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Exploration on the Construction of an Intelligent Educational Evaluation System Integrating the CIPP Model and Artificial Intelligence Technology from the Perspective of New Engineering

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Abstract: This study explores the feasibility of constructing an intelligent educational evaluation system based on the CIPP model and artificial intelligence technology in the context of new engineering disciplines. By integrating the CIPP model with AI technology, a novel intelligent educational evaluation system was designed. Through experimental validation and case studies, the system demonstrated significant effectiveness in improving teaching quality, facilitating personalized student development, and optimizing educational resource allocation. Additionally, the study predicts potential changes this system could bring to the education industry and proposes relevant policy recommendations. Although the current research has limitations, with technological advancements in the future, this system is expected to provide stronger support for innovations in engineering education models.

Keywords: New engineering disciplines; CIPP model; Artificial intelligence; Intelligent educational evaluation system; Educational innovation

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1. Introduction

In the context of new engineering disciplines, education evaluation systems are undergoing unprecedented challenges and opportunities [1]. With the rapid development of technology, particularly the rise of artificial intelligence, traditional education evaluation methods have struggled to comprehensively and accurately assess students' capabilities and development. The root of this problem lies in the fact that traditional methods often focus on single examination results or fixed evaluation criteria while neglecting individual student differences, skill development, and the cultivation of non-cognitive abilities [2,3]. Therefore, constructing a flexible and efficient intelligent education evaluation system has become particularly urgent. The new engineering discipline background imposes new requirements on education evaluation systems. New engineering disciplines

emphasize practice and innovation, focusing on the cultivation of students' comprehensive qualities and capabilities. In this context, education evaluation systems need to pay more attention to the development of students' practical operation capabilities, problem-solving abilities, teamwork abilities, and other aspects. To achieve this goal, there is an urgent need to introduce new evaluation concepts and technical means [4,5].

With the rapid development of new engineering disciplines, traditional education evaluation methods can no longer meet the complex and changing needs of engineering education. Therefore, it is crucial to seek a more scientific, reasonable, and highly adaptable evaluation tool. The CIPP model, as a comprehensive evaluation model covering four dimensions—context, input, process, and product—provides a systematic framework for education evaluation [6,7]. The integration of artificial intelligence technology further enhances the intelligence and precision of the evaluation system.

2. Overview of the CIPP model and artificial intelligence technology

2.1. Overview of the CIPP model

The CIPP model, namely the Context, Input, Process, and Product evaluation model, is an education evaluation model proposed by Stufflebeam in 1967. This model holds a pivotal position in education evaluation, with its core concept being to regard education evaluation as a systematic tool to determine whether educational activities have achieved their intended goals and how to optimize and improve them. In constructing an intelligent education evaluation system, the CIPP model provides a comprehensive and systematic perspective, making evaluation no longer limited to single examination scores or outcomes but spanning the entire process of educational activities.

2.2. Introduction to artificial intelligence technology

The potential value of artificial intelligence technology in the education sector is not only reflected in personalized teaching but also in helping educational departments conduct more scientific and comprehensive education evaluations. An education evaluation system based on the CIPP model, combined with artificial intelligence technology, can achieve a comprehensive, objective, and accurate assessment of students' learning outcomes. This intelligent evaluation system can not only improve the efficiency and accuracy of education evaluation but also provide teachers with more personalized teaching suggestions, thereby further enhancing teaching quality.

2.3. Integration of CIPP and artificial intelligence technology

The combination of the CIPP model and artificial intelligence technology has broad application prospects in constructing an intelligent education evaluation system. AI technology can help educators collect and analyze educational data more efficiently and accurately, providing strong support for all links of the CIPP model [8]. For example, in "context" evaluation, AI technology can help analyze students' learning needs and interests; in "input" evaluation, AI can assist teachers in selecting appropriate teaching resources and strategies; in "process" evaluation, AI can monitor students' learning progress and feedback in real time, providing timely adjustment suggestions for teachers; in "product" evaluation, AI can comprehensively analyze students' multi-faceted performance to provide educators with more comprehensive and objective evaluation results.

3. Design of the intelligent education evaluation system

3.1. Requirement analysis

To construct an intelligent education evaluation system that meets the requirements of the new engineering discipline background, as well as the application of the CIPP model and artificial intelligence technology, it is necessary to comprehensively collect requirement information about the ideal education evaluation system from multiple perspectives.

From the teacher's perspective, they expect the evaluation system to provide comprehensive and objective student learning data to better understand students' learning situations and adjust teaching strategies. At the same time, teachers hope the system can simplify the evaluation process, reduce the workload of manual data entry and organization, and improve work efficiency. Additionally, teachers expect the system to provide real-time feedback to help them identify problems and intervene promptly, thereby enhancing teaching quality.

For students, they hope the evaluation system can fairly and objectively assess their learning outcomes and provide personalized learning suggestions. Students expect the system to record their learning trajectories, help them recognize their learning weaknesses and strengths, and enable self-adjustment and improvement. At the same time, students hope the system can provide diverse evaluation methods, not limited to traditional written test scores, but also including evaluations of project completion, teamwork capabilities, and other aspects.

Managers pay more attention to the overall effectiveness and data analysis functions of the evaluation system. They hope to evaluate teaching quality and formulate and adjust education policies through data collected by the system. Managers also expect the system to provide an early warning mechanism to identify and solve problems in education promptly. Meanwhile, for convenient management and supervision, managers hope the system can support multi-level user permission settings to ensure data security and accuracy.

To meet these requirements, the CIPP model and artificial intelligence technology can be integrated into the design of the intelligent education evaluation system. The CIPP model emphasizes the four links of context, input, process, and product evaluation, helping teachers comprehensively consider all aspects of the evaluation system. Artificial intelligence technology, on the other hand, can provide powerful data processing and analysis capabilities to achieve automated evaluation and personalized suggestions. Through this design, an intelligent education evaluation system that meets the requirements of the new engineering discipline background and the needs of teachers, students, and managers can be constructed.

3.2. Technology selection

In the research on the intelligent education evaluation system based on the CIPP model and artificial intelligence under the new engineering discipline background, technology selection is a crucial aspect. To ensure the scientificity and practicality of the evaluation system, it is necessary to carefully select appropriate technical routes based on the requirement analysis results. This includes the selection of key components such as data collection methods and algorithm models [9].

In terms of data collection, considering the diversity and complexity of the education evaluation system, a multi-dimensional and multi-channel data collection method was adopted. Specifically, it integrates data records from online learning platforms, classroom interaction data, students' homework and test scores, and other data sources to comprehensively reflect students' learning situations and teaching effects. Additionally, natural language processing technology was introduced to deeply mine text information such as students' learning reflections and teachers' comments, thereby more accurately assessing students' learning progress and teachers' teaching quality.

In the selection of algorithm models, focus was placed on models that can handle large-scale data, adapt to learning, and have good interpretability. Machine learning algorithms such as Support Vector Machines (SVM), Random Forest, and Gradient Boosting Tree have attracted attention due to their powerful classification and prediction capabilities. These algorithms can automatically learn and adjust model parameters based on historical data to more accurately predict future trends. At the same time, deep learning technologies, particularly Recurrent Neural Networks (RNN) and Long Short-Term Memory Networks (LSTM), were introduced to process sequential data and capture temporal dependencies in the learning process.

To ensure the rationality and effectiveness of technology selection, sufficient experimental verification and model comparison were conducted. Model parameters were continuously optimized through technical means such as cross-validation and grid search to improve prediction accuracy. Additionally, emphasis was placed on the interpretability of models to ensure that evaluation results can be intuitively understood and accepted by educators and students.

4. Discussion on application prospects

4.1. Prediction of industry impact

In the context of new engineering disciplines, the intelligent education evaluation system based on the CIPP model and artificial intelligence demonstrates broad application prospects. This system not only deeply integrates modern technology with education evaluation theory but also is expected to bring far-reaching reforms to the entire education industry [10,11].

The intelligent evaluation system will also bring more diversified and personalized evaluation services to the education industry. Under traditional evaluation methods, it is often difficult to fully consider students' individual differences and diverse needs. In contrast, the intelligent evaluation system based on the CIPP model and artificial intelligence can provide customized evaluation plans and services according to students' actual situations and needs. This not only helps to more comprehensively understand students' learning situations and development potential but also provides educational institutions with more targeted teaching improvement suggestions, thereby promoting continuous improvement in education quality.

4.2. Evaluation of social benefits

The research on the intelligent education evaluation system based on the CIPP model and artificial intelligence under the new engineering discipline background has profound social benefits. From a long-term perspective, the social contributions of this research are mainly reflected in promoting equitable education opportunities and enhancing citizens' scientific and technological literacy.

This evaluation system helps promote equitable education opportunities. In traditional education systems, significant differences in education quality exist among students due to multiple factors such as geography, economic conditions, and school resources. The intelligent education evaluation system based on the CIPP model and artificial intelligence can provide each student with more personalized and scientific learning plans and evaluation feedback through big data analysis and intelligent algorithms. This not only helps students better understand their learning situations and adjust learning strategies in a timely manner but also enables more equitable allocation of educational resources. Through intelligent evaluation, educators and policymakers can more accurately identify educational needs and optimize the allocation of educational resources, thereby narrowing educational gaps between regions and schools and enabling more students to access high-quality educational resources.

5. Conclusion and outlook

In this study, we discussed the intelligent education evaluation system based on the CIPP model and artificial intelligence in the context of new engineering disciplines. However, like any research, this study has its limitations. First, the breadth and depth of data collection need to be improved. Due to time and resource constraints, the research sample may not fully represent all student groups in the new engineering discipline education background, which may affect the universality and applicability of the research results. Second, the research mainly focuses on technical implementation and preliminary applications, and the long-term effects and impacts of the intelligent education evaluation system have not been deeply explored. Additionally, although attempts were made to integrate the CIPP model and artificial intelligence technology, the integration theory and practice of these two methods is still in the initial stage and requires further verification and optimization.

Finally, we call on more education practitioners and researchers to participate in the research on intelligent education evaluation systems. Only through continuous practice, reflection, and improvement can we construct a more scientific, effective, and humanized education evaluation system to provide strong support for the development of new engineering discipline education. With the continuous advancement of technology and the innovation of education concepts, intelligent education evaluation systems will play a more important role in the future.

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Disclosure statement

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