Research on Innovative Models and Practical Pathways of Education Management Driven by Artificial Intelligence

Xingnan Zhan, Shangjie Meng

China International Language and Culture College, Krirk University, Bangkok 10220, Thailand

Abstract: This study focuses on exploring innovative models and practical pathways of education management driven by artificial intelligence (AI). It aims to address the limitations of traditional education management in the face of challenges such as educational expansion and diverse demands, thereby enhancing the efficiency and quality of education management. Utilizing literature review, comparative analysis, and theoretical deduction, we systematically review the integration of AI and education management both domestically and internationally. the research first conducts a comprehensive analysis of the current application of AI technologies in education, identifying advantages and potential issues. Subsequently, based on the education management process, it delves into strategies for constructing AI-driven innovative models across various dimensions, including resource allocation, student assessment, and teacher management. Furthermore, it systematically plans practical pathways for innovation, considering policy support, technological standards, and talent development. the findings indicate that AI can effectively optimize education management processes, achieving precise resource allocation and enhancing the scientific nature of student evaluations and the specificity of teacher management. the practical implementation of innovative models requires collaborative efforts, improving policy frameworks, standardizing technology applications, and strengthening professional talent cultivation to promote the intelligent transformation of education management and support the high-quality development of the education sector.

Keywords: Artificial Intelligence; Education Management; Innovative Models; Practical Pathways; Intelligent Transformation

1. Introduction

1.1 Research Background and Significance

In the digital era, the education sector is undergoing profound transformations, with the rapid development of artificial intelligence (AI) presenting new opportunities and challenges for education management. According to UNESCO, the global student population has increased by approximately 15% over the past decade, leading to increasingly diverse and personalized educational demands. Traditional education management models, reliant on human experience, struggle with inefficiencies in resource allocation, student assessment, and teacher management, making it difficult to meet the needs of large-scale, diverse education effectively.

Against this backdrop, AI, with its powerful data processing, pattern recognition, and intelligent decision-making capabilities, emerges as a key force driving innovation in education management. From the perspective of enhancing educational resource utilization, AI can precisely match teaching resources with student and teacher needs. In student assessment, it offers comprehensive, objective, and dynamic evaluations, while in teacher management, it aids in optimizing teaching processes and guiding professional development. For instance, analyzing vast amounts of teaching data through AI can reveal student learning patterns, allowing for the customization of personalized learning paths to improve learning outcomes. Therefore, a thorough investigation into the innovative models and practical pathways of education management driven by AI is of significant practical importance for enhancing education quality, promoting educational equity, and advancing educational modernization.

1.2 Review of Domestic and International

Research

Internationally, research on the integration of AI and education management has started earlier. the United States leads in the application of educational big data and AI, developing intelligent education management systems for real-time monitoring and precise intervention in student learning processes. Similarly, EU countries are actively promoting related research, focusing on policy guidance for the normative application of AI in education management, such as enacting data protection regulations to ensure student data security.

In recent years, domestic research in this field has been on the rise, with numerous universities and research institutions conducting studies on AI's application in optimizing teaching resource allocation and evaluating students' comprehensive qualities. For instance, a research team from Tsinghua University is exploring the use of deep learning algorithms to optimize course scheduling and enhance resource utilization, while East China Normal University has made progress in developing intelligent systems for formative student assessments. However, both domestic and international research still exhibit shortcomings. On one hand, there is a disconnect between theoretical research and practical application, making it difficult for some innovative models to be implemented in real educational management scenarios. On the other hand, interdisciplinary research needs strengthening, as there is insufficient integration of educational science, management science, and computer science to comprehensively analyze the complex issues in the convergence of AI and education management.

2. Theoretical Foundations of AI and Education Management

2.1 Overview of Artificial Intelligence Technologies

AI encompasses several key technological domains, including machine learning, deep learning, natural language processing, and computer vision. Machine learning trains models through data, enabling them to make predictions and decisions. For instance, in supervised learning, models learn the mapping between input data and output results using labeled datasets to classify or predict new data. Deep learning, a subset of machine learning, constructs deep neural networks that automatically learn complex patterns from large datasets, achieving remarkable results in image and speech recognition. Natural language processing aims to enable computers to understand and generate human language, facilitating natural interactions, such as automated question-answering in intelligent teaching support systems. Computer vision focuses on enabling computers to extract information from images or videos, applicable in analyzing classroom behaviors to monitor student performance.

2.2 Theoretical Foundations of Education Management

Education management theory encompasses multiple aspects, including organizational behavior theory, systems theory, and decision theory. Organizational behavior theory examines individual and group behaviors within educational organizations, studying how to enhance operational efficiency through motivation mechanisms and team building. Systems theory views education management as a complex system, emphasizing the interconnections and collaborative effects among various elements, such as the need for cooperation among teaching, administrative, and logistical departments within schools to achieve overarching educational goals. Decision theory provides education managers with decision-making methods and strategies, enabling them to collect and analyze educational information and make informed decisions using scientific decision models in areas like curriculum design and faculty allocation.

2.3 Theoretical Support for the Integration of AI and Education Management

From the perspective of technology empowering education, AI technologies provide strong data processing and analysis tools that align with the demands for precision and scientific decision-making in education management. Education big data theory lays the groundwork for this integration by collecting, storing, and analyzing vast amounts of educational data to uncover underlying educational patterns and potential value, enriching the data resources available for AI

algorithms to optimize education management processes.

Learning analytics theory starts with analyzing students' learning processes and employs AI technologies to deeply mine learning behavior data, allowing insights into students' learning progress, knowledge mastery, and learning styles, thereby providing a basis for personalized teaching and management. For example, based on learning analytics technologies, targeted tutoring resources can be provided to students facing learning difficulties, and teaching strategies can be adjusted accordingly.

3. Constructing Innovative Models of Education Management Driven by AI

3.1 Innovative Model for Teaching Resource Allocation

AI can facilitate the establishment of an intelligent teaching resource allocation model. By analyzing multi-dimensional data on students' learning needs, teachers' teaching characteristics, and the attributes of teaching resources, precise matching of resources can be achieved. Machine learning algorithms can analyze data on students' subject performance, interests, and learning habits to predict their preferences for different teaching resources. Meanwhile, evaluating teachers' teaching experiences, specialties, and styles, alongside information on resource types, difficulty, and target audience, enables the development of resource recommendation models.

For example, resources that promote inquiry-based teaching can be matched with teachers who excel in that area, while targeted tutoring materials and micro-lecture videos can be provided to students struggling in mathematics. This precise allocation improves the utilization rate of teaching resources; related studies indicate that adopting an intelligent resource allocation model has increased the actual usage rate of teaching resources by approximately 25%, preventing resource idleness and waste.

3.2 Innovative Model for Student Academic Evaluation

Traditional student academic evaluations predominantly rely on exam scores, leading to issues of one-sidedness and a lack of process-oriented assessment. the AI-driven innovative model for student academic evaluation introduces diversified evaluation criteria and dynamic evaluation mechanisms. By employing natural language processing technology to analyze students' contributions during classroom discussions and online learning platforms, assessments of their cognitive abilities and knowledge acquisition can be made. Additionally, computer vision technology can monitor classroom behaviors, such as attention and participation levels, serving as criteria for evaluating learning attitudes.

Simultaneously, a dynamic evaluation model can be constructed to track students' learning processes in real time, adjusting evaluation strategies according to changes in their learning states. For instance, when a student experiences significant fluctuations in grades at a certain stage, the system can automatically analyze their learning behavior data, identify causes, and provide corresponding improvement suggestions, leading to more comprehensive, objective, and personalized academic evaluations that foster holistic student development.

3.3 Innovative Model for Teacher Management

In terms of teacher management, AI can support the creation of intelligent teaching support and professional development management models. By collecting and analyzing data on teachers' teaching processes, such as classroom teaching videos, reflection records, and student feedback, AI algorithms can evaluate teaching quality and provide targeted suggestions for improvement. For example, analyzing interactions and pacing in classroom videos can highlight both strengths and areas for development in teaching.

Furthermore, based on analyses of teachers' professional development needs, personalized training courses and academic resources can be recommended, aiding in their professional growth. For instance, new teachers may be recommended basic teaching skill training, while experienced teachers can receive resources on cutting-edge teaching concepts and methods, enhancing the overall teaching quality of the teaching workforce.

4. Practical Pathways for Innovative Models of Education Management Driven by AI

4.1 Policy Support and Assurance

Policy plays a crucial role in facilitating the implementation of AI-driven innovative models in education management. At the national level, specific policies should be introduced to encourage educational institutions to explore the application of AI technologies. For instance, establishing dedicated funds to support pilot projects in AI education management has already seen some regions investing millions to assist schools in adopting intelligent education management systems. Policies should also provide tax incentives and subsidies to schools and enterprises involved in AI educational innovation, thereby reducing technical application costs and enhancing participation.

Furthermore, it is essential to improve data security and privacy protection policies. Educational data often includes sensitive information such as personal student details and learning records, necessitating rigorous regulatory frameworks to safeguard data. Establishing comprehensive guidelines for data collection, storage, usage, and transmission will clarify rights and responsibilities related to data subjects, ensuring that data serves educational management innovation within a lawful and secure context. the EU's General Data Protection Regulation (GDPR) serves as a valuable reference for protecting educational data and promoting orderly advancements in education management innovation.

4.2 Technical Application Standards and Guidelines

Unified technical application standards are fundamental for the widespread and effective use of AI in education management. Standards should be established for the interfaces of various education management systems and AI technology platforms to ensure smooth data flow and interaction among different systems. For example, specifying data transmission formats and interface protocols between student information management systems and intelligent academic assessment systems will prevent information silos caused by incompatible interfaces.

Regarding the application of AI algorithms in education management, it is necessary to establish standards for algorithm evaluation and oversight. These should assess the accuracy, fairness, and interpretability of algorithms to avoid biases affecting student assessments and teacher management. Regular audits of AI algorithms used in education management should be conducted to ensure compliance with educational goals and ethical guidelines. Additionally, quality standards for AI educational products should encompass functionality, stability, and usability, guaranteeing that they meet the practical needs of educational management and promote standardized technological application.

4.3 Professional Talent Development and Team Building

Professional talent is the core driving force behind AI-driven innovations in education management. Universities should offer relevant programs and courses to cultivate interdisciplinary talents who understand both education management theory and AI technology. Courses focused on AI applications in education and educational data mining should combine theoretical instruction with practical projects, equipping students with the skills needed to apply AI in educational management contexts. Surveys show that some universities have introduced such programs, with graduates in high demand in educational technology companies and school IT departments.

For current education management personnel, targeted training should be provided to enhance their AI literacy. Training topics should include fundamental AI concepts, case studies of technology applications in education management, and data-driven decision-making methods. A blended training approach—combining online and offline formats—will enable education managers to quickly master new technologies and apply them effectively in their daily work. Additionally, schools should form interdisciplinary teams comprising education experts, information technology personnel, and data analysts to collaboratively advance AI education management innovation projects, leveraging expertise from various fields to support the practical implementation of innovative models.

5. Implementation Case Studies and Effectiveness Analysis

5.1 Introduction to Typical Cases

A well-known university has introduced an AI-

driven intelligent resource recommendation system for teaching. This system collects multi-source data on students' academic performance, course selection records, and participation in academic activities since their enrollment, using machine learning algorithms to analyze their learning needs and interests. Meanwhile, various educational resources on campus, such as online courses, academic lecture videos, and experimental guides, are categorized and tagged. Based on the analysis results, personalized learning resources are precisely recommended to students. For instance, for computer science students, the system recommends advanced programming tutorials and practical project resources tailored to their performance in programming language courses.

In student academic evaluation, a secondary school has adopted an intelligent academic evaluation system. This system utilizes natural language processing technology to analyze students' spoken contributions and written comments, evaluating their understanding and application of knowledge. Additionally, cameras installed in classrooms employ computer vision technology to monitor students' attention levels and participation behaviors. the system tracks students' learning processes in real time, issuing alerts and providing improvement suggestions when it detects anomalies, such as delivering resources on improving attention to students who consistently show less than 70% attention in class for a week.

5.2 Evaluation of the Effectiveness of Innovative Model Implementation

Follow-up evaluations of the aforementioned cases and similar practices reveal significant successes. In terms of teaching resource allocation, there has been a substantial increase in resource utilization rates. Statistics show that following the implementation of the intelligent recommendation system, the effective usage rate of recommended resources among students increased from below 40% to over 70%, with enhanced targeted learning feedback leading to noticeable improvements in learning efficiency.

Regarding student academic evaluation, the results have become more comprehensive and objective. Traditional assessment methods that primarily rely on exam scores only reflect limited aspects of student learning, whereas the intelligent evaluation system incorporates multi-dimensional data from the learning process, providing a more accurate depiction of student learning states.comparatively, after implementing the intelligent evaluation system, the accuracy of teachers' understanding of students' learning improved by approximately 30%, allowing students to adjust their learning methods based on system feedback, contributing to an overall upward trend in academic performance. In teacher management, educators have enhanced their control over the teaching process, with professional development effectively promoted. the intelligent teaching support system provides teachers with quality analysis reports, assisting in identifying problems in their teaching; around 80% of teachers reported improved teaching outcomes after adjusting their strategies based on the recommendations from these reports.

6. Conclusion

This study has explored the innovative models and practical pathways of education management driven by artificial intelligence in depth. By analyzing the integration of AI technologies with educational management theories, innovative models for teaching resource allocation, student academic evaluation, and teacher management have been constructed. In terms of practical pathways, the importance of policy support, technical standard formulation, and professional talent development has been highlighted, with typical cases validating the effectiveness of these innovative models. the research demonstrates that AI can significantly enhance the efficiency and quality of education management, achieving precise resource allocation, diversified academic evaluations, and intelligent teacher management, thus providing robust support for the modernization of education management.

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