenges. These include differences in teachers' digital competencies, limited ability to formulate effective prompts, difficulties in selecting appropriate AI applications, limited time to learn and explore AI, and the need to verify the accuracy and relevance of AI-generated information. The availability of supporting facilities and the uneven implementation of digital

learning also influence the optimization of AI utilization at the madrasah. Nevertheless, these challenges have encouraged teachers to continuously develop their digital, pedagogical, and technological literacy through training, workshops, self-directed learning, and collaboration with colleagues. Thus, the adaptation process should not be understood merely as teachers' ability to operate AI applications, but as their ability to integrate technology with pedagogical considerations and the learning context.

Institutional support also emerged as an important factor in sustaining teachers' pedagogical adaptation to AI. MAN 1 Lubuklinggau provides support through training and workshops, the development of digital-based learning, and programs aimed at strengthening teachers' competencies. Such institutional support provides teachers with opportunities to learn, practice, and develop their ability to use AI in a more directed and responsible manner. Therefore, pedagogical adaptation is not solely an individual process but is also shaped by the institutional environment, particularly through the availability of learning opportunities, facilities, guidance, and policies that support technological innovation in education.

Viewed through Talcott Parsons' structural-functionalist theory, the findings demonstrate that the integration of AI into learning reflects the four functions of the AGIL framework. The adaptation function is reflected in teachers' efforts to adjust their pedagogical competencies and teaching practices in response to technological developments. The goal attainment function is demonstrated through the use of AI to support the achievement of learning objectives and improve the effectiveness of learning activities. The integration function is reflected in collaboration among teachers and the institutional support provided by the madrasah in aligning AI utilization with the existing educational environment. Meanwhile, the latency function is demonstrated through the maintenance of educational values, ethical principles, responsibility, academic integrity, and teacher professionalism despite the increasing use of AI in learning.

Overall, this study concludes that pedagogical adaptation to AI at MAN 1 Lubuklinggau does not imply the replacement of teachers by technology, but rather a transformation in the ways teachers plan, implement, and evaluate learning. AI serves as a supporting technology that can enrich learning and increase teachers' efficiency, while teachers remain responsible for making pedagogical decisions, guiding students, verifying information, and maintaining meaningful human interaction in the learning process. The successful integration of AI therefore depends not only on the availability of technological facilities but also on teachers' pedagogical competence, AI literacy, critical judgment, ethical awareness, and ability to adapt technology to students' needs and the characteristics of the madrasah. Sustainable institutional support is consequently essential to ensure that AI utilization develops equitably and responsibly while preserving the educational values, norms, and professional identity of teachers.

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