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The Use of Artificial Intelligence in Personalizing Learning Experiences at Schools

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Abstract: The implementation of personalized learning often faces obstacles, especially related to the workload of teachers who have to manage the learning needs of many students simultaneously. In this situation, AI comes as an innovative solution. This study uses a literature review approach to explore the use of Artificial Intelligence (AI) in personalizing learning experiences in schools. Literature review was chosen as the main method because it allows researchers to analyze and synthesize various previous studies, both theoretical and empirical, in order to build a comprehensive understanding. Data in this study were collected through a systematic review of secondary sources, including journal articles, books, research reports, and policy documents related to the use of AI in education. Literature searches were conducted using academic databases such as Google Scholar, ScienceDirect, Springer, and ProQuest, with relevant keywords such as "Artificial Intelligence in Education", "Personalized Learning with AI", and "Educational Technology Implementation". This study found that AI has great potential to improve the personalization of learning experiences in schools. With its ability to analyze student data in real-time, AI can provide learning experiences that are tailored to individual needs, learning styles, and levels of understanding. This allows teachers to identify areas that require special attention and provide relevant materials, accelerate the learning process, and improve academic outcomes. To support the implementation of AI in education, clear policies are needed and training support for teachers is needed so that they can make optimal use of this technology. In addition, investment in adequate technological infrastructure is also very important so that AI can be effectively integrated into the learning process. Collaboration between the government, educational institutions, and technology parties is key to achieving this goal.

Keywords: Artificial Intelligence (AI), Personalized Learning, Schools

A. Introduction

Education is one of the main pillars in the development of a nation. In the context of the digital era, education is undergoing a massive transformation marked by the integration of technology in the learning process. One of the technological innovations that is increasingly being used is Artificial Intelligence (AI) (Singh et al., 2024). AI has the ability to analyze large amounts of data, recognize patterns, and provide relevant recommendations. This ability makes AI very potential in supporting the personalization of learning in schools (Sahito et al., 2024).

Personalized learning is an approach that adjusts learning methods, materials, and speed based on individual student needs. This approach is considered more effective than conventional methods that tend to be uniform, because it is able to accommodate differences in student abilities, learning styles, and interests (Benayache & Mourad, 2024). However, the implementation of personalized learning often faces obstacles, especially related to the workload of teachers who have to manage the learning needs of many students simultaneously. In this situation, AI is present as an innovative solution.

AI in personalized learning can be used for various purposes. For example, AI can help analyze student learning outcomes in real-time, provide specific feedback, and recommend materials that are appropriate to the student's ability level (Yamijala et al., 2024). In addition, AI also allows the creation of more interactive learning experiences, such as through AI-based chatbots or intelligent tutor systems that can answer student questions directly. By utilizing AI, learning can be designed to be more flexible, adaptive, and data-driven (Mishra, 2024).

The application of AI in personalized learning has shown positive results in various studies. Madhu (2024) research shows that AI is revolutionizing education by tailoring the learning experience to the needs of each student, increasing engagement, and improving overall learning outcomes. Mykhaylenko et al. (2024) research in their study highlights that AI, especially tools like ChatGPT, effectively personalizes learning by adapting to an individual's psychological profile and learning pace, increasing student engagement and motivation while requiring careful consideration of ethical issues, especially regarding student data privacy.

Tilepbergenovna (2024) research found that AI significantly personalizes learning in schools by offering customized educational experiences, utilizing intelligent tutoring systems that adapt to each student's needs, increasing engagement, and providing innovative solutions that meet diverse learning styles, ultimately changing the educational landscape. Gu (2024) in the study also found that AI enhances personalized learning by providing customized educational materials, improving information acquisition and retention, and optimizing learning efficiency. This technology meets individual students' needs, learning styles, and abilities, thus

significantly improving their educational experience. In addition, Ajuwon et al. (2024) research found that AI integration also helps teachers save time on administrative tasks, so they can focus more on teaching and direct interaction with students.

Various studies have proven the great potential of AI, but the application of AI in personalizing learning in schools is not without challenges. The main challenges include limited technological infrastructure in some schools, lack of teacher understanding of the use of AI, and issues related to student data privacy. In addition, the success of AI implementation also depends heavily on the design of fair and unbiased algorithms, so that all students, regardless of social or economic background, get the same benefits (Arya & Verma, 2024).

Thus, research on the use of AI in personalizing learning experiences in schools is very relevant. This research not only aims to explore the potential of AI in improving the quality of education, but also to identify the challenges and solutions needed so that the implementation of this technology can run effectively and sustainably. This research is believed to be able to provide real contributions in developing a more adaptive, inclusive, and technology-based education ecosystem.

B. Methods

This study uses a literature review approach to explore the use of Artificial Intelligence (AI) in personalizing learning in schools. Literature review was chosen as the main method because it allows researchers to analyze and synthesize various previous studies, both theoretical and empirical, in order to build a comprehensive understanding of this topic.

The data in this study were collected through a systematic review of secondary sources, including journal articles, books, research reports, and policy documents related to the use of AI in education. Literature searches were conducted using academic databases such as Google Scholar, ScienceDirect, Springer, and ProQuest, with relevant keywords such as "Artificial Intelligence in Education", "Personalized Learning with AI", and "Educational Technology Implementation".

The literature selection was done carefully based on certain criteria, such as relevance to the research topic and credibility of the sources. The selected studies were analyzed to identify key trends, challenges, and potential solutions related to the implementation of AI in personalizing learning in schools. Through this approach, this study aims to present a holistic view, covering the positive impacts of AI on students' learning experiences, the challenges that may be faced in implementing this technology, and the opportunities that educators and policymakers can take advantage of in order to improve the quality of education. This literature review also provides a strong conceptual foundation for future research on the integration of intelligent technologies in education.

C. Results and Discussion

Artificial Intelligence (AI) and Its Applications in Various Fields

Artificial Intelligence (AI) is a branch of computer science that focuses on developing systems capable of performing tasks that normally require human intelligence (Geada, 2024). This technology is designed to study data, recognize patterns, make decisions, and even interact with humans naturally. AI involves a variety of techniques, including machine learning, natural language processing, and computer vision (Pocock & Hugh, 1993).

According to Pocock dan Hugh (1993), AI is defined as an attempt to replicate intelligent reasoning through machines, by comparing conventional problem-solving methods with intelligent approaches, allowing computers to solve complex problems faced by traditional methods. Geada (2024) said that the advantage of AI lies in its ability to analyze large amounts of data quickly and accurately, make predictions based on identified patterns, and adapt to new information. This technology not only makes human life easier but also changes the way various industries operate in various fields.

In healthcare, AI is used to detect diseases with high accuracy, such as cancer through medical image analysis. AI also automates administrative processes, such as patient scheduling and medical record management. AI-based virtual assistants, such as medical chatbots, provide health information and help patients manage early symptoms. AI improves early detection and diagnosis of diseases, especially chest cancer, through advanced imaging analysis, leading to better patient outcomes. AI algorithms help in treatment planning and prognosis prediction, enabling personalized care and monitoring (Paliwal, 2024).

In the financial sector, AI plays a role in detecting fraudulent activities, analyzing investment risks, and providing financial recommendations. Banks and financial technology companies are using AI to improve customer experience through automated services such as chatbots and product personalization based on customer data analysis. In addition, utilizing AI in trading systems such as analyzing market trends, increasing investment efficiency (Weng et al., 2024).

In the manufacturing sector, AI is used to automate production processes, detect machine failures through predictive analytics, and improve operational efficiency. AI-based robots are also used for heavy and repetitive tasks in factories. AI technology facilitates automated production lines and intelligent quality inspections, significantly reducing labor costs and improving product quality. AI-powered predictive maintenance minimizes downtime and operational disruptions (Yao et al., 2024).

AI helps e-commerce platforms like Amazon and Tokopedia by providing product recommendations based on customer preferences. In digital marketing, AI is used to analyze consumer data, predict market trends, and create personalized content for specific audiences. AI-based analytics optimize inventory management and personalize customer experiences, leading to increased sales and customer satisfaction. Chatbots and virtual assistants improve customer service efficiency and engagement (Weng et al., 2024).

AI has revolutionized education through adaptive learning systems, which allow learning materials to be tailored to the individual needs of students. For example, e-learning platforms like Duolingo use AI to analyze user progress and suggest appropriate materials. AI also supports teachers by providing student data analytics to identify areas that need more attention (Mehak & Mehta, 2023).

The Relationship Between AI and Personalized Learning

Personalized learning is an educational approach that adapts the learning experience to the needs, interests, abilities, and preferences of each individual student. This approach differs from traditional teaching methods that are uniform for all students in a class. Personalized learning aims to provide a more relevant, meaningful, and effective learning experience, so that students can reach their maximum potential.

According to Tomlinson (2001), personalization of learning includes differentiation strategies, where teachers modify content, processes, products, or learning environments to meet the diverse needs of students. He emphasized that personalization is not just about providing different materials, but also about creating learning interactions that allow students to learn according to their own styles and speeds.

Kaswan et al. (2024) describe personalized learning as an approach that prioritizes the "relationship" between students and the learning itself. In their view, personalization involves more than simply customizing materials; it involves understanding students' contexts, including their social, cultural, and emotional backgrounds. By understanding this, teachers and technology can create learning experiences that are truly relevant and encourage student engagement.

Meanwhile, Zahra dan Parisa (2024) highlighted the importance of technology in supporting personalization of learning. They stated that artificial intelligence (AI)-based software can help personalize the learning experience by analyzing student data to identify individual needs, providing appropriate materials, and providing quick feedback. This technology allows students to learn at their own pace without the pressure of keeping up with the overall class tempo.

The opinions of these experts show that personalization of learning is not only a strategy, but also an educational philosophy that prioritizes students as the center of the learning process. AI has become a catalyst for transformation in the world of education, especially in supporting personalization of learning (Zahra & Parisa, 2024). The relationship between AI and personalization of learning lies in the ability of AI technology to understand student learning behavior, recognize patterns, and provide tailored recommendations. AI-based systems can collect data on students' preferences, learning styles, abilities, and levels of understanding through their interactions with digital learning platforms. This data is then processed to create a unique learning experience for each individual (Yamijala et al., 2024).

AI also plays a role in supporting teachers in creating personalized learning experiences by analyzing student data, AI can provide detailed progress reports, identify areas that need more attention, and even provide specific teaching strategy suggestions. This helps teachers focus on more meaningful interactions with students, while administrative tasks such as evaluations are managed by the system (Rekha et al., 2024).

AI and personalized learning complement each other in creating student-centered education. These technologies enable learning that is not only more tailored to individual needs but also more responsive to developments and challenges of education in the digital era. Thus, AI becomes an important pillar in building an adaptive, inclusive, and relevant education system in the future.

AI Applications in Personalized Learning

One example of the application of AI in personalized learning is adaptive learning systems. These systems use AI algorithms to adjust learning materials according to the student's ability level. If a student is struggling with a concept, the system can provide additional explanations or simpler exercises. Conversely, students who are quick to grasp can be given more complex challenges to maintain their engagement (Madhu et al., 2024). Platforms such as DreamBox, Smart Sparrow, and Knewton are examples of AI-based adaptive systems that have been applied in education. These systems provide a dynamic learning experience, ensuring that each student receives relevant material at their own learning pace.

In addition, AI-based virtual assistants, such as chatbots and virtual tutors, are increasingly being used to provide real-time learning support. Chatbots can answer student questions, provide learning resources, or even motivate students through reminders and praise. This not only increases student engagement but also provides greater access to learning, especially for those who need help outside of school hours (Qureshi et al., 2024; Sahito et al., 2024). For example, chatbots such as IBM Watson Tutor and Google Assistant can be used to provide explanations of concepts, help complete assignments, or remind students about their study schedules. These virtual

assistants provide particular benefits for students who need support outside of school hours, helping them access information at any time without relying on the presence of a teacher.

AI technology also supports personalization of learning through natural language processing. For example, AI can analyze students' written answers to evaluate their level of understanding, identify conceptual errors, and provide specific feedback. In this way, students receive guidance tailored to their needs without having to wait for teachers to provide manual evaluations (Gu, 2024). In addition, NLP is used in language learning applications such as Duolingo, which provides interactive and adaptive language learning based on user performance. This technology ensures that students receive learning tailored to their needs, whether in terms of vocabulary, grammar, or pronunciation (Yamijala et al., 2024).

AI can recommend learning content based on a student's individual needs. Much like the recommendation algorithms on streaming platforms like Netflix or Spotify, AI technology in education can suggest relevant videos, articles, or other learning resources. Platforms like Coursera and Khan Academy use AI to provide recommendations based on a student's learning outcomes and interests. This allows students to explore topics that interest them while staying focused on their academic goals (Yılmaz, 2024).

Case Studies of AI Use in Various Countries

The application of AI in education has had a significant impact, especially in supporting the personalization of learning and increasing the efficiency of the teaching and learning process. Several countries and schools have become pioneers in utilizing AI to create a more adaptive, inclusive and innovative education system. South Korea is one of the countries that actively implements AI technology in education. One of its flagship programs is the "AI Tutor System," which is implemented in various schools. This program utilizes machine learning algorithms to analyze students' abilities and needs, and provides automatically tailored learning materials. For example, AI is used to help students prepare for college entrance exams by providing AI-based test simulations that adjust the level of difficulty to the student's abilities. As a result, students get a more effective learning experience, as they can focus on their weaknesses without feeling overwhelmed by material that is too difficult or too easy (Ma et al., 2024). In addition, the South Korean government has launched the "Smart Education" initiative, which aims to digitize the entire curriculum and provide access to AI-based learning platforms across the country. This program aims to bridge the educational gap between urban and rural areas (Ma et al., 2024). China is also one of the most advanced countries in the use of AI for education. Many schools in China have adopted AI technology to monitor student progress, analyze their performance, and provide direct feedback to teachers and parents. For example, educational technology companies such as Squirrel AI have developed

adaptive learning systems that are used by thousands of students across China. The system uses data analysis to identify students' strengths and weaknesses and recommend optimal learning paths. In addition, AI is used to detect students' emotions during the learning process through facial expression analysis, which helps teachers understand students' level of engagement in class (Ma et al., 2024).

Finland, known for its progressive education system, has begun integrating AI into its curriculum to enhance students' learning experience. One notable initiative is the introduction of AI courses for high school students, such as the "Elements of AI" program, which is designed to provide students with a basic understanding of AI. In addition, schools in Finland are using AI to support language teaching. Using AI-based applications, students can learn foreign languages more interactively through speech recognition, grammar analysis, and exercise recommendations based on their progress (Glushkova & Malinova, 2023).

In the United States, AI has been adopted in various educational institutions, from elementary schools to universities. One example of a successful application of AI is the adaptive learning platform ALEKS (Assessment and Learning in Knowledge Spaces). ALEKS is used for subjects such as mathematics and science, where it analyzes students' level of understanding and adapts materials and exercises to their needs (Walsh, 2023). Universities are also using AI to improve the student experience. For example, Georgia State University uses an AI chatbot called "Pounce" to provide administrative and academic support to new students. The chatbot answers questions about registration, class schedules, and financial aid, reducing the workload of administrative staff and speeding up responses to student needs (Glushkova & Malinova, 2023).

In India, AI is being used to reach students in remote areas that are difficult to reach by traditional education infrastructure. One such initiative is the use of AI-based apps like Byju's and Vedantu, which offer interactive video-based learning tailored to students' abilities. Additionally, the Indian government has launched programs like "AI for All," which aims to increase AI literacy among students and teachers and prepare them for the digital age. AI is also being used to analyze student data at the national level, helping policymakers understand educational challenges and design more effective interventions (Byakodi, 2024).

The above case studies show how AI can transform the education landscape across countries and institutions. From adaptive learning systems in South Korea to AI applications in China, Finland, the United States, and India, the technology has provided innovative solutions to educational challenges. With AI's ability to analyze data, provide real-time feedback, and support personalized learning, the future of global education looks increasingly inclusive and technology-driven.

Benefits of AI Implementation in Personalized Learning

The implementation of AI in personalized learning has brought significant positive impacts to students, teachers, and the education system. AI enables education to be more adaptive and relevant to individual needs, thus providing concrete benefits, such as improved learning outcomes, efficiency in the teaching process, and increased student engagement.

AI-powered personalization of learning helps students achieve better learning outcomes because each individual gets a learning experience tailored to their needs and abilities. According to Gu (2024), AI technology enables:

1. Adaptation of Material and Learning Pace: AI analyzes students' abilities in real-time and provides materials that are appropriate to their level of understanding. If a student is struggling with a topic, AI can provide additional exercises or simpler explanations. Meanwhile, students who are quick to grasp can move on to more complex topics without having to wait for others.
2. Instant Feedback: AI-based systems like adaptive learning systems provide instant feedback to students. They can learn about their mistakes and receive immediate suggestions for improvement, which speeds up the process of understanding and mastering the material.
3. In-depth Evaluation: AI uses data to analyze students' learning patterns, identify their strengths and weaknesses, and recommend effective learning strategies. This helps students focus on areas that need more attention.

AI is not only beneficial for students but also helps teachers in increasing the efficiency of the teaching process. Yamijala et al. (2024) said that with AI's ability to automate certain tasks, teachers can focus more on meaningful interactions with students. Some of the benefits include:

1. Reduced Administrative Burden: AI can handle administrative tasks such as grading assignments, processing test results, and generating student progress reports. For example, AI algorithms can grade essay assignments quickly, providing quality feedback without taking a long time.
2. Improved Teaching Planning: With the analysis of student data provided by AI, teachers can create more effective teaching plans. They can understand the unique needs of each student and design a tailored approach to support learning.
3. Increased Resource Availability: AI can recommend additional relevant learning resources, such as videos, articles, or interactive simulations, that teachers can use to enrich the learning process in the classroom.

AI also plays a role in increasing student engagement in the learning process. This technology makes learning more interesting and relevant to their interests. According to Sahito et al. (2024), some of the ways AI increases student engagement are:

1. Gamification and Interactivity: AI-based learning systems can integrate gamification elements, such as challenges, points, and rewards. This makes learning more fun and increases students' motivation to continue learning.
2. Flexible and Personalized Learning: AI enables students to learn anytime and anywhere through digital platforms. This gives them the freedom to learn according to their style and schedule, which increases their sense of autonomy and motivation.
3. Real-Time Learning Support: AI-based chatbots and virtual tutors provide instant learning support, answering students' questions, and guiding them in completing assignments. With this support, students feel more supported and motivated to continue learning.
4. Relevant Context: AI can customize learning content based on students' interests, so they feel more connected to the material being learned. For example, a student who loves music can be given examples of math learning related to music theory.

The implementation of AI in personalized learning provides broad and profound benefits. Improved learning outcomes are achieved through customized materials, instant feedback, and personalized learning strategies. Teaching efficiency increases with reduced administrative burden and more focused planning, allowing teachers to interact more directly with students. On the other hand, student engagement increases thanks to interactive, relevant, and flexible learning.

Challenges and Obstacles

While AI has great potential to revolutionize education, its implementation in schools is not without its challenges. There are several obstacles that must be overcome to ensure that this technology can be adopted effectively and provide equitable benefits. These challenges include aspects of technology and infrastructure, teacher awareness and competence, data privacy and security, and the digital divide. Here is a narrative explanation of each challenge:

1. Technology and Infrastructure

The use of AI in education requires adequate technological and infrastructure support, but in many areas, this is a major obstacle. Farooqi et al. (2024) found that many educational institutions, especially in developing areas, do not have the infrastructure and technology needed to implement AI effectively. Schools, especially in rural or disadvantaged areas, do not have access to adequate hardware such as computers, tablets, or stable internet connections. Without this infrastructure, AI technology is difficult to implement optimally. Procurement of AI devices, software, and other supporting systems requires large investments. This is an obstacle for schools with limited budgets. In addition to procurement, maintenance of AI devices and software

also requires additional resources, including experts to ensure the technology continues to run properly.

2. Teacher Awareness and Competence

Teachers play a critical role in the successful implementation of AI in schools, but lack of awareness and competence regarding this technology is a significant barrier. Many teachers are not familiar with the concept of AI and how it can be applied in the learning process. As a result, they are hesitant or reluctant to use this technology in the classroom. Farooqi et al. (2024) in their research found that educators' fear of losing their jobs and reluctance to adapt to new technologies can hinder AI integration. Sytnyk dan Podlinyayeva (2024) emphasized that comprehensive training for educators is essential in alleviating these concerns and promoting AI acceptance.

3. Privacy and Data Security

The use of AI in education also involves the collection and analysis of student data, which raises concerns about privacy and security. Farooqi et al. (2024) said that AI systems require extensive data, raising concerns about potential violations and misuse. AI systems usually collect students' personal data, including demographic information, learning outcomes, and behavioral patterns. If this data is not managed properly, there is a risk of data leakage or misuse. In many countries, regulations regarding the use of data in educational technology are still unclear or not strictly enforced. This can open up loopholes for privacy violations. On the other hand, parents are concerned about how their children's data is used and who has access to the information. These concerns can hinder the adoption of AI in schools.

4. Digital Divide

The digital divide, or the difference in access to technology between different groups, is a challenge in implementing AI in schools. Students from low-income families often do not have access to the devices and connectivity needed to support AI-based learning. Then schools in remote areas are faced with a lack of basic infrastructure such as electricity, let alone advanced technology such as AI. In addition, there is a significant gap between schools with abundant resources and schools with limited facilities, so that the implementation of AI tends to only be enjoyed by certain groups (Sytnyk & Podlinyayeva, 2024).

Potential and Future Prospects

AI has the potential to continue to transform the world of education. With the advancement of technology, the opportunity to improve learning in schools through AI is becoming increasingly real. The future of AI use in schools can be realized

through three main aspects: the development of AI technology, collaboration between government, schools, and industry, and the potential for further research.

1. AI Technology Development

Advances in AI technology open up new opportunities to create more sophisticated and relevant solutions in education. AI systems can increasingly understand students' needs in depth, both in terms of academic ability, learning style, and emotional state. This technology enables truly personalized and adaptive learning, so that students feel more supported and motivated.

The combination of AI with technologies such as virtual reality (VR) and augmented reality (AR) can provide immersive and interactive learning experiences. For example, students can "walk" on the surface of Mars or "observe" human organs in real-time through AI-powered simulations. In addition, AI technologies such as natural language processing can be developed to help students learn new languages, read complex literature, or even understand content in multiple languages instantly. In the future, AI-based virtual tutors will not only provide answers to students' questions but will also be able to provide contextual explanations, motivate, and provide guidance according to individual needs.

2. Collaboration between Government, Schools, and Industry

The implementation of AI in schools cannot be successful without close collaboration between various stakeholders. Collaboration between government, schools, and industry is essential to ensure that the benefits of AI are widely felt. Government can play a role in providing regulations, funding, and infrastructure that support the implementation of AI in schools. In addition, policies that ensure equal access to this technology are essential to closing the digital divide.

Schools as the main place for AI implementation can contribute through technology adoption, teacher capacity building, and evaluation of the effectiveness of AI solutions in learning. Active participation from schools is important to ensure that AI truly meets educational needs. Then, the technology industry can provide innovation in the form of AI software and hardware that is relevant to education. They can also collaborate with schools to organize training, seminars, or workshops for teachers and students. In addition, Collaboration can also involve local communities, non-governmental organizations, and parents of students to support the implementation of AI that is appropriate to the cultural context and specific needs in certain areas.

3. Potential for Further Research

The application of AI in education opens up opportunities for further research that can deepen understanding and address existing challenges, for example the

effectiveness of AI-based learning, research that evaluates the impact of AI on student learning outcomes, motivation, and engagement can help optimize implementation strategies. Then research that focuses on how AI can be applied to ensure equitable access for all students, including those with special needs or from underserved communities.

Further studies on how to protect student data in AI systems and create higher security standards can also be conducted to help alleviate privacy concerns. In addition, research on how AI can be used to understand how the human brain works in learning will pave the way for more effective and scientifically based approaches to education. Research on the ethical aspects of implementing AI in education is also interesting, such as the use of data, transparency of algorithms, and its impact on the role of teachers, can help create responsible guidelines.

The potential and future prospects for the use of AI in schools are enormous. The continued development of AI technology enables education to become more personal, adaptive, and interactive. Collaboration between government, schools, and industry is key to creating an educational ecosystem that supports the implementation of this technology in a sustainable and inclusive manner. On the other hand, continued research provides opportunities to improve and refine the technology and ensure that AI is used ethically and fairly. With a shared commitment from all stakeholders, AI can become a key pillar in realizing higher quality education in the future.

D. Conclusion

Artificial Intelligence (AI) has the potential to enhance the personalization of learning experiences in schools. With its ability to analyze student data in real-time, AI can provide learning experiences that are tailored to individual needs, learning styles, and levels of understanding. This allows teachers to identify areas that require special attention and provide relevant materials, accelerating the learning process, and improving academic outcomes. To support the implementation of AI in education, clear policy development and training support are needed for teachers to be able to utilize this technology optimally. In addition, investment in adequate technological infrastructure is also essential for AI to be effectively integrated into the learning process. Collaboration between the government, educational institutions, and technology parties is key to achieving this goal.

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