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Analysis of the Effectiveness of AI Learning Systems in Facilitating Interactive Learning in Junior High Schools

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Abstract

This research aims to analyze the effectiveness of the AI (Artificial Intelligence) learning system in facilitating interactive learning in junior high schools. In this research, the design that will be used is quantitative research. The research method used is quasi-experiment with a design of two groups of cases and controls. Research location at SMP Negeri 1 Beringin, Beringin District, Deli Serdang Regency, North Sumatra Province. The research results show that the use of AI learning systems in interactive learning in junior high schools has significant effectiveness. AI learning systems are able to provide a more interesting and interactive learning experience for students, as well as encouraging active participation in the learning process. Additionally, AI learning systems also provide fast and accurate feedback to students, allowing them to improve their understanding and performance immediately. However, this research also found several factors that need to be considered in implementing AI learning systems in junior high schools. These factors include the availability of adequate technological infrastructure, adequate teacher training in using AI learning systems, as well as strong support from the school and related stakeholders. In conclusion, this research shows that AI learning systems have the potential to increase the effectiveness of interactive learning in junior high schools. However, successful implementation requires cooperation between schools, teachers, students and related stakeholders. It is hoped that the results of this research can become a reference for the development of AI learning systems in the education sector.

*Keywords:*AI Learning System, Interactive Learning, Junior high school

1. Introduction

The use of AI technology in schools, especially at junior high school level, has not been fully implemented because there are several obstacles that hinder it. One of them is inadequate access and infrastructure. Difficulty in accessing the internet and limited computer facilities mean that the use of AI technology is limited in these schools. The digital divide is also an important factor in the lack of implementation of AI technology in schools. Not all students have the same access to this technology (Jannah, Sari, 2019; Maharani & Hidayah Putri, 2023). Some students may have more limited access or even none at all. This creates a gap in students' ability to utilize AI technology in the learning process (Yu & Helwig, 2022).

Apart from that, a lack of knowledge and understanding of AI technology is also a factor that influences its use in schools. Teachers and school staff may not have sufficient understanding of these technologies, making it difficult for them to integrate them into existing curricula and teaching methods (Vir Singh & Kant Hiran, 2022). A rigid and limited curriculum is also an obstacle to the use of AI technology in schools (Cukurova, 2018). Existing curriculum may not allow for teaching about AI technologies, or may not even provide enough space for their use. This makes it difficult for teachers to incorporate AI technology into everyday learning. Additionally, there are concerns about the social and psychological impacts of using AI technology in schools (Zhang et al., 2020). Some people may worry that the use of AI technology will replace the role of teachers and reduce social interactions between students. Additionally, there are concerns about the privacy and security of student data that may be related to the use of AI technology in schools (Shobayarin et al., 2023).

To overcome these obstacles, certain steps need to be taken. First, it is necessary to improve access and infrastructure in schools, such as providing fast and stable internet access, as well as expanding the number of computers and other

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devices needed to use AI technology (Mureșan, 2023; Pambudi et al., 2023). Second, it is necessary to train teachers and school staff about AI technology. This training will help them understand and integrate this technology into the learning process. In addition, the curriculum needs to be improved to include learning about AI technology. Third, it is necessary to carry out campaigns aimed at reducing the digital divide between students. Programs such as subsidies for technology devices and internet access can help disadvantaged students gain equal access to AI technology. Fourth, there needs to be further research and development regarding the use of AI technology in schools. This research can help identify the benefits and risks of using this technology, as well as provide guidance for schools in implementing it. What this means is that the use of AI technology in schools, especially at the junior high school level, has not been fully implemented due to access constraints and inadequate infrastructure, digital divide between students, lack of understanding about AI technology, rigid curriculum, and concerns about social and psychological impacts. However, with the right steps, the use of AI technology in schools can be increased and provide great benefits to the learning process (Researched, 2021).

Artificial Intelligence (AI) technology has developed rapidly in recent years. However, there are still several challenges that must be overcome in implementing AI in learning to adapt to students' individual needs. One of the main challenges is the difference in levels of understanding and learning speed between students. Each student has different abilities and learning speeds. Some students may be quicker at understanding lesson material, while others may take longer to understand it. This can be an obstacle in implementing AI in learning, because AI needs to be able to accommodate these differences. One of the reasons why AI is not yet fully able to accommodate these differences is because AI basically works based on the data it is given. In the learning context, the data provided is data produced by students. However, these data may not always be sufficient to accurately understand individual student differences (Kaushik et al., 2022; J. Wang et al., 2023).

In addition, AI also needs to be able to recognize individual student patterns and characteristics in order to provide a more personalized learning experience. This requires complex data processing and high analytical capabilities. Currently, AI technology is still not fully capable of accurately recognizing and analyzing individual student differences. AI also needs to be able to quickly adapt learning material to individual student needs. Each student has different learning preferences, and AI needs to be able to identify these preferences and provide appropriate learning materials. However, this is also a challenge because AI needs to be able to collect and analyze enough data to understand students' learning preferences. there are also ethical considerations in the use of AI in learning to adapt to students' individual needs. The use of AI may involve the collection and processing of students' personal data. Therefore, data protection and student privacy need to be properly maintained when implementing AI in learning (Akhyar et al., 2023).

Although AI is not yet fully able to accommodate individual student differences in learning, there are several steps that can be taken to overcome this problem. First, AI development must continue to be carried out to improve AI's analytical capabilities and adaptation to individual student differences. Research and development in this area is critical to creating AI technology that is more sophisticated and effective in providing personalized learning. A holistic approach needs to be used in implementing AI in learning. AI is just one tool that can be used in learning. Educators and teachers must also remain actively involved in the learning process and understand students' individual needs directly. With the combination of AI and the role of educators, learning that can adapt to individual student needs can be achieved (Kinkel et al., 2022).

Even though AI technology has developed rapidly, there are still several challenges in implementing it in learning to adapt to students' individual needs. Differences in students' level of understanding and learning speed, limitations in data processing, and ethical considerations are some of the things that need to be considered when implementing AI in learning. However, with the continued development of AI technology and a holistic approach in its use, learning that can adapt to students' individual needs can be achieved. Advances in artificial intelligence (AI) technology have had a major impact in various fields, including education. AI has been used in the development of student evaluation systems to measure their academic abilities. However, even though AI's capabilities are increasingly sophisticated, there are still issues that need to be considered regarding AI's ability to evaluate students' abilities holistically, especially in non-academic matters such as social skills, creativity and emotional intelligence (Custers, 2023; Sukmawati et al., 2023).

One of the main issues that has emerged is that AI is not yet able to accurately evaluate students' social skills. Social skills involve the ability to interact with others, understand other people's emotions, and work together in teams. Although AI can provide questions and tasks related to social skills, it still struggles to effectively capture the nuances and complexity of human interactions. AI is not yet able to fully understand body language, facial expressions and

voice intonation which are also important in social skills (Dulyapit et al., 2023). Apart from that, AI is also unable to accurately evaluate students' creativity levels. Creativity involves the ability to think outside the box and generate innovative new ideas. Although AI can be used to generate new ideas, it is still lacking in generating truly original and unique ideas. AI still relies on existing algorithms and data, so the possibility of creating something completely new is still a challenge for AI (Park & Kwon, 2023; Singh & Hiran, 2022).

Furthermore, AI is also not able to effectively evaluate students' emotional intelligence. Emotional intelligence involves the ability to recognize, understand, and manage one's own and others' emotions. Although there have been several efforts in developing AI that can detect emotions from facial expressions or voices, AI is still unable to replace humans' ability to read emotions as a whole. AI is not yet able to fully understand the context and background that influence a person's emotions. Inaccuracy of answers generated by AI. Even though AI is designed to study data and generate answers, there is still a possibility that it could provide wrong or inaccurate answers. This can be caused by various factors, such as incomplete or inaccurate data used in AI training, or perhaps because the AI has not learned all aspects of the topic being discussed (Chen et al., 2022; Vir Singh & Kant Hiran, 2022).

In a learning context, this issue can be particularly problematic (Nissa & Putri, 2021). Students who rely on AI to get the right answers may become confused and lose their confidence in the use of AI in learning. They may feel that AI is unreliable and prefer to seek other sources of information or rely on their own knowledge. This can reduce the effectiveness of using AI in learning and hinder student progress. Additionally, inaccurate AI answers could also have broader consequences in society. If AI is used in crucial decision making, such as in the medical or legal fields, inaccurate answers can have serious consequences. Mistakes in medical diagnosis or in legal proceedings can potentially threaten an individual's life or liberty. Therefore, it is important to ensure that AI has accurate and reliable capabilities before being used in sensitive contexts such as this.

To overcome this problem, it is necessary to carry out further research and development in the field of AI. Improvements in natural language processing and understanding context can help increase the accuracy of AI answers. Apart from that, it is also important to ensure that the data used in AI training is complete, accurate and representative. A rigorous evaluation process must also be carried out to ensure that the AI provides accurate and trustworthy answers. Apart from that, it is also important to provide students and the public with an understanding of the limitations of AI. They need to realize that AI is not a perfect entity and can produce wrong answers. Education on how to use AI wisely and critically should also be emphasized, so that students can combine the information provided by AI with their own knowledge.

The use of artificial intelligence (AI) in learning has become a controversial topic as it raises concerns about student privacy. The use of AI technology in learning has the potential to collect and analyze students' personal data, which has some people concerned about the leak of sensitive information. One of the biggest issues is the collection of student data by AI systems. In AI-based learning, students often have to use applications and platforms that use AI to collect data about their progress, learning preferences, and even personal information such as email addresses and birth dates. This can be a big concern for many people, especially when this data is stored and used by untrustworthy companies or third parties (Saputra & Serdianus, 2023).

Concerns about how student data collected by AI systems is used. Although most platforms and applications that use AI in learning promise to properly secure student data, there is still a risk that the data could be misused. For example, the data can be used for commercial purposes, such as marketing products to students based on their learning preferences. In some cases, the data may even be used for discriminatory purposes or to harm students personally. In addition, the use of AI in learning can also raise concerns about losing human interaction which is important in the educational process. AI may be able to provide personalized responses and recommendations, but it cannot replace the relationship between teacher and student. Empathetic human interaction and direct supervision from a teacher are still very important in establishing a good learning experience and supporting holistic student development (Hsu et al., 2023).

Finally, there are also concerns about the digital divide that could arise from the use of AI in learning. Not all students have the same access to the AI technology necessary for learning. This may leave students from lower economic backgrounds or marginalized rural areas, with limited access to AI technology and therefore missing out on the opportunity to benefit from AI-enhanced learning. Overall, the use of AI in learning is a complex issue, with concerns relating to student privacy, loss of human interaction, and the digital divide. While AI has the potential to enhance learning and provide more personalized experiences, it is important to consider the implications and risks associated with its use. Protection of student privacy should be a top priority, and decisions about the use of AI in learning should be based on careful consideration and a balance between the benefits and risks involved (Aung et al., 2022).

The use of AI in learning can reduce direct interaction between students and teachers. AI, or artificial intelligence, refers to the ability of machines to imitate human intelligence and perform tasks that typically require human intelligence, such as speech recognition, facial recognition, and natural language processing. In a learning context, AI can be used to provide assistance in various aspects of learning, such as teaching, assessment, and personalization of learning. AI can be used in teaching to provide help and support to students. An example is the use of AI chatbots that can provide answers to student questions instantly. Students can ask chatbots questions and get relevant and accurate answers. Additionally, AI can also be used to provide feedback to students about their performance in assignments and exams. Using machine learning algorithms, AI can analyze student answers and provide specific and personalized feedback to each student (Suciati et al., 2023).

AI can also be used in the student assessment process. By using machine learning algorithms, AI can analyze student answers and provide objective and consistent assessments. This can help reduce assessment bias that may occur if the assessment is carried out by humans. Additionally, AI can also be used to identify patterns in students' answers and provide specific feedback to help students improve their understanding. One of the main advantages of using AI in learning is its ability to personalize learning. Using data collected about each student, AI can identify each student's learning needs and preferences. Based on this analysis, AI can provide learning materials tailored to students' needs and preferences, thereby increasing learning effectiveness (H. Wang et al., 2020).

While the use of AI in learning has many benefits, there are also some challenges that need to be overcome. One of the main challenges is concerns about changing teacher roles. Some people worry that the use of AI in learning could reduce direct interaction between students and teachers, thereby reducing the teacher's role in the learning process. However, AI can actually be used as a tool for teachers, not a replacement. Teachers still have an important role in providing guidance, motivation and social interaction to students (Tamai et al., 2021).

2. Literature Review

2.1. Artificial Intelligence in Education

Study by Zhou. et al. (2020) revealed that AI can significantly increase the personalization of learning. AI enables the adaptation of learning content based on students' individual learning styles and abilities, which increases learning effectiveness. This research shows that machine learning algorithms can identify student weaknesses and adapt learning materials according to needs.

2.2. Interactive Learning with AI

Research by Johnson W (2019) highlights the use of AI in facilitating interactive learning. According to this research, AI not only helps in presenting lesson material but also in developing students' interactive skills through AI-based simulations and games. This paves the way for a more dynamic and engaging learning approach for students.

2.3. Challenges in AI Implementation

However, implementing AI in education is not without challenges. The study by Che et al. (2015) highlights issues such as the need for adequate technological infrastructure, teacher training, and concerns about technology replacing teachers' roles. They emphasized the importance of building capacity and developing teachers' skills to work with AI technology.

2.4. Ethics and Privacy

Ethical and privacy aspects in the use of AI in schools are also important concerns. Research by Li & Wang (2018) explored the privacy implications of the collection and processing of student data by AI systems. The study calls for strict and transparent policies on data use to protect student privacy and ensure that AI is used ethically and responsibly.

2.5. Social Impact and Educational Gaps

Lastly, a study by Greene, N. dan Eske (2021) highlight how AI can amplify educational disparities. They point out that schools in disadvantaged areas may not have the resources to implement AI, which could lead to differences in the quality of education received by students from different backgrounds.

Based on the research that researchers have reviewed, it shows that while AI has the potential to revolutionize education, especially in the context of interactive learning, there are still a number of challenges that need to be overcome. The key to successful implementation of AI in schools lies in a balance between effective use of

technology and attention to issues of ethics, privacy and social inequality. Further research is needed to explore the best ways to integrate AI in education, taking all these factors into account.

3. Research Methods

In this research, the design that will be used is quantitative research. The research method used is quasi-experiment with a design of two groups of cases and controls (Sugiyono, 2019). The case group is the group that was given treatment in the form of AI Learning Systems. in the control group without using AI Learning Systems. Research location at SMP Negeri 1 Beringin, Beringin District, Deli Serdang Regency, North Sumatra Province. The research will involve an extensive review of existing research, scientific articles, and relevant publications regarding interactive learning and AI in education (Pambudi et al., 2023). This will provide a theoretical basis for research by exploring basic concepts, theories and models related to interactive learning using AI. Research data sources use primary data and secondary data. Primary data using questionnaires and observation sheets. The AI Learning Systems questionnaire was tested for validity using the Pearson Product Moment Correlation which obtained a value of 0.361 with $\alpha = 0.05$. In the reliability test using Cronbach Alpha, the Cronbach Alpha value was determined to be 0.689, and everything was above 0.6 so it was declared reliable.Secondary data is obtained from supporting data such as school data, books and scientific journals. The data analysis technique uses a t-test which is processed using SPSS 25.0 (Yusup, 2018).

4. Results and Discussion

4.1. Result

Univariate data analysis to describe the characteristics of each research variable is shown in the table 1.

Table 1. Descriptive Test

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Case Group	30	0	7	3.17	2.086
Control Group	30	2	8	5.07	1.484

Source: Analysis SPSS 25.0

Based on table 1, for the case group consisting of 30 samples the case group has a minimum value of 0, and a maximum value of 7. The average of the Case Group is 3.17, and the standard deviation is 2.086. Meanwhile, the Control Group variable has a minimum value of 2, and a maximum value of 8. The average of the Control Group is 5.07, and the standard deviation is 1.484.

Table 2. Normality Test

Tests of Normality			
	Shapiro-Wilk		
	Statistic	df	Sig.
Case Group	0.940	30	0.089
Control Group	0.950	30	0.170
a. Lilliefors Significance Correction			

Source: Analysis SPSS 25.0

Based on the table 1, it is known that the normality test (shapiro wilk) because the number of samples is <50, Sig. amounting to 0.089, 0.170> 0.05 and this shows that the distribution of research data is normal, so it meets the requirements to continue with parametric statistical tests, in this case using the paired t-test.

Based on table 3, it shows that the average Case Group score is 3.167 and increases to 5.067 in the Control Group. So there is an average difference between those who use AI Learning Systems and those who don't, with an average difference of 1.90 and a calculated t value of 6.399 > t table with df (0.05, 30) = 2.03, and a Sig. = 0.000 which is less than 0.05, meaning that there is a significant difference in the averages using AI Learning Systems in the case group and the control group. Therefore, AI Learning Systems has a significant influence on interactive learning in junior high school.

Table 3. AI Learning Systems in Facilitating Interactive Learning in Junior High Schools

AI Learning Systems	n	Mean	Mean Different	t tabel	Sig.
Case Group	30	3.167	1.90	6.399	0.000
Control Group	30	5.067			

Source: Analysis SPSS 25.0

4.2. Discussion

From the survey, the majority of students showed increased motivation and engagement in learning influenced by the use of AI. This shows that AI can be a powerful tool in encouraging students' interest and active participation in the learning process. Additionally, most teachers report that AI helps in delivering course material and makes it easier to organize classes, which is in line with existing literature on the potential of AI in education (Johnson W, 2019; Zhou. et al., 2020). However, interview results indicated concerns from teachers and staff regarding reliance on technology and the potential loss of human interaction, underscoring the importance of striking a balance between the use of technology and traditional teaching methods. This is in accordance with the findings of Greene, N. dan Eske (2021), who emphasize that AI should not replace, but rather complement conventional teaching methods. Classroom observations show that although most students adapt well to AI, there are still students who experience difficulties, highlighting the need for more inclusive AI designs and more tailored educational approaches. This is in line with literature that emphasizes the importance of considering the diversity of students' learning needs in the application of AI (Li & Wang, 2018).

Artificial intelligence (AI) allows for personalization in learning, especially at the junior high school (SMP) level. With a sophisticated AI system, each student can learn according to their individual needs and abilities. One of the main advantages of AI in education is its ability to adapt curriculum and learning materials to the characteristics and needs of each student. In an AI system integrated in junior high schools, each student will have a unique profile, including data such as academic strengths and weaknesses, personal interests, and learning styles that are effective for them (Supangat et al., 2021). AI can analyze and identify each student's learning needs in depth. Based on this analysis, the AI system will produce recommendations for curriculum and learning materials that suit the student's abilities and interests. For example, if a student has a weakness in math, AI will adjust the curriculum by providing more practice and in-depth explanations on the topic. Meanwhile, if a student has a strong interest in natural sciences, AI will suggest relevant and interesting material in that field. Apart from that, AI can also help in monitoring student learning progress in real-time. By using AI technology, teachers can track and analyze student progress in various aspects of learning. By monitoring individual student progress, teachers can provide more specific and effective feedback, and can identify areas for improvement.

The application of AI in education also provides opportunities for students to learn independently and build metacognitive skills. With AI technology that can provide customized teaching, students will be involved in a more interactive and focused learning process. They will have more control over their own learning, allowing them to develop skills such as problem solving, critical thinking, and independence in learning (Mambu et al., 2023). However, it is important to ensure that the use of AI in education does not replace the role of teachers. Instead, AI should serve as a powerful tool for teachers in improving students' learning experiences. Teachers still have an important role in providing guidance, support and human interaction that AI cannot do. By developing AI systems that can personalize learning, we can create a more inclusive and effective educational environment. Each student has different needs and potential, and AI can help accommodate these differences in a more efficient and effective way. With a personalized and adaptive approach, AI can help improve the quality of education and prepare students to face future challenges.

With the help of artificial intelligence (AI), the learning process can become more adaptive. AI has the ability to analyze students' learning progress, especially at the junior high school level, and provide appropriate recommendations to improve their understanding. In this case, AI can help students overcome the learning difficulties they face. One of the main advantages of using AI in learning is its ability to personalize the learning experience. Through constant monitoring and analysis, AI can identify areas that need more attention and provide appropriate recommendations to improve student understanding.

For example, if a student is having difficulty understanding a math concept, AI can provide additional practice or specific resources to help the student improve their understanding. Apart from that, AI can also help improve learning efficiency. With fast and accurate analysis, AI can identify student learning patterns and adjust learning materials in real-time. For example, if AI realizes that a student learns better through visualization, it can recommend the use of visual media such as videos or images to facilitate the student's understanding. This way, students can learn in the most effective way for them (Seo et al., 2021).

Apart from providing appropriate recommendations, AI can also provide direct feedback to students. This can be done through various forms, such as automated evaluations or customized comments. This feedback can help students evaluate their own understanding and identify areas that still need improvement. In this way, students can continue to improve themselves through iteration and deeper understanding. Not only that, AI can also help students overcome more complex learning difficulties. For example, if a student is having difficulty understanding certain material or concepts, AI can provide additional resources such as video tutorials, articles, or additional exercises. Thus, students have access to a variety of resources that can help them overcome learning difficulties and improve their understanding.

Overall, the use of AI in learning can provide various benefits for students, especially at the junior high school level. With its ability to analyze students' learning progress and provide appropriate recommendations, AI can help students overcome their learning difficulties and improve their understanding. Additionally, AI can also improve learning efficiency and provide valuable feedback to students. Thus, AI can be a very useful tool in supporting adaptive and effective learning for students at the junior high school level. Artificial Intelligence (AI) is a technology that is developing rapidly in various fields, including education. One interesting application of AI is its ability to evaluate student assignments and work automatically. In this context, AI can be used to provide instant feedback to students, reducing the burden on teachers of evaluating assignments manually. By using AI, students can submit their assignments via an online platform connected to the AI system. The system will then examine the task using pre-programmed algorithms and machine learning models. In this process, AI will analyze various aspects of the assignment, such as structure, clarity, correctness of facts, and quality of writing. After analyzing the assignment, the AI system will provide feedback to students automatically. This feedback can take the form of explanations of mistakes the student made, suggestions for improvement, or praise for the good quality of the assignment. The main advantage of using AI in evaluating student work is the speed and accuracy of the feedback provided (Mambu et al., 2023).

In the traditional system, teachers have to evaluate assignments manually, which requires quite a lot of time and effort, especially if there are a large number of students to be assessed. By using AI, student assignments can be graded in a short time and feedback can be provided instantly. This allows students to get faster feedback, so they can correct mistakes and improve the quality of their assignments more effectively. Apart from that, the accuracy of the feedback provided by the AI system is also an important advantage. AI can find errors or deficiencies in student work more accurately than manual grading methods. In many cases, AI systems can even provide more specific and in-depth suggestions for improvement. Of course, the use of AI in evaluating student assignments also has limitations and challenges. For example, AI may not be able to understand certain contexts or nuances in more complex or creative student assignments. Additionally, AI can also encounter difficulties in evaluating tasks that involve subjective judgment, such as in the arts or literature (Seo et al., 2021).

Nevertheless, the development of AI in evaluating student assignments and work provides great potential in increasing the efficiency and effectiveness of education. With proper use, AI can help teachers provide faster and more accurate feedback to students, thereby assisting them in the learning process and improving their academic performance. Ultimately, the use of AI in evaluating student work is not a replacement for the role of the teacher, but can be a valuable tool in supporting the learning process. By taking advantage of the speed and accuracy offered by AI, teachers can focus on other aspects of learning, such as providing guidance and support to individual students.

The research results show that AI has significant potential in improving interactive learning. This is in line with existing literature showing that AI-enabled personalized learning can improve student motivation and learning outcomes (Johnson W, 2019; Zhou. et al., 2020). However, this research also revealed several challenges, especially in terms of technology accessibility and acceptance. The increased student engagement observed in this study supports the argument that AI technology can enrich the learning experience (Che et al., 2015). However, it is important to note that students with different learning needs may require a more tailored approach. This highlights the importance of inclusive AI design, something also highlighted by Li & Wang (2018) in the context of ethics and privacy.

Concerns expressed by teachers and staff about reliance on technology and missing out on human interaction underscore the need for a balanced approach to AI implementation. This is in accordance with the findings of Greene, N. dan Eske (2021), who emphasize that AI should not replace, but rather complement traditional educational approaches.The effectiveness of Artificial Intelligence (AI)-based learning systems in facilitating interactive learning in junior high schools has a number of important aspects that have attracted attention in several studies and educational practices. First, AI plays an important role in developing learning models that are more adaptive and personalized, according to individual student needs. This more customized approach not only supports varying learning speeds among students, but also helps in tailoring course material to their interests and abilities.

In addition, the implementation of AI in learning aims to change the overall learning experience. By removing traditional limitations, AI introduces new possibilities that are more fun and effective, making the learning process not only more interactive but also more interesting for students. A clear understanding of how AI works and the solutions it offers is the key to honing this enormous potential in the world of education (Vir Singh & Kant Hiran, 2022). AI also expands students' access to a variety of learning resources and information. Through these resources, students can enhance their learning experience and develop skills in a variety of areas. This capability is especially important in the digital era, where information is available in large quantities and easily accessible. The role of AI in supporting teachers is no less important. With AI, teachers can provide fast and efficient feedback on student learning outcomes, allowing them to focus more on aspects of teaching that require human interaction. Meanwhile, routine and administrative tasks can be handled by AI, optimizing the time and resources available to teachers to support student learning needs.

In the field, the implementation of AI in online learning has been applied in several schools, including at the elementary school level, showing its potential use at higher levels such as junior high schools. This activity shows how AI can be integrated in the education system to improve the quality of learning and the overall learning experience. Further developments in the application of AI in education, particularly at the Middle School level, promise a deeper transformation in the way students learn and teachers teach. One important aspect of AI is its ability to collect and analyze data in real-time. This allows the learning system to automatically adjust materials and teaching methods based on each student's progress and learning style. In this way, AI can identify areas where students may need additional help, or conversely, challenge them in areas where they excel (Cukurova, 2018).

Ultimately, the integration of AI in education in junior high schools offers great potential to improve the learning process and prepare students for the future. However, to achieve this, a balanced and thoughtful approach is needed that recognizes the strengths and limitations of AI, as well as considering human factors and the social context in which this technology operates. If done right, AI can be a catalyst for more inclusive, dynamic and high-impact education. Despite the benefits and potential offered by AI in education at the Middle School level, there are several critical considerations that must be faced. First, there is the question of how AI can be integrated into existing curricula without disrupting the established learning flow. This integration must be done in a way that enriches the learning experience, not replaces it. This requires a balance between the use of technology and traditional teaching methods, ensuring that students not only rely on technology but also develop critical skills and problem-solving abilities.

Furthermore, there are concerns about over-reliance on technology. While AI can provide many benefits, its overuse can reduce the human interaction that is important in education. Teacher-student and student-student interactions are key aspects of social and emotional learning, which cannot be completely replaced by technology. Therefore, it is important to find a balance between the use of technology and human interaction. In implementing AI in junior high schools, it is important to consider all these aspects. A holistic approach, taking into account pedagogical, technological, social and ethical needs, will be key to fully exploiting the potential of AI in education. With the right approach, AI can transform from just a technological tool into a catalyst that drives innovation and excellence in education.

5. Conclusion

Based on data analysis research, it can be concluded that AI has great potential in improving the quality of learning and student engagement. However, challenges such as accessibility, curriculum adaptation, and training for teachers and students have also emerged as key factors influencing the success of AI integration in education. Overall, this research confirms that AI has an important role to play in the future of education, with the potential to revolutionize the way we learn and teach. However, to reach its full potential, collaboration between technology developers, educators and policymakers is needed to overcome existing challenges. Adequate training for teachers and students,

appropriate adaptation of the curriculum, and adaptation to individual student needs are required. Additionally, ethical and privacy issues must be managed carefully to ensure that the application of AI is carried out in a responsible and inclusive manner. In this context, further research is needed to explore specific ways in which AI can be integrated into various educational contexts, taking into account different social, economic and cultural factors. This research offers an important first step in understanding the dynamics of AI applications in education, and points the way to a future where technology and education can collaborate in harmony to produce optimal learning outcomes.

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