

Analysis on Improving Classroom Effectiveness Based on Artificial Intelligence Assisted Teaching System

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Abstract

The AI-assisted teaching system optimizes the classroom teaching process through big data analysis and intelligent algorithms. The system can accurately manage teaching and achieve personalized goals. It uses natural language processing, computer vision and machine learning technologies to automatically collect and analyze classroom data. The system can also adjust teaching strategies in real time to enhance classroom interactivity and student participation. It helps teachers track students' learning progress through real-time data feedback and personalized learning path recommendations. In addition, it optimizes the teaching design and evaluation system to improve classroom efficiency and learning outcomes. Ultimately, the system promotes the transformation of education to intelligence.

Keywords

AI-assisted Teaching System, Classroom Efficiency Improvement, Personalized Learning, Data-driven, Intelligent Teaching

1. Introduction

The widespread application of artificial intelligence technology in the field of education is changing the traditional classroom teaching model. The intelligent teaching system uses big data analysis, natural language processing and machine learning algorithms to realize the intelligence of classroom management and the personalization of learning paths. This significantly improves the efficiency and quality of classroom teaching. Through real-time data feedback and intelligent interaction, teachers can more accurately grasp the teaching rhythm [1,2]. Students can also get guidance that is more in line with their personal needs during the learning process. This change has promoted the modernization of education and the innovative development of teaching models [1,2].

1.1 System Composition of Artificial Intelligence-assisted Teaching System

The artificial intelligence-assisted teaching system is mainly composed of three modules: data acquisition module, data processing module and intelligent interaction module.

The data acquisition module is the basis of the entire system. It collects classroom teaching data in real time through intelligent devices, including student attendance, classroom participation and interaction. These data provide sufficient materials for subsequent processing and analysis.

The data processing module is the core of the system. It uses big data analysis technology to scientifically judge and deeply mine the collected data. This module accurately analyzes classroom behavior characteristics and learning effects through pattern recognition and learning prediction models. At the same time, it can evaluate students' classroom performance and academic performance, and generate visual reports [3]. These reports provide a scientific basis for the optimization of teaching strategies. In addition, the module can predict learning trends and help teachers intervene in advance, thereby improving the quality of teaching.

The intelligent interaction module is a bridge for real-time interaction and feedback between teachers and students. It is based on speech recognition technology to quickly identify students' questions and discussion content. The system will analyze the semantics and give corresponding responses. The intelligent question and answer function can answer students' questions in real time. When students speak, answer questions or interact, the system will immediately provide evaluation and guidance. This instant feedback mechanism improves students' enthusiasm for classroom participation.

1.2 Technical Support for Artificial Intelligence-assisted Teaching System

The implementation of artificial intelligence-assisted teaching system relies on multiple core technologies.

Natural language processing (NLP) plays a key role in teaching feedback. It intelligently interprets students' questions, classroom discussions and homework texts through semantic analysis and sentiment recognition. NLP can quickly evaluate students' mastery of knowledge. During classroom discussions and oral expressions, NLP can analyze students' language expression quality in real time and provide constructive feedback to help students improve their expression skills.

Computer vision (CV) is of great significance in classroom behavior analysis. It uses image recognition and motion tracking technology to accurately capture students' classroom behavior. Specific functions include attendance recording [4], concentration monitoring, and interactive behavior analysis. By recognizing facial expressions and body movements, CV can assess students' concentration and learning engagement, thereby helping teachers optimize teaching methods.

Machine learning (ML) technology is the core of personalized learning path recommendation. It builds a learning prediction model to intelligently recommend learning materials and personalized practice tasks based on students' learning history and classroom performance.

2. Analysis of the Application of Artificial Intelligence-assisted Teaching System in Classroom Management

2.1 Classroom Order Maintenance

The intelligent attendance system uses face recognition technology to automatically manage student attendance. When students enter the classroom, the system collects facial features through the camera, quickly matches student information, and generates real-time attendance records. Compared with the traditional roll call method, intelligent attendance is faster and can effectively avoid attendance errors and signature on behalf of others. In special cases, the system also supports voice verification and ID card swiping double verification to ensure the accuracy of attendance data [5].

The behavior monitoring module can monitor the classroom status in real time to help teachers master classroom discipline and student concentration. The system uses computer vision technology and body movement recognition algorithms to identify students' facial expressions, body postures and classroom behaviors. For example, it can detect students dozing off, whispering or playing with mobile phones. Teachers can instantly understand the status of students through visual data, adjust teaching strategies in time, and improve classroom interaction effects.

The intelligent monitoring system can also automatically generate classroom behavior reports analyzing changes in student concentration and classroom discipline. These reports can help teach management departments evaluate classroom order and teacher teaching effectiveness. Practical application shows that this monitoring method can effectively reduce classroom interference factors and create a good learning atmosphere.

2.2 Teaching Resource Management

The system has automatic classification and archiving functions. It intelligently classifies teaching materials such as courseware, video, audio, etc. according to teaching content, course progress and subject characteristics. Through text analysis and semantic understanding technology, the system can automatically classify materials related to the subject into the same folder, greatly reducing the workload of teachers to organize materials [6]. After-class materials will also be automatically sorted by course chapters and synchronized to the teaching platform for students to review and review.

The system can dynamically generate teaching materials and review plans to support personalized teaching. Based on big data analysis, the system will automatically generate targeted learning materials and review tasks based on students' classroom performance and learning progress. Before the final exam or periodic assessment, the system will automatically integrate key and difficult knowledge, provide review strategies and intensive exercises, and help students prepare for the exam efficiently.

The teaching resource management module also has version control and updates reminder functions. When teachers modify or update courseware, the system will automatically record version changes and push the latest resources to the student end to ensure timely updating of teaching materials. Through the resource sharing platform, teachers of various subjects can communicate and share high-quality teaching resources, thereby improving the overall teaching level of the school.

3. Teaching Design Optimization Strategy Based on Artificial Intelligence

3.1 Personalization of Teaching Content

The system pushes targeted learning materials through intelligent means. It can accurately locate students' weak points in knowledge. The system uses data mining technology to comprehensively analyze students' learning data. These data include homework scores, classroom performance and assessment results. Through analysis, the system can accurately identify students' knowledge blind spots. Based on the analysis results, the system automatically pushes matching learning resources. The push content includes video explanations, consolidation exercises and expansion materials. This can help students learn more targeted and autonomously. After class, students can focus on strengthening weak points. In this way, students can gradually improve their comprehensive abilities.

The system uses knowledge graphs to build personalized learning paths. Knowledge graph technology organizes subject knowledge into a network structure. It can clearly show the relationship between knowledge points. The system formulates personalized learning plans based on students' mastery. This helps students master knowledge step by step. Taking mathematics learning as an example, the system analyzes students' mastery of functions. Then pushes learning content from shallow to deep. The content includes function concepts, properties and applications. This can help students gradually break through learning difficulties.

3.2 Diversification of Teaching Methods

AI-assisted interactive teaching significantly improves classroom interaction. Voice assistants and intelligent question-and-answer robots support real-time interaction. When teachers ask questions, voice assistants can quickly collect students' answers. The system will perform data analysis on the answers. Feedback includes accuracy and typical error analysis. Intelligent question-and-answer robots can generate multiple solutions. Students can choose solutions to discuss. This interactive mode can stimulate learning interest. At the same time, it helps teachers understand students' understanding level.

Virtual simulation laboratories break through the limitations of traditional teaching. Subjects such as physics and chemistry are often restricted by experimental conditions. Traditional experimental teaching is often difficult to carry out. The system uses virtual reality technology to build an experimental environment. Students can operate in the virtual world. For example, circuit construction and debugging in physical experiments. Students can observe experimental results and data changes in real time. This method improves the flexibility of experiments. At the same time, it reduces experimental risks and costs. Make teaching more practical and interesting.

4. Intelligent Improvement of Personalized Learning and Evaluation Mechanism

4.1 Intelligent Tracking of Learning Process

It is difficult for traditional teaching mode to fully track the learning progress of each student. Teachers can usually only measure the learning effect through periodic assessment. This method has the problems of lag and one-sidedness. The artificial intelligence-assisted teaching system adopts intelligent tracking technology. It can track students' learning progress in real time. At the same time, it accurately evaluates students' learning status.

The system uses data mining technology to analyze learning conditions and predict learning behaviors. By collecting and analyzing classroom performance data, including interaction frequency, answer accuracy, homework completion, etc., the system establishes a comprehensive learning situation file. Combined with historical learning data, predict students' future learning performance. Discover the weak links in knowledge mastery in advance. This prediction mechanism helps teachers intervene in teaching. Teachers can adjust teaching methods and progress in a targeted manner. Avoid students from falling behind in learning due to misunderstanding.

The adaptive learning system can adjust the teaching progress in real time according to students' performance. It truly teaches students in accordance with their aptitude. The system dynamically adjusts the teaching difficulty according to classroom interaction and homework performance. For students with strong comprehension ability, the system pushes more challenging extension content. For students who understand slowly, the system focuses on consolidating basic knowledge. This mechanism is particularly effective in teaching subjects such as mathematics and physics. It can narrow the learning gap between students and promote personalized development.

Through intelligent tracking, the system generates personalized learning reports. Teachers can adjust teaching strategies in time according to the reports. Students can also clearly understand their learning status. This helps to formulate a reasonable review plan. At the same time, cultivate students' self-management and reflection abilities.

4.2 Innovation in Evaluation Mechanism

Evaluation is an important part of teaching feedback. Traditional evaluation methods such as written tests and stage tests have limitations. The main problems are the single evaluation dimension and the long feedback cycle. Artificial intelligence technology makes classroom evaluation more scientific, comprehensive and intelligent.

The AI automatic grading system improves the efficiency of homework grading and exam evaluation. The system uses natural language processing technology to analyze answers to subjective questions. It can accurately identify keywords and core ideas in the answers. For objective questions, the system achieves second-level grading through pattern matching. AI grading is not only fast, but also avoids human errors. Ensure the fairness and consistency of evaluation. The system can also conduct a comprehensive analysis of the grading results. Provide score distribution and error concentration point analysis. Help teachers to fully understand students' knowledge mastery.

The data-driven evaluation model realizes multidimensional dynamic evaluation. The system comprehensively analyzes classroom interaction, learning behavior and test scores. Generates a scientific learning effect evaluation report. The report not only includes score analysis, but also covers learning habits, knowledge point mastery, etc. For different subjects and knowledge modules, the system provides specific improvement suggestions. For example, in physics experiment classes, the system analyzes experimental data and operation videos. Evaluate students' operational standardization and data processing capabilities. Provide a basis for teachers to improve experimental teaching.

5. Evaluation of the Effectiveness of AI-assisted Teaching System in Improving Classroom Effectiveness

5.1 Construction of Effectiveness Indicators

The core of improving classroom effectiveness is to improve student participation and teaching effectiveness. In the effectiveness evaluation stage, a scientific and reasonable indicator system needs to be constructed first. Classroom participation is one of the key indicators for evaluating classroom effectiveness. Monitoring work mainly relies on

smart cameras and facial expression analysis technology. Real-time cameras can capture students' facial expressions, body movements and attention changes. Artificial intelligence algorithms can perform emotional discrimination and behavior analysis to calculate participation-related data values. When students actively answer questions, follow explanations with their eyes, or actively participate in interactions, the system will record high participation scores. If students are distracted or sleepy, the score will be in a lower range. Through continuous monitoring and data accumulation, the system can generate a participation change curve. This helps teachers to grasp the classroom atmosphere in real time and adjust teaching strategies when appropriate.

Teaching effectiveness is another core evaluation dimension. It is generally measured through a comprehensive evaluation of academic performance and changes in learning interests. The system will analyze test scores, homework completion, and classroom test performance. After combining these data, the system will give a teaching effectiveness score. The system also uses sentiment analysis and learning behavior tracking technology. This can determine the changes in students' interest in learning content. The system also monitors the interactive voice status, questioning enthusiasm and discussion enthusiasm in the classroom. Based on this data, the system can generate a trend chart of learning interest. By comprehensively analyzing academic performance and interest changes, teachers can accurately evaluate the actual effects of different teaching strategies. This helps teachers continuously optimize classroom design and teaching methods.

5.2 Case Analysis

A school has fully enabled the artificial intelligence-assisted teaching system in daily classroom management and teaching design. In order to test the system's effect on improving classroom efficiency, the school conducted a series of comparative experiments. The experiment selected two parallel classes. One class was used as the experimental group and fully adopted the AI-assisted teaching system. The other class was used as the control group and still used traditional teaching methods. After a semester of comparative research, the experimental group performed better in both classroom participation and academic performance. The frequency of classroom interaction of students in the experimental group increased by 30%. Their facial concentration scores increased by an average of 15%. The pass rate of academic performance increased by 20%. These data show that AI technology can significantly improve classroom activity and learning effectiveness.

Through the post-class questionnaire survey, it was found that the students in the experimental group generally gave good feedback. They believed that the targeted learning materials pushed by AI intelligence can help consolidate weak knowledge points. Teachers also reported that the intelligent classroom management system greatly reduced the time for classroom order management. In this way, teachers can focus more on teaching content. Teachers in the control group said that due to the lack of intelligent assistance, the classroom management pressure was high. Their teaching effect did not meet the expected level. Through comparative experiments and case analysis, the role of AI-assisted teaching system in improving classroom efficiency has been strongly proved.

5.3 Challenges and Countermeasures

Although the artificial intelligence-assisted teaching system can improve classroom efficiency, large-scale application still faces some challenges. The first is the legal and ethical issues of data privacy protection. During the real-time monitoring and data analysis of the classroom, the system will collect a large amount of student personal data. These data include facial features, daily behavior records and learning archives. How to ensure data security in system development and application is a difficult problem. Data leakage and abuse must be prevented. A strict data protection mechanism needs to be established. Specific measures include data anonymization, access control and data encryption storage. Before using the AI teaching system, schools should explain the privacy policy to students and parents. Clear authorization must be obtained and operations must comply with laws and regulations.

Improving teachers' skills is the key to effectively applying AI teaching systems. At present, many teachers have limited knowledge of artificial intelligence technology. They find it difficult to fully utilize the system functions in the teaching process. Schools should conduct AI teaching skills training regularly. The training content should include system operation, data interpretation and classroom strategy optimization methods. Specifically, it can cover practical skills such as intelligent attendance management, classroom behavior analysis and personalized learning path planning. Schools should also organize teaching seminars and experience exchange activities. Encourage teachers to share application cases of AI technology in teaching. Only in this way can teachers' educational information literacy be gradually improved.

6. Conclusion

The AI-assisted teaching system has obvious advantages in improving classroom efficiency. It optimizes classroom management through data collection, intelligent analysis and real-time interaction. At the same time, it improves teaching design, realizes personalized learning and accurate evaluation. Actual cases have proved that the system has significantly improved classroom participation and teaching effectiveness. However, with the widespread application of technology, some problems have become increasingly prominent. The first is the issue of data privacy protection. The second is the need to improve teachers' skills. In order to promote the sustainable development of AI technology in the field of education, the following measures need to be taken: strengthen technical specifications and ethical guarantees;

improve teachers' information literacy; and build a modern teaching system that combines intelligence and humanization, so as to effectively help the modernization and upgrading of education.

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