



The Utilization of Artificial Intelligence (AI) as a Supporting Learning Medium in the Implementation of the Merdeka Curriculum in Secondary Schools

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ABSTRAK

Perkembangan teknologi Artificial Intelligence (AI) yang semakin pesat telah membuka peluang baru dalam mendukung proses pembelajaran di sekolah menengah. Namun, pemanfaatan AI sebagai media pendukung pembelajaran dalam implementasi Kurikulum Merdeka masih memerlukan kajian lebih mendalam, terutama terkait manfaat dan tantangan penggunaannya dalam praktik pendidikan. Oleh karena itu, penelitian ini bertujuan untuk menganalisis pemanfaatan Artificial Intelligence (AI) sebagai media pendukung pembelajaran dalam implementasi Kurikulum Merdeka di sekolah menengah. Penelitian ini menggunakan pendekatan kuantitatif dengan metode survei deskriptif. Partisipan penelitian berjumlah 80 responden yang terdiri atas 20 guru dan 60 siswa sekolah menengah yang telah memanfaatkan AI dalam kegiatan pembelajaran. Pengumpulan data dilakukan melalui penyebaran kuesioner dan dokumentasi, dengan kuesioner sebagai instrumen utama penelitian. Data yang diperoleh dianalisis menggunakan teknik statistik deskriptif berupa distribusi persentase dan analisis nilai rata-rata untuk mengidentifikasi pola pemanfaatan AI serta persepsi responden terhadap penggunaannya. Hasil penelitian menunjukkan bahwa 86,25% responden telah memanfaatkan AI dalam kegiatan pembelajaran, 82,50% menyatakan AI mempermudah akses terhadap informasi pembelajaran, 78,75% menilai AI membantu meningkatkan pemahaman materi, dan 80,00% menyatakan AI

mendukung kemandirian belajar sesuai dengan prinsip Kurikulum Merdeka. Penelitian ini menyimpulkan bahwa AI merupakan media pendukung pembelajaran yang efektif dalam menciptakan pembelajaran yang fleksibel, adaptif, dan berpusat pada peserta didik. Implikasi penelitian ini menunjukkan pentingnya penguatan kompetensi digital, penyediaan infrastruktur teknologi yang memadai, serta pengembangan kebijakan pendidikan untuk mengoptimalkan integrasi AI dalam pembelajaran di sekolah menengah.

ABSTRACT

The rapid development of Artificial Intelligence (AI) technology has created new opportunities to support learning processes in secondary schools. However, the integration of AI as a learning support medium within the implementation of the Merdeka Curriculum remains limited and requires further investigation, particularly regarding its benefits and challenges in educational practice. Therefore, this study aimed to analyze the utilization of Artificial Intelligence (AI) as a supporting learning medium in the implementation of the Merdeka Curriculum in secondary schools. This research employed a quantitative approach using a descriptive survey method. The participants consisted of 80 respondents, including 20 teachers and 60 students from secondary schools who had experience using AI in learning activities. Data were collected through questionnaires and supported by documentation, with the questionnaire serving as the primary research instrument. The collected data were analyzed using descriptive statistical techniques, including percentage distribution and mean score analysis, to identify patterns of AI utilization and respondents' perceptions. The results revealed that 86.25% of respondents had utilized AI in learning activities, while 82.50% stated that AI facilitated faster access to learning information. Furthermore, 78.75% reported that AI helped improve their understanding of learning materials, and 80.00% indicated that AI supported independent learning in accordance with the principles of the Merdeka Curriculum. The study concludes that AI serves as an effective learning support medium that promotes flexible, adaptive, and student-centered learning. These findings imply the importance of strengthening digital competencies,

technological infrastructure, and educational policies to optimize the integration of AI in secondary school learning environments.



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1. INTRODUCTION

Artificial Intelligence (AI) is a technology that enables computer systems to mimic human cognitive abilities, such as learning, analyzing data, solving problems, and making decisions automatically. In education, AI has developed into an innovation that supports the transformation of learning by providing adaptive learning resources, personalized materials, automated feedback, and developing 21st-century skills. The implementation of AI in education aligns with the principles of the Independent Curriculum, which emphasizes learner-centered learning, differentiated learning, and strengthening competencies and character. AI functions not only as a learning aid but also as a medium capable of improving the quality of learning interactions, the efficiency of the learning process, and access to broader knowledge sources (Alam & Mohanty, 2023). Therefore, utilizing AI as a learning support medium is a relevant strategy in supporting the implementation of the Independent Curriculum in secondary schools.

The development of AI utilization in education has shown an increasing trend in recent years. Research by Mohebbi, (2025) revealed that more than 78% of students and 72% of secondary school teachers stated that the use of AI helps them search for information and complete learning assignments more effectively. Research by Bressane et al., (2024) showed that integrating AI technology into media and teaching materials development can increase student engagement by up to 67% compared to conventional media. Furthermore, research by Alkatheiri, (2022) found that 81% of respondents expressed a need for AI-based learning media and interactive technology to support the implementation of the Independent Curriculum. These findings demonstrate that AI has great potential in creating more engaging, flexible, and student-centered learning experiences.

Other studies also show that AI contributes to increasing student motivation and learning independence. Srinivasan, (2022) reported that the use of AI in learning had a positive effect of 74.3% on student motivation and 69.5% on learning independence. Similar findings were presented by (Zhong, 2023), who showed that the implementation of an AI-based adaptive learning platform can increase learning effectiveness by up to 71% through the presentation of material tailored to individual student abilities. Meanwhile, research by Ma et al., (2024) explains that AI technology can help students gain a more personalized learning experience, thereby impacting increased participation and learning outcomes. These research results indicate that AI plays a crucial role in encouraging the creation of independent learning, one of the main characteristics of the Independent Curriculum.

In the context of implementing the Independent Curriculum, the use of AI also benefits teachers in designing and implementing learning. Research by Javaid et al., (2023) shows that the use of AI in developing teaching modules can increase the efficiency of lesson planning time by up to 60%. Lindner et al., (2021) found that 76% of vocational high school teachers utilize AI to help develop materials, assessments, and differentiate learning according to student needs. Furthermore, research by Alqahtani et al., (2023) shows that the use of AI-based systems can help teachers analyze student learning progress more quickly and accurately. These findings indicate that AI is not only beneficial for students but also serves as an important instrument for teachers in implementing the principles of the Independent Curriculum more effectively.

The use of AI in secondary schools has also been applied to various subjects and has shown positive results. Research by (Aptyka et al., 2025) on the use of ChatGPT in science learning in junior high schools showed that 83% of students found it easier to understand the subject matter with the help of AI. Research by Chiu et al., (2024) found that the use of an AI-based learning system can improve student learning outcomes by 18% compared to traditional learning methods. Meanwhile, research by Hamid et al., (2023) revealed that AI technology such as ChatGPT can improve students' critical thinking, creativity, and problem-solving skills. These findings strengthen the argument that AI can be an effective learning support medium in creating an innovative and responsive learning environment to students' needs.

However, various studies have also identified a number of challenges in utilizing AI in schools. Dong et al., (2025) found that approximately 42% of teachers still experience difficulties integrating AI into the learning process due to limited digital competency. Research by Ma et al., (2024) showed that 38% of schools face challenges with inadequate technological infrastructure and internet access. Alkatheiri, (2022) emphasized that the use of AI in education requires consideration of ethical aspects, data security, and the potential for student dependence on technology. These conditions indicate that the success of utilizing AI in implementing the Independent Curriculum is determined not only by the availability of technology, but also by the readiness of human resources and adequate support from educational policies.

Various previous studies have consistently shown that AI significantly contributes to improving the quality of learning, learning motivation, student independence, teacher work efficiency, and the implementation of differentiated learning, the main characteristics of the Independent Curriculum. However, most research still focuses on user perceptions, the effectiveness of specific platforms, or the implementation of AI in specific subjects. Research specifically examining the use of AI as a learning support medium in the comprehensive implementation of the Independent Curriculum in secondary schools is still relatively limited, especially those that integrate the perspectives of both teachers and students. Therefore, this study is novel in its in-depth examination of the role of AI as a learning support medium in the implementation of the Independent Curriculum in secondary schools. The purpose of this study is to analyze the use of Artificial Intelligence (AI) as a learning support medium in the implementation of the Independent Curriculum in secondary schools and to identify its benefits, challenges, and implications for improving the quality of learning.

2. METHOD

This study uses a quantitative approach with a descriptive survey method to analyze the use of Artificial Intelligence (AI) as a learning support medium in the implementation of the Independent Curriculum in secondary schools. The quantitative approach was chosen because it can provide an objective picture of the level of AI utilization, perceived benefits, and challenges faced by users in the learning process. This study focuses on collecting numerical data which is then analyzed using descriptive statistics to obtain comprehensive information about the phenomenon under study. This approach is suitable for identifying behavioral trends, perceptions, and experiences of technology users in an educational context (Creswell & Creswell, 2018).

The data sources in this study consist of primary and secondary data. Primary data were obtained directly through questionnaires distributed to 80 respondents from secondary schools, including 20 teachers and 60 students who have utilized AI technology in their learning activities. Participants were selected using a purposive sampling technique, taking into account their experience using AI in the Independent Curriculum-based learning process. Meanwhile, secondary data were obtained from various scientific sources, such as journal articles, proceedings, books, and educational policy documents relevant to the use of AI and the implementation of the Independent Curriculum. The collected data were classified into quantitative data in the form of questionnaire scores and qualitative data in the form of open-ended responses, which were used to strengthen the interpretation of the research results.

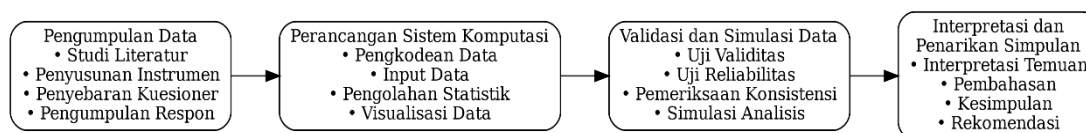


Figure 1. Research Procedure

The research procedure was carried out in several stages. The first stage was data collection through the preparation of research instruments, content validity testing by experts, and distribution of questionnaires to respondents. The second stage was the design of a computing system, which utilized statistical data processing software to group, process, and visualize the research data. The third stage was data validation and simulation, which included checking the completeness of the data, testing the instrument's reliability using Cronbach's Alpha, and simulating descriptive statistical analysis to ensure the consistency of the data processing results. These stages aimed to ensure data quality so that the research results had a high level of accuracy and reliability (Creswell & Creswell, 2018).

The final stage is data interpretation and drawing conclusions. At this stage, the results of descriptive statistical analysis in the form of percentages, average scores, and distribution of respondents' answers are interpreted based on theories of educational technology utilization, Artificial Intelligence, and the implementation of the Independent Curriculum. Next, the research findings are compared with previous research to identify similarities, differences, and the research's contribution to the development of technology-based learning in secondary schools. Based on these interpretations, conclusions are drawn that describe the level of AI utilization as a learning support medium, the benefits obtained, challenges faced, and implications that can be used as recommendations for teachers, schools, and education policymakers in optimizing the implementation of the Independent Curriculum. This includes information on how the data was collected, the data sources, and the methods used to analyze the data.

3. RESULTS AND DISCUSSION

RESULTS

The research results show that the use of Artificial Intelligence (AI) as a learning support medium in the implementation of the Independent Curriculum has been widely adopted by respondents. Based on the data analysis, 86.25% of respondents stated that they have used various AI platforms, such as ChatGPT, Gemini, Copilot, and other AI-based applications to support learning activities. Meanwhile, 13.75% of respondents admitted that they still rarely use AI due to limited knowledge and access to the technology. These findings indicate that the development of AI technology has become an important part of the learning ecosystem in secondary schools and is beginning to be integrated into various learning activities in accordance with the principle of flexibility promoted by the Independent Curriculum.

The study also showed that AI provides significant benefits in increasing the effectiveness of the learning process. 82.50% of respondents stated that AI helped them obtain learning information more quickly and accurately. Furthermore, 78.75% of respondents assessed that AI can help them understand difficult subject matter through simpler and more interactive explanations. Teachers also revealed that the use of AI facilitates the development of teaching materials, learning modules, and evaluation instruments tailored to students' needs. These findings indicate that AI plays a role as a supporting medium that can improve the quality of the teaching and learning process more effectively and efficiently.

Regarding the implementation of the Independent Curriculum, research results show that the use of AI supports differentiated and student-centered learning. 80.00% of students stated that AI helps them learn according to their individual abilities and pace. Furthermore, 76.25% of teachers stated that AI helps them provide a wider variety of learning materials and activities. The

use of AI also allows students to receive rapid feedback on assignments and questions. This demonstrates that AI has significant potential in supporting the principles of personalized and independent learning, a key characteristic of the Independent Curriculum.

Despite its numerous benefits, this study also identified several challenges in utilizing AI in secondary schools. 43.75% of respondents expressed concerns regarding the accuracy of information generated by AI. Furthermore, 38.75% of respondents stated that limited internet access remains a major barrier to using this technology. Some teachers also stated that not all educators have sufficient digital competencies to optimally integrate AI into the learning process. Other findings indicate concerns about the potential for students to become dependent on AI to complete academic assignments without proper supervision and guidance.

Overall, the research results show that the use of Artificial Intelligence (AI) as a learning support medium has made a positive contribution to the implementation of the Independent Curriculum in secondary schools. The high level of AI use by teachers and students indicates that this technology has become a relevant learning resource in supporting 21st-century learning. AI not only helps improve access to information and learning effectiveness, but also supports the implementation of differentiated learning, the development of independent learning, and increased student creativity. However, optimizing the use of AI requires improving teachers' digital competencies, providing adequate technological infrastructure, and developing responsible AI policies to maximize its benefits in the implementation of the Independent Curriculum.

DISCUSSION

The main findings of the study indicate that the use of Artificial Intelligence (AI) as a learning support medium has a positive impact on the implementation of the Independent Curriculum in secondary schools. The high level of AI use by teachers and students indicates that this technology is capable of supporting the creation of more flexible, adaptive, and learner-centered learning. These findings can be interpreted as AI functioning as a tool that facilitates information access, accelerates the process of finding learning resources, and supports independent learning, which is one of the main characteristics of the Independent Curriculum. Theoretically, these results align with constructivism theory, which emphasizes that learners construct knowledge through active interaction with the learning environment and diverse information sources (Szymkowiak et al., 2021). Furthermore, the concept of personalized learning explains that AI technology enables learning to be tailored to learners' needs, interests, and abilities, thereby increasing the effectiveness of the learning process. Thus, AI functions not only as a technological tool but also as a medium that supports the transformation of the learning paradigm in the Independent Curriculum.

The findings of this study indicate that AI contributes to increased learning effectiveness, ease of access to information, and student learning independence. These results align with research, which found that most teachers and students considered AI capable of increasing the efficiency of the learning process and facilitating the search for academic information. Similar findings were also reported by Al-khresheh, (2024), who stated that the use of AI has a positive effect on student motivation and learning independence. Internationally, research by Wang et al., (2023) shows that AI has the potential to improve the quality of learning through systems that are adaptive and responsive to user needs. The similarity of these research results with previous research indicates consistent empirical evidence that AI can be an effective learning medium in supporting the teaching and learning process. Thus, these research findings further strengthen the argument that integrating AI in education is a relevant strategy for improving the quality of learning in the digital era.

The research also shows that the use of AI supports the implementation of differentiated learning, one of the main principles of the Independent Curriculum. AI's ability to provide information quickly, provide immediate feedback, and adapt learning resources to students' needs demonstrates that this technology can support more personalized learning. These findings

align with the theory of learning differentiation proposed by [Malik et al., \(2023\)](#), which emphasizes that the learning process needs to be tailored to students' readiness, interests, and learning profiles. These findings are also supported by research by [Dong et al., \(2025\)](#), which found that the use of AI can increase students' learning engagement, critical thinking skills, and problem-solving skills. However, this study also identified challenges in the form of limited teacher digital competence and students' potential dependence on AI. These findings align with research by [Alqahtani et al., \(2023\)](#), which emphasize that implementing AI in education requires human resource readiness, adequate digital literacy, and pedagogical oversight to ensure the technology is used wisely and responsibly.

The strength of this research lies in its specific link between the use of AI and the implementation of the Independent Curriculum in secondary schools through the perspectives of both teachers and students. Most previous studies tend to focus on the effectiveness of AI in specific subjects or only examine the perceptions of one user group. Therefore, this study provides a more comprehensive picture of the benefits, challenges, and relevance of AI in supporting 21st-century learning. The contribution of this research lies in providing empirical evidence that can be used as a basis for educational policymaking related to the integration of AI in learning. Furthermore, the results of this study provide practical implications for schools and teachers to develop learning strategies that optimally utilize AI to support differentiated learning, strengthen digital competencies, and improve the quality of learning in accordance with the objectives of the Independent Curriculum ([Al-khresheh, 2024](#)).

However, this study has several limitations that should be considered. First, the limited number of respondents (80) means the results cannot be broadly generalized to all secondary schools in Indonesia. Second, the use of a descriptive survey approach means this study is unable to explain the causal relationship between AI utilization and improved student learning outcomes. Third, the data obtained is still dominated by respondents' perceptions, thus potentially introducing subjectivity into the assessment. Therefore, further research is recommended to involve a larger sample size and cover various regions and school characteristics. Future research should also use a mixed methods or experimental approach to measure the impact of AI on learning outcomes more objectively and in-depth. Furthermore, studies on the ethics of AI use, digital literacy, data security, and the development of AI-based education policies need to be continuously developed to ensure the use of technology is effective, safe, and sustainable.

4. CONCLUSION

This study concludes that Artificial Intelligence (AI) plays a strategic role as a learning support medium in the implementation of the Independent Curriculum in secondary schools. The presence of AI can support the creation of a more flexible, adaptive, and student-centered learning process by providing broad access to information, more personalized learning experiences, and support for independent learning. The use of AI also helps teachers develop more innovative and responsive learning to student needs, thus aligning with the learning characteristics expected in the Independent Curriculum.

In addition to providing various benefits, implementing AI in learning requires human resource readiness, technological infrastructure support, and proper management to ensure optimal and responsible use. Therefore, the integration of AI in education should not be understood merely as the use of technology, but also as part of a learning transformation that encourages improvements in educational quality. Conceptually, this research demonstrates that AI has the potential to be a critical component in supporting the development of a more effective, inclusive, and sustainable 21st-century learning ecosystem in secondary schools.

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