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AI-Based Adaptive Learning Innovation in MAN 2 Kota Palu to Optimize Student Potential

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ABSTRACT

This research explores the application of Artificial Intelligence (AI)-based adaptive learning technology in MAN 2 Kota Palu, focusing on optimizing students' academic potential. A qualitative approach is used by collecting data from interviews, observations, and document analysis. The results show that implementing AI-based adaptive learning has improved student motivation and learning outcomes. Teachers report that this technology allows for customizing teaching materials and methods according to students' needs, creating a more personalized and relevant learning experience. Nonetheless, the study also identified several challenges, including limited technology infrastructure, lack of teacher training, and initial resistance from some students to new technologies.
These findings provide valuable insights for education practitioners on innovative strategies for using AI to improve student learning outcomes in MAN 2 Kota Palu. This research also contributes to the understanding of the implementation of AI-based adaptive learning in the context of secondary education in Indonesia. The implications of these findings are important for the future development of educational technology, highlighting the importance of investment in adequate technology infrastructure and comprehensive training programs for teachers.

1. Introduction

Education is an important foundation in a nation's development. In the ever-evolving digital era, technology has become vital in transforming education. One of the technological innovations that attracts attention in the world of education is adaptive learning based on Artificial Intelligence (AI). This technology promises personalized solutions that can improve learning effectiveness by adapting teaching materials and methods according to students' individual needs.

In Indonesia, Madrasah Aliyah Negeri (MAN) is a secondary education institution that plays a vital role in shaping a quality young generation. MAN 2 Kota Palu, one of the region's leading madrasas, is committed to adopting the latest technology to improve the quality of education provided to students.

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This research explores the implementation of AI-based adaptive learning in MAN 2 Kota Palu. The main focus is identifying how these innovations can optimize students' academic potential by adjusting teaching materials and methods according to individual needs. By understanding the implementation process and its impact on learning, this research is expected to provide insight for education practitioners about innovative strategies for using AI to improve student learning outcomes.

In the next section, this article will discuss a literature review related to adaptive learning, AI in education, the benefits of AI-based adaptive learning technology, and case studies of implementing this technology in several educational institutions. This study uses a qualitative approach by collecting data from interviews, observations, and document analysis. This data analysis will be presented in the results and discussion section to provide a comprehensive understanding of the implementation of AI-based adaptive learning in MAN 2 Kota Palu.

2. Literature Review

2.1 Adaptive Learning

Adaptive learning is an approach that allows teachers to adjust teaching materials and methods based on student's individual needs and abilities (Jing et al., 2023). This approach utilizes data obtained from student learning activities to adjust the content provided. Adaptive learning can increase student engagement and motivation by providing a personalized and relevant learning experience (Velander et al., 2024). Adaptive learning technology uses algorithms to analyze student interactions and provide appropriate feedback and content (Li et al., 2023).

2.2 Artificial Intelligence in Education

Artificial Intelligence (AI) has been applied in various fields, including education, to improve the effectiveness and efficiency of the teaching and learning process (Sanabria-Navarro et al., 2023). AI can analyze large amounts of data and provide personalized recommendations for students. AI in education can use intelligent tutors, automated assessment systems, and predictive analytics tools to identify student needs. (Hashimoto & Johnson, 2023). AI can also help design adaptive and flexible curricula, allowing students to learn at their own pace and in their learning style (Vandenberg & Mott, 2023).

2.3 Benefits of AI-Based Adaptive Learning

The main benefit of AI-based adaptive learning is the personalization of education, which can improve student motivation and learning outcomes (Owan et al., 2023). Adaptive learning can help students of varying ability levels better understand the subject matter (Tursynova et al., 2023). In addition, AI can help teachers identify student learning difficulties and provide timely interventions. AI can also automate administrative tasks, allowing teachers to focus more on learning and interacting with students (Kaiss et al., 2023).

2.4 Case Study of AI Implementation in Adaptive Learning

Several case studies have demonstrated the success of AI implementation in adaptive learning (Fernandes et al., 2023). A high school in the United States showed that students who studied with an AI-based adaptive learning system significantly improved academic achievement compared to those with conventional methods (Dukhanina & Maximenko, 2020). The study also found that students were more motivated and engaged in the learning process when the material was tailored to their needs and abilities.

2.5 Challenges in the Implementation of AI Technology

Despite the many benefits, implementing AI technology in education also faces various challenges. The main challenges include: Limited technological infrastructure, Lack of teacher training, Initial resistance from some students and parents to new technology (Wang et al., 2023). Additionally, there are concerns about the privacy and security of student data collected and analyzed by AI systems. Addressing these challenges requires investment in technological infrastructure, comprehensive teacher training programs, and strong policies to protect student data (Tkachenko, 2023).

3. Methodology

This study uses a qualitative approach with a case study design at MAN 2 Kota Palu. Data were collected through in-depth interviews with teachers and students, direct observation in class, and document analysis related to implementing AI-based adaptive learning (Velander et al., 2024). The research participants involved five teachers in the AI-based adaptive learning program, as well as 30 students who participated (Ahmad, Han, et al., 2023). Participant selection was carried out purposively to obtain relevant and in-depth information.

Data were collected through semi-structured interviews with teachers and students to gain their perspectives on the benefits and challenges of AI-based adaptive learning. Classroom observations were conducted to see how AI technology is applied to learning (Ahmad, Alam, et al., 2023). Document analysis included curriculum, student learning outcome reports, and program evaluation records. Data were analyzed using thematic analysis techniques to identify key themes from interviews, observations, and documents (Ayanwale et al., 2022). The analysis process involves data transcription, coding, and organizing themes relevant to the research objectives.

4. Results and Discussion

4.1 Implementation of AI-Based Adaptive Learning in MAN 2 Kota Palu

This study identified that implementing AI-based adaptive learning at MAN 2 Kota Palu has gone well, with some areas for improvement. Based on teacher interviews, AI technology has helped identify students' learning needs and provide materials appropriate to their abilities. Teachers reported that using AI in adaptive learning allows them to pay more attention to students who need additional assistance. In contrast, students who are quicker to understand the material can continue progressing at their own pace.

4.2 Benefits of AI-Based Adaptive Learning

4.2.1 Increased Student Motivation and Engagement:

Teachers reported that students were more motivated and engaged in the learning process when the material was tailored to their interests and abilities. Students felt more valued and had a more personalized learning experience. One teacher said, "Students seemed more enthusiastic about learning because they felt the material was neither easy nor difficult."

4.2.2 Improved Learning Outcomes:

Learning outcome data shows significant improvements in student academic achievement after implementing AI-based adaptive learning. For example, students' average math test scores increased by 15% after one semester using the AI system. Students also reported feeling more confident in completing assignments and exams because they were learning the material at their own pace.

4.2.3 More Effective Time for Teachers:

With AI technology handling the customization of learning materials, teachers have more time to focus on other aspects of teaching, such as providing direct feedback and supporting students who need extra help. Teachers also report that their workload has become more manageable with AI systems automating some administrative tasks.

4.3 Challenges in Implementation

4.3.1 Limitations of Technology Infrastructure:

One of the main challenges faced is the limited technological infrastructure in schools. Although MAN 2 Kota Palu has made efforts to provide adequate devices, several classes still experience technical constraints, such as unstable internet connections and a lack of adequate hardware.

4.3.2 Lack of Training for Teachers:
Some teachers feel unprepared to use AI technology in their teaching due to the lack of comprehensive training. The existing training is still not in-depth enough to truly master the optimal use of AI systems. One teacher stated, "We need more training to understand and utilize all the features offered by this AI system."

4.3.3 Initial Resistance from Students:
At the beginning of the implementation, some students showed resistance to the use of new technology. They felt awkward and uncomfortable with the system, which was different from the conventional learning methods they were used to. However, over time, students began to get used to it and even increased their acceptance and engagement with the AI system..

5. Conclusion

Adaptive learning based on Artificial Intelligence (AI) has become one of the promising innovations in the world of education. This study explores the implementation of AI-based adaptive learning technology at MAN 2 Palu City, focusing on optimizing students' academic potential. From the results of the research and discussion that have been presented, several conclusions:

1) Benefits of AI-Based Adaptive Learning:
   Implementing AI-based adaptive learning at MAN 2 Kota Palu has significantly benefited the learning process. This technology increased student motivation and engagement, as well as improved learning outcomes.
2) Challenges in Implementation:
   Despite the many benefits offered, implementing AI technology also faces several challenges. Limited technological infrastructure, a lack of teacher training, and initial resistance from some students are challenges that need to be overcome to maximize the potential of AI-based adaptive learning.
3) Recommendations for Next Steps:
   Based on the research findings, several recommendations are made for the next steps in implementing AI-based adaptive learning at MAN 2 Kota Palu. These include developing better technology infrastructure, increasing teacher training, and taking a more adaptive approach to introducing technology to students.

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