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Transformation of Education Management Based on Artificial Intelligence in Enhancing Learning Effectiveness in the Era of Society 5.0

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Abstrak: *The transformation of education management in the era of Society 5.0 requires the integration of advanced technologies such as Artificial Intelligence (AI) to enhance learning effectiveness and institutional performance. This study aims to analyze how AI-based education management transformation contributes to improving learning effectiveness through institutional, pedagogical, and ethical dimensions. This research employs a qualitative approach with a descriptive-analytical design using a literature-based method. Data were collected from relevant scholarly journal articles and analyzed using content and thematic analysis to identify patterns, relationships, and key findings related to AI implementation in education. The results indicate that AI significantly improves curriculum relevance, administrative efficiency, teacher performance, and personalized learning processes. AI also enhances student engagement and supports the development of 21st-century skills. However, challenges such as digital inequality, limited human resource readiness, and ethical concerns related to data privacy remain critical issues. The discussion highlights that the successful implementation of AI in education depends on strong policy support, continuous teacher training, and the establishment of clear ethical guidelines. In conclusion, AI-based education management transformation can effectively enhance learning outcomes in the Society 5.0 era when implemented through a balanced, human-centered, and well-regulated approach.*

Keywords : *Artificial Intelligence, Education Management, Learning Effectiveness, Society 5.0, Educational Transformation*

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INTRODUCTION

The rapid advancement of digital technology has fundamentally reshaped various sectors of human life, including education, particularly in the transition toward the *Society 5.0* era, which emphasizes the integration of cyberspace and physical space in a human-centered framework. In this context, education is no longer positioned merely as a knowledge transmission process but as a dynamic ecosystem that requires adaptive, innovative, and technology-driven management systems. One of the most prominent technological developments influencing this transformation is Artificial Intelligence (AI), which has increasingly been integrated into educational management practices to enhance efficiency, effectiveness, and responsiveness to learners' needs. The transformation of education management based on AI is therefore becoming an urgent necessity to ensure that educational institutions remain relevant and capable of producing human resources who are competitive, creative, and adaptive in facing global challenges (Susilo & Aritonang, 2023; Yusuf & Ulum, 2025).

Empirical phenomena indicate that many educational institutions are still struggling with conventional management systems characterized by rigid curriculum structures, manual administrative processes, and limited utilization of data for decision-making. These limitations often result in inefficiencies, inaccuracies in student assessment, and a lack of responsiveness to the diverse learning needs of students. In contrast, the integration of AI in educational management has demonstrated significant potential in addressing these challenges by enabling adaptive curriculum design, automating administrative processes, and facilitating data-driven decision-making processes. AI-based systems are capable of analyzing large datasets related to student performance and institutional operations, thereby supporting more accurate and strategic decision-making processes in education (Mufti et al., 2024; Hasanah & Budiyo, 2024).

At the level of institutional and system management, AI plays a strategic role in transforming various aspects of educational governance. In curriculum planning, AI enables the development of adaptive and flexible curricula that are aligned with students' needs and industry trends, thus ensuring the relevance of educational outcomes in the context of *Society 5.0*. Furthermore, AI-based systems contribute to improving administrative efficiency by automating processes such as student data management, scheduling, and assessment, which significantly reduces human error and increases operational effectiveness. These transformations indicate that AI is not only a technological tool but also a strategic instrument in enhancing the overall quality of educational management systems (Putra, 2023; Maola et al., 2024).

In addition to administrative and curriculum management, AI also has a significant impact on human resource management in education. The transformation toward AI-based education management requires the recruitment of educators who possess digital literacy and technological competencies, as well as the implementation of continuous professional development programs to ensure that teachers can effectively utilize AI tools in their teaching practices. Moreover, performance evaluation systems based on data analytics enable educational institutions to assess teacher performance more objectively and accurately, thereby supporting the development of a more professional and accountable education workforce. This transformation highlights the importance of integrating technology with human resource development to achieve sustainable improvements in educational quality (Rohida & Sudiantini, 2025; Rochmat et al., 2024).

At the level of the learning process, AI has significantly transformed teaching and learning practices by enabling personalized and adaptive learning experiences. Through learning analytics and intelligent tutoring systems, AI can identify individual student

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characteristics, learning styles, and performance levels, allowing for the development of customized learning pathways that enhance learning effectiveness. This approach has been successfully implemented in various fields, including Islamic education, Arabic language learning, and arts education, demonstrating the flexibility and effectiveness of AI in different educational contexts. The ability of AI to provide real-time feedback and continuous assessment also contributes to improving student learning outcomes (Karmilah et al., 2025; Hs & Purba, 2025).

Furthermore, AI has been shown to enhance interactivity and support the development of 21st-century skills such as critical thinking, collaboration, and digital literacy. The use of advanced AI technologies, including deep learning, enables students to engage in more interactive and collaborative learning activities, thereby fostering higher-order thinking skills. However, there are concerns that excessive reliance on AI may reduce students' creativity and independence, particularly if AI is used as a substitute for critical thinking rather than as a supportive tool. Therefore, it is essential to ensure a balanced integration of AI in education that promotes both technological proficiency and human cognitive development (A.M et al., 2025; Oktavian et al., 2024).

Despite the numerous opportunities offered by AI in education, several challenges must be addressed to ensure its effective implementation. One of the main challenges is related to data privacy and ethical considerations, as the use of AI often involves the collection and analysis of large amounts of personal data. Without proper regulations and safeguards, this may lead to potential misuse of data and violations of privacy rights. In addition, the readiness of human resources remains a critical issue, as many educators lack the necessary skills and competencies to effectively integrate AI into their teaching practices. These challenges highlight the need for comprehensive policies and capacity-

building initiatives to support the sustainable implementation of AI in education (Jusman & Usman, 2025; Septiyanti et al., 2025).

Another significant challenge is the existence of a digital divide, which may exacerbate educational inequalities if not properly addressed. Unequal access to technology and digital infrastructure can limit the ability of certain educational institutions to adopt AI-based systems, thereby creating disparities in the quality of education. Furthermore, the integration of AI in education raises important concerns regarding the preservation of moral, cultural, and humanistic values, which are essential components of education in the context of Society 5.0. Therefore, it is necessary to adopt a human-centered approach that ensures AI serves as a supportive tool rather than replacing the role of teachers (Yusuf & Ulum, 2025; Zebua, 2024).

The existing literature has highlighted various aspects of AI implementation in education; however, there remains a significant research gap in terms of developing a comprehensive and integrative model of AI-based education management. Most previous studies tend to focus on specific aspects, such as personalized learning or administrative efficiency, without examining how these elements can be integrated into a holistic management framework. Additionally, there is limited research that explores the role of supporting factors such as policy frameworks, teacher training, and ethical guidelines in ensuring the success of AI-based education management, particularly in developing countries (Mufti et al., 2024; Oktavian et al., 2024).

Based on these gaps, the novelty of this study lies in its integrative approach that simultaneously examines institutional management, learning process transformation, and ethical considerations within a unified framework of AI-based education management. This study not only analyzes the technological aspects of AI implementation but also emphasizes the importance of human resource



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development, policy support, and ethical governance in achieving effective educational transformation. By adopting this comprehensive perspective, this research contributes to the development of a more holistic understanding of how AI can be utilized to enhance learning effectiveness in the era of Society 5.0 (Cahyo et al., 2025; Gultom et al., 2025).

In addition, the integration of ethical considerations and humanistic values represents a critical dimension of AI-based education management that must be carefully addressed. The literature emphasizes the need for clear ethical guidelines, data protection mechanisms, and the integration of religious and humanistic values to ensure that AI is used responsibly and in alignment with societal norms. Collaboration between government, educational institutions, and industry stakeholders is also essential to create a supportive ecosystem for the implementation of AI in education, particularly in addressing challenges related to infrastructure, policy development, and capacity building (Karmilah et al., 2025; Zebua, 2024).

In light of the above discussion, it can be concluded that the transformation of education management based on AI has significant potential to enhance learning effectiveness in the era of Society 5.0, provided that it is supported by appropriate policies, comprehensive teacher training, and strong ethical guidelines. Therefore, the objective of this study is to analyze how AI-based education management transformation can improve learning effectiveness by integrating institutional, pedagogical, and ethical dimensions into a comprehensive framework that aligns with the principles of Society 5.0 (Susilo & Aritonang, 2023; Yusuf & Ulum, 2025).

METHOD

This study adopts a qualitative research approach with a descriptive-analytical design to

examine the transformation of education management based on Artificial Intelligence (AI) in enhancing learning effectiveness in the era of Society 5.0. The qualitative approach is considered appropriate as it allows for an in-depth exploration of complex phenomena related to the integration of technology, institutional management, and pedagogical practices within educational contexts. The research focuses on analyzing how AI contributes to institutional management transformation, learning process innovation, and ethical governance in education. The study employs a literature-based research strategy (*library research*), where data are derived from relevant scholarly sources, including peer-reviewed journal articles, conference proceedings, and academic publications that discuss AI in education, educational management, and Society 5.0. The data collection technique involves systematic identification, selection, and review of literature using inclusion criteria such as relevance to the research topic, publication within the last five years, and credibility of the source. Key themes explored include AI-based curriculum development, administrative automation, personalized learning systems, teacher competency development, and ethical considerations in AI implementation.

The data analysis technique used in this study is qualitative content analysis combined with a thematic analysis approach. In the initial stage, the collected data are organized, categorized, and coded based on key themes related to AI-based education management transformation. Subsequently, the data are analyzed through an interactive model involving data reduction, data display, and conclusion drawing to identify patterns, relationships, and emerging insights. Thematic analysis is conducted to synthesize findings across different studies, enabling the development of an integrative framework that connects institutional management, learning processes, and ethical dimensions. To ensure the validity and reliability of the findings, the study applies triangulation of sources by comparing multiple scholarly references and cross-verifying key arguments. The results of

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the analysis are then interpreted to provide a comprehensive understanding of how AI-based education management can effectively enhance learning outcomes while maintaining human-centered values in the context of Society 5.0.

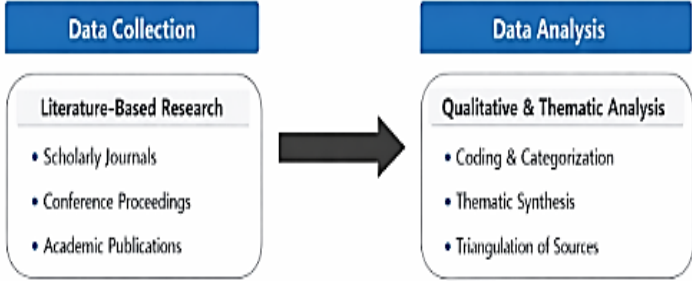


Figure 1. Diagram Conceptual Research

RESULTS AND DISCUSSION

The following table presents the research findings by summarizing the key dimensions of Artificial Intelligence (AI)-based education management transformation and their impact on learning effectiveness in the era of Society 5.0.

Table 1. Summary of AI-Based Education Management Transformation and Its Impact on Learning Effectiveness

No	Dimension & Key Findings	Impact and Challenges
1	Institutional Management: AI supports adaptive curriculum planning aligned with industry needs	Enhances relevance of learning and graduate competitiveness; challenges include limited policy support and infrastructure readiness
2	Administrative Management: Automation of student data, scheduling, and assessment systems	Improves efficiency, accuracy, and time management; challenges include data privacy and system security issues

3	Human Resource Management: Continuous teacher training and AI-based performance evaluation	Strengthens teacher competency and professionalism; challenges include low digital literacy among educators
4	Learning Process: Personalized and adaptive learning using AI analytics	Increases student engagement and individualized outcomes; challenges include over-reliance on AI
5	Learning Interaction: AI enhances interactivity and 21st-century skills	Develops critical thinking and collaboration; challenges include potential decline in creativity
6	Ethical & Value Integration: Implementation of ethical guidelines and human-centered AI	Preserves moral and humanistic values; challenges include lack of standardized ethical frameworks

Based on Table 1, it can be interpreted that the transformation of AI-based education management significantly contributes to enhancing learning effectiveness across multiple dimensions, ranging from institutional management to learning processes. The integration of AI has proven to improve administrative efficiency, curriculum relevance, and the quality of learning interactions through more adaptive and personalized approaches. However, the successful implementation of AI is still constrained by several challenges, including human resource readiness, digital inequality, and concerns related to ethics and data privacy. Therefore, a comprehensive approach is required, encompassing strong policy frameworks, continuous teacher training, and clear ethical guidelines to ensure that this transformation is implemented effectively



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while maintaining human-centered values within the framework of Society 5.0.

Discussion

The findings presented in Table 1 demonstrate that the transformation of education management based on Artificial Intelligence (AI) plays a significant role in enhancing learning effectiveness in the era of Society 5.0. This transformation is not merely technological but systemic, encompassing institutional management, learning processes, and ethical governance. At the institutional level, the integration of AI into curriculum planning has enabled the development of adaptive and responsive curricula aligned with both learner needs and industry demands. This aligns with the concept of Society 5.0, which emphasizes human-centered innovation supported by advanced technology. AI-driven curriculum design allows educational institutions to dynamically adjust learning content based on real-time data and predictive analytics, thereby ensuring relevance and competitiveness of graduates. Previous studies have highlighted that AI-based curriculum systems can significantly improve alignment between education and labor market demands, reducing the gap between academic output and industry expectations (Susilo & Aritonang, 2023; Yusuf & Ulum, 2025).

Furthermore, the role of AI in administrative and data management has proven to be a critical factor in improving institutional efficiency. The automation of student data processing, scheduling, and assessment systems reduces human error and accelerates decision-making processes. This efficiency directly contributes to improved educational service delivery, allowing institutions to focus more on pedagogical innovation rather than administrative burdens. The findings of this study are consistent with prior research indicating that AI-based management systems enhance organizational effectiveness through data-driven decision-making and real-time monitoring of academic performance (Mufti et al., 2024; Maola et al.,

2024). However, this transformation also introduces challenges related to data security and privacy, which must be addressed through robust governance frameworks and regulatory policies (Jusman & Usman, 2025; Septiyanti et al., 2025).

In addition to administrative transformation, human resource management emerges as a crucial component in the successful implementation of AI-based education systems. The findings indicate that continuous teacher training and the recruitment of digitally literate educators are essential to maximize the potential of AI in education. AI-based performance evaluation systems provide objective and data-driven insights into teacher effectiveness, enabling targeted professional development programs. This aligns with previous studies that emphasize the importance of teacher readiness and digital competence as key determinants of successful technology integration in education (Rohida & Sudiantini, 2025; Rochmat et al., 2024). Without adequate training and support, the implementation of AI may lead to resistance among educators and limit its effectiveness in improving learning outcomes (Sunarti, 2025).

At the level of the learning process, the integration of AI has significantly enhanced personalization and adaptability in education. AI-powered learning analytics and intelligent tutoring systems enable the development of individualized learning pathways tailored to students' abilities, preferences, and learning styles. This personalized approach has been shown to improve student engagement, motivation, and academic performance across various disciplines, including religious education, language learning, and the arts. The findings of this study support previous research indicating that AI-based adaptive learning systems contribute to more effective and inclusive education by addressing diverse learner needs (Karmilah et al., 2025; Hs & Purba, 2025). Moreover, real-time feedback mechanisms provided by AI allow students to continuously monitor and improve their learning progress, thereby fostering a more autonomous and self-regulated learning

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environment (Mufti et al., 2024; Hasanah & Budiyo, 2024).

In addition to personalization, AI also enhances interactivity and supports the development of 21st-century skills, which are essential in the context of Society 5.0. The use of AI technologies such as deep learning and intelligent systems facilitates collaborative learning environments where students can engage in problem-solving, critical thinking, and digital communication. These competencies are increasingly important in a rapidly changing global landscape where innovation and adaptability are key to success. The findings are consistent with studies showing that AI-based learning environments can significantly improve students' critical thinking and collaborative skills (A.M et al., 2025; Oktavian et al., 2024). However, the results also highlight a potential drawback, namely the risk of reduced creativity and over-dependence on AI tools, which may hinder students' ability to think independently if not properly managed (Gultom et al., 2025).

The discussion of opportunities and challenges further reinforces the complexity of implementing AI in education. On the one hand, AI offers significant opportunities in terms of administrative efficiency, data-driven decision-making, and personalized learning. On the other hand, it presents substantial challenges related to ethical considerations, digital inequality, and human resource readiness. The digital divide remains a critical issue, particularly in developing countries, where unequal access to technology can exacerbate existing educational disparities. This finding aligns with previous research emphasizing the need for equitable access to digital infrastructure to ensure that the benefits of AI are distributed fairly across different educational contexts (Yusuf & Ulum, 2025; Hasanah & Budiyo, 2024). Additionally, the reliance on AI systems raises concerns about the potential loss of human values in education, highlighting the importance of maintaining a balance between technological innovation and humanistic principles.

One of the most critical aspects identified in this study is the importance of ethical

governance in AI-based education management. The use of AI involves the collection and processing of large amounts of data, which raises significant concerns regarding privacy, security, and ethical use. Without clear guidelines and regulations, the implementation of AI may lead to unintended consequences, such as data misuse or bias in decision-making processes. Therefore, the establishment of ethical frameworks and data protection policies is essential to ensure the responsible use of AI in education. This is supported by existing literature, which emphasizes the need for ethical guidelines and regulatory frameworks to safeguard the interests of all stakeholders in the education system (Cahyo et al., 2025; Zebua, 2024).

Moreover, the integration of humanistic and cultural values into AI-based education management is crucial to maintaining the essence of education as a human-centered endeavor. AI should not replace the role of teachers but rather serve as a tool to enhance their effectiveness. Teachers play a vital role in fostering moral values, critical thinking, and emotional intelligence, which cannot be fully replicated by AI systems. Therefore, the successful implementation of AI in education requires a balanced approach that combines technological innovation with human-centered pedagogy. This perspective is reinforced by studies highlighting the importance of integrating ethical and cultural values into AI-based education systems to ensure their alignment with societal norms and expectations (Karmilah et al., 2025; Gultom et al., 2025).

Another important finding is the role of policy support in facilitating the transformation of education management based on AI. Effective implementation of AI requires comprehensive policies that address issues such as infrastructure development, teacher training, data governance, and ethical standards. Government involvement is essential in creating a supportive ecosystem that enables educational institutions to adopt and utilize AI technologies effectively. Collaboration between government, educational institutions, and industry stakeholders is also necessary to ensure the sustainability of AI integration in

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education. This finding is consistent with previous studies that emphasize the importance of multi-stakeholder collaboration in driving educational innovation (Jusman & Usman, 2025; Septiyanti et al., 2025).

In line with the research objective, the findings of this study confirm that the transformation of education management based on AI can significantly enhance learning effectiveness in the era of Society 5.0, provided that it is supported by strong policies, continuous teacher training, and robust ethical guidelines. The integration of AI into educational management enables more efficient administrative processes, more relevant and adaptive curricula, and more personalized and interactive learning experiences. However, the success of this transformation depends on the ability of educational institutions to address the associated challenges and ensure that AI is implemented in a responsible and human-centered manner.

Overall, this study contributes to the growing body of literature on AI in education by providing a comprehensive analysis of how AI-based education management can enhance learning effectiveness. By integrating institutional, pedagogical, and ethical dimensions, this study offers a holistic perspective on educational transformation in the era of Society 5.0. The findings underscore the importance of adopting a balanced approach that leverages the potential of AI while preserving the core values of education, thereby ensuring that technological innovation contributes to the development of a more effective, inclusive, and human-centered education system (Susilo & Aritonang, 2023; Karmilah et al., 2025).

CONCLUSIONS

Based on the findings and discussion, it can be concluded that the transformation of education management based on Artificial Intelligence (AI) has a significant and measurable impact on enhancing learning effectiveness in the era of Society 5.0, particularly through improvements in institutional management, administrative

efficiency, human resource development, and adaptive learning processes. AI enables the creation of more relevant curricula, data-driven decision-making, and personalized learning experiences that support student engagement and achievement. However, the effectiveness of this transformation is highly dependent on the presence of strong policy frameworks, continuous teacher training to ensure digital competence, and the implementation of clear ethical guidelines to safeguard data privacy and maintain human-centered educational values. Therefore, AI should be positioned not as a replacement for educators but as a strategic tool that strengthens the role of teachers and supports a more responsive, efficient, and value-oriented education system aligned with the principles of Society 5.0.

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