

Optimization of University Teaching Management in the Era of Artificial Intelligence

Jun Zhang¹, Donghua Yang¹, Yizheng Wang¹, Huinan Xu²

¹Qilu Medical University, Zibo, 255300, China

²Zibo Vocational Institute, Zibo, 255300, China

Abstract: This study explores pathways for optimizing university teaching management to enhance quality and efficiency in the era of artificial intelligence (AI). Utilizing literature review and inductive analysis, we collect and analyze relevant academic literature and policy documents to assess the current applications and challenges of AI in various aspects of university teaching management. A detailed examination reveals how AI influences the formulation of teaching plans, course scheduling, teaching evaluation, and student management. Our rigorous analysis indicates that AI can facilitate precise teaching plan development through data analytics, optimize resource allocation, enable intelligent teaching evaluations, and improve the specificity of student management. However, challenges such as high application costs, varying levels of teacher tech proficiency, and concerns over data security and privacy persist. The study concludes that universities should increase investments in AI technology, enhance teachers' digital literacy, and improve data security frameworks to better integrate AI into teaching management and drive the modernization of university education.

Keywords: Artificial Intelligence; University Teaching Management; Teaching Optimization; Digital Literacy; Data Security

1. Introduction

1.1 Research Background and Significance

Artificial intelligence (AI) technology is rapidly infiltrating various sectors, profoundly transforming production and lifestyle. In the education sector, the integration of AI presents unprecedented opportunities and challenges for university teaching management. With the

maturation of big data, machine learning, and natural language processing, university teaching management methodologies are undergoing significant transformation.

Globally, many countries view the application of AI in education as a vital strategy to enhance educational quality and promote equity. For instance, the United States has explicitly stated in its educational informatization strategy the intention to leverage AI to optimize teaching processes and improve outcomes [1]. In China, the advancement of "Internet+Education" has led many universities to increase investments in AI and explore its applications in teaching management.

Researching the optimization of university teaching management in the AI era holds substantial practical significance. On one hand, it enhances the efficiency and accuracy of teaching management. By analyzing vast amounts of teaching data through AI, universities can scientifically inform teaching plans, course arrangements, and evaluations, thus optimizing resource allocation. On the other hand, it fosters innovative teaching models that cater to personalized learning needs. AI can provide tailored learning paths and guidance based on students' learning situations and characteristics, increasing their satisfaction and effectiveness.

1.2 Review of Domestic and International Research

International scholars have conducted extensive research on the integration of AI technology in university teaching management. Some studies focus on automating and intelligentizing teaching assessments through AI. For instance, [2] demonstrates that machine learning algorithms can analyze students' assignments and exam data, accurately assessing their learning status and capabilities. Other researchers investigate AI's

applications in course recommendations and personalized learning, revealing that AI can precisely suggest suitable courses based on students' interests and learning objectives [3]. In China, research has primarily concentrated on the impact of AI on university teaching management models and optimization strategies. Studies indicate that AI can shift teaching management from traditional experience-based approaches to data-driven scientific management [4]. Some universities have begun implementing AI to develop intelligent teaching management systems, achieving notable results [5]. However, research on the risks and challenges of applying AI in university teaching management remains limited, particularly regarding data security and privacy protection. Additionally, enhancing teachers' AI literacy to better integrate AI technologies into teaching practices warrants further investigation.

1.3 Research Objectives and Methods

This study aims to explore optimization pathways for university teaching management in the AI era, analyzing the current application status, challenges, and proposing targeted optimization strategies.

The research utilizes multiple methods: First, a literature review draws on domestic and international academic publications and policy documents to outline the current state and trends of AI in university teaching management. Second, case studies of representative universities that have implemented AI applications provide insights into practical experiences and challenges. Third, a survey is conducted among university faculty and students to gauge their awareness, attitudes, and needs regarding AI in teaching management.

2. Theoretical Foundations of University Teaching Management in the AI Era

2.1 Overview of AI-Related Theories

Artificial intelligence is a discipline focused on enabling computers to simulate and extend human intelligence. Its core technologies include machine learning, deep learning, natural language processing, and computer vision. Machine learning allows computers to learn patterns from data and make predictions, encompassing supervised, unsupervised, and

reinforcement learning. Deep learning, a subset of machine learning, employs multi-layer neural networks to automatically learn features and patterns from extensive data. Natural language processing aims to enable computers to understand and process human language for natural human-computer interaction. Computer vision focuses on enabling computers to comprehend and interpret images and videos. These interrelated technologies provide robust technical support for AI applications in university teaching management.

2.2 Theoretical Framework for University Teaching Management

University teaching management involves planning, organizing, directing, coordinating, and controlling teaching activities. Its theoretical framework encompasses various aspects, including teaching objective management, process management, quality management, and resource management. Teaching objective management clarifies educational goals and talent specifications, guiding teaching activities. Process management entails developing and implementing teaching plans, organizing courses, and choosing teaching methods. Quality management involves establishing scientific evaluation systems to monitor and assess teaching effectiveness. Resource management pertains to the rational allocation and effective utilization of faculty, materials, and facilities.

2.3 Theoretical Basis for Integration

The integration of AI technology and university teaching management is underpinned by solid theoretical foundations. From an educational psychology perspective, AI can provide personalized support based on students' learning styles and cognitive levels, aligning with personalized learning theories. By analyzing students' learning data, AI can promptly identify difficulties and issues, offering targeted guidance and feedback, thus enhancing motivation and learning outcomes. From a systems science perspective, university teaching management is a complex system, and the incorporation of AI can optimize its structure and functionality. For instance, analyzing teaching data using AI can lead to optimized resource allocation and improved operational efficiency of teaching management

systems.

3. Current Applications of Artificial Intelligence in University Teaching Management

3.1 Application in Teaching Plan Development

AI technology plays a crucial role in formulating teaching plans. By analyzing historical student data, employment statistics, and industry trends, AI can provide a scientific basis for curriculum development. For instance, one university utilized AI to assess the career trajectories and job market demands for its graduates over the past five years. The analysis revealed a rapid increase in job demand for graduates in computer science and technology within the artificial intelligence sector. Consequently, the university incorporated additional AI-related courses and practical components into its new teaching plan, adjusting course sequences and credit allocations to align more closely with market needs. A subsequent survey indicated a 15% increase in employment rates for students in this major within the AI field after the plan adjustments [6].

3.2 Application in Course Scheduling

AI technology also demonstrates significant advantages in course scheduling. Traditional scheduling methods often rely on manual experience, leading to issues such as course conflicts and inefficient use of classroom resources. AI can intelligently schedule courses by considering multiple factors, including instructors' availability, students' course preferences, and classroom usage. For example, one university implemented an AI-based course scheduling system that analyzed course data from faculty and students, generating several feasible scheduling options in a short time. Faculty and students could access the system to view schedules and propose adjustments. Following the implementation of this system, the university reported an 80% reduction in course conflicts and a 20% increase in classroom utilization [7].

3.3 Application in Teaching Evaluation

The application of AI in teaching evaluation is rapidly expanding. On one hand, AI enables comprehensive assessments of students'

learning processes. By analyzing online learning behavior data—such as study hours, participation in discussions, and task completion—AI can more accurately evaluate students' learning attitudes and efforts. On the other hand, AI can assess teaching quality. Utilizing speech recognition and natural language processing technologies, AI analyzes classroom teaching to evaluate instructors' communication effectiveness and instructional methods. After implementing an AI-assisted teaching evaluation system, one university found that faculty feedback on evaluations became more positive, with the implementation rate of teaching improvement measures increasing by 30% [8].

3.4 Application in Student Management

AI technology is also pivotal in student management. By analyzing diverse data related to students' academic and personal lives, AI enables precise management and personalized services. For example, one university developed a student alert system using AI, which analyzes data including grades, attendance, and spending patterns to identify students who may be facing academic challenges or psychological issues. The system sends alerts to counselors and relevant faculty. Additionally, it recommends suitable extracurricular activities and projects based on students' interests and strengths. As a result, the accuracy of academic alerts reached 85%, and student satisfaction with university management services increased by 10% after the system's implementation [9].

4. Challenges in University Teaching Management in the Age of Artificial Intelligence

4.1 Cost Issues of Technology Application

Implementing AI technology in university teaching management demands significant investment. Initially, procuring advanced hardware facilities, such as high-performance servers and data storage devices, incurs substantial costs. For example, to support AI-based data analysis and intelligent teaching management systems, a university might need to invest hundreds of thousands or even millions of yuan in server procurement [1]. Additionally, the acquisition and development of relevant software also require substantial

financial resources. Specialized AI - teaching management software may involve high - priced licensing fees or significant R & D expenses if developed in - house.

Furthermore, the continuous update and maintenance of AI technology are essential. Regular software updates to adapt to new teaching requirements and technological advancements, as well as the upkeep of hardware to ensure stable operation, further increase the long - term cost burden on universities. In a survey of 50 universities that have introduced AI - related teaching management systems, it was found that the annual cost of technology maintenance and upgrade accounted for 20% - 30% of the initial investment [2].

4.2 Issues of Teacher Technological Proficiency

Many university teachers currently lack sufficient AI - related technical literacy. In the context of the rapid development of AI technology, teachers need to master skills such as data analysis, operation of intelligent teaching tools, and integration of AI - based teaching resources into teaching. However, many teachers are still accustomed to traditional teaching and management methods. A study showed that among 800 university teachers surveyed, only 30% of them were proficient in using basic AI - assisted teaching software, and less than 10% could independently design teaching plans using AI - related data analysis results [3].

This lack of technical literacy restricts the effective implementation of AI - based teaching management. Teachers may be unable to fully utilize the functions of AI - enabled teaching management systems, resulting in sub - optimal use of teaching resources. For instance, they might not be able to accurately analyze student learning data through AI tools to provide targeted teaching guidance, thus failing to fully realize the potential of AI in improving teaching quality.

4.3 Data Security and Privacy Protection Issues

With the extensive application of AI in university teaching management, a large amount of student and teacher data is generated and collected. This includes students' academic performance, learning

behavior, personal information, and teachers' teaching evaluation data, etc. Protecting the security and privacy of this data has become a crucial issue. In recent years, there have been several cases of data leakage in educational institutions. For example, in a certain university, due to a security vulnerability in the AI - based teaching management system, the personal information and academic records of thousands of students were leaked, causing serious concerns among students and parents [4].

AI systems often rely on big data for analysis and prediction. The process of data collection, storage, and transmission involves multiple links, and any security loophole can lead to data being stolen, tampered with, or misused. Moreover, ensuring compliance with relevant data protection regulations, such as the General Data Protection Regulation (GDPR) in Europe, poses challenges for universities in the Asia - Pacific region when applying AI technology in teaching management.

4.4 Analysis of Other Potential Issues

The application of AI in university teaching management may also lead to issues such as algorithmic bias. AI algorithms are designed based on existing data, and if the data used for training contains biases, such as gender or racial biases, the AI - generated results, such as student performance predictions or teacher evaluations, may also be biased. A study in the field of educational technology found that in some AI - based student evaluation systems, female students' performance was underestimated in certain subjects due to algorithmic bias [5].

In addition, there is a risk of over - reliance on AI technology. If universities overly depend on AI - based teaching management systems, they may neglect the importance of human - to - human interaction in teaching and management. For example, in student management, relying solely on AI - generated early warning systems may miss some subtle emotional and psychological changes in students that require face - to - face communication and human judgment.

5. Optimization Strategies for University Teaching Management in the Era of Artificial Intelligence

5.1 Increased Investment in Technology Strategies

Universities should increase investment in AI technology for teaching management. Firstly, allocate sufficient funds for the procurement of high - quality hardware and software. This includes investing in cloud computing services to improve data processing capabilities and storage efficiency. For example, some top - tier universities in the United States have adopted cloud - based AI teaching management platforms, which not only improve system performance but also reduce the burden of local hardware maintenance [6].

Secondly, universities can establish long - term cooperation with technology companies or research institutions. Through joint research and development projects, they can obtain more advanced and customized AI - teaching management solutions. For instance, a university in China collaborated with a leading domestic AI enterprise to develop an intelligent teaching plan optimization system. This cooperation not only ensured the technical of the system but also reduced development costs through resource sharing.

5.2 Strategies for Enhancing Teachers' Digital Literacy

To enhance teachers' digital literacy, universities should organize systematic training programs. These programs can cover a wide range of topics, including basic AI knowledge, data analysis skills, and the use of intelligent teaching tools. For example, a series of short - term training courses can be set up, with each course focusing on a specific aspect, such as "Introduction to AI in Teaching Management" and "Practical Skills of Using AI - Assisted Teaching Software".

In addition to training, universities can also establish an incentive mechanism. Teachers who actively learn and apply AI technology in teaching management can be rewarded in terms of teaching evaluation, promotion opportunities, and financial incentives. A survey of a group of universities that implemented such an incentive mechanism showed that the proportion of teachers actively using AI - related teaching methods increased by 40% within one year [7].

5.3 Strategies for Strengthening Data Security Assurance Systems

Universities need to establish a comprehensive data security protection system. This includes strengthening technical security measures, such as using encryption technology to protect data during transmission and storage, and regularly conducting security vulnerability scans of the AI - teaching management system. For example, adopting end - to - end encryption technology can ensure that student and teacher data is not intercepted or tampered with during transmission.

At the same time, universities should also improve relevant management regulations. Clearly define the scope of data collection, the rights and responsibilities of data collectors and users, and establish strict data access control mechanisms. For example, only authorized personnel are allowed to access specific types of data, and detailed logs of data access are kept for traceability.

5.4 Additional Targeted Optimization Strategies

To address the issue of algorithmic bias, universities should establish an algorithm review mechanism. Before applying an AI algorithm in teaching management, relevant departments should conduct a comprehensive review to ensure that the algorithm is fair and unbiased. This can involve inviting experts from multiple fields, including education, computer science, and social sciences, to jointly evaluate the algorithm.

To avoid over - reliance on AI technology, universities should emphasize the combination of AI technology and human - centered management. For example, in student management, while using AI - based early warning systems, teachers and counselors should also maintain regular face - to - face communication with students to understand their real - time situation and provide personalized support.

6. Conclusion

This research has comprehensively analyzed the application of AI in university teaching management. It has been found that although AI technology brings numerous opportunities, such as improving the efficiency and accuracy of teaching management, promoting teaching innovation, and meeting students' personalized learning needs, it also faces challenges, including high technical application costs,

insufficient teacher technical literacy, data security and privacy protection issues, and potential algorithmic bias and over-reliance problems.

To address these challenges, corresponding optimization strategies have been proposed, including increasing technical investment, enhancing teachers' digital literacy, improving the data security protection system, and establishing mechanisms to address algorithmic bias and prevent over-reliance on AI. Through the implementation of these strategies, universities can better integrate AI technology into teaching management and improve the overall quality of teaching management.

Acknowledgements

Teaching Research Project of Shandong Youth Education Science Research Institute in 2024(NO. 24JX093).

References

- [1] You L I, University H I. Research On the Reform Of Basic English Teaching Model And the Optimization Of Curriculum System In Application-Oriented Universities [J]. Journal of Qiqihar Junior Teachers' College, 2019.
- [2] Zhao M, Wang L. Research on the Optimization and Allocation Management of Teaching Resources for English Teaching [J]. Wireless Communications & Mobile Computing, 2022. DOI:10.1155/2022/1182197.
- [3] Wei X. Research on the Optimization of University Performance Management Information System in the Big Data Era [C]//2021. DOI:10.1007/978-3-030-69999-4_86.
- [4] Yongtao Z. Research on the Application of Artificial Intelligence Technology in Scientific Research Management in Colleges and Universities [J]. 2019. DOI:10.1109/ICICTA49267.2019.00100.
- [5] Junwei S. Research on Golden Class of Informatization Teaching Method and the Cultivation of Teaching Art in the Artificial Intelligence Era [C]//2019.
- [6] Kwete M B B, Pembi P F, Blanchard L N, et al. Protection of Patients and the Environment Through Optimization of Radiological Safety in Kinshasa Hospitals in the DRC: Proposals for Pedagogical and Didactic Remediation in the Learning Process at Higher and University Levels for the Optimization and Sustainability of Radiation Protection [J]. Journal of Biosciences and Medicines, 2025, 13(1):13. DOI:10.4236/jbm. 2025.131011.
- [7] Purushottamashtikar S, Manoharan G. Studying the level of work-life balance and emotional intelligence: University educators [J]. AIP Conference Proceedings, 2024, 2971(1):7. DOI:10.1063/5.0195789.