

## *Retraction*

# **Retracted: Construction of Intelligent Textbook Courseware Management System Based on Artificial Intelligence Technology**

### **Wireless Communications and Mobile Computing**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] Q. Zhao, "Construction of Intelligent Textbook Courseware Management System Based on Artificial Intelligence Technology," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 9993183, 11 pages, 2022.

## Research Article

# Construction of Intelligent Textbook Courseware Management System Based on Artificial Intelligence Technology

Qiu Zhao 

Educational Administration, Chengdu Normal University, Chengdu 611130, China

Correspondence should be addressed to Qiu Zhao; 990038@cdnu.edu.cn

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On the one hand, the lack of specialized knowledge and knowledge of software development is serious. Second, the development process takes a lot of time, and the development cost is high. Shortening the development time, reducing the development cost, and reducing the dependence on artificial intelligence can be realized by developing an intelligent courseware writing system. The research of intelligent teaching system based on Web and multiagent technology in this paper will surely promote the continuous development and progress of intelligent teaching and related disciplines, which has profound theoretical and practical significance. The design of the model may need to be emphasized and improved in the understanding and reform of classroom management concepts. The comprehensive improvement has an increase of 86.3%, which is of great significance for courseware management. In terms of courseware management, due to the model design, it is also well reflected in personalization, and the improvement of management is 74.6%.

## 1. Introduction

With the rapid development of artificial intelligence (AI) technology, the application of AI in the field of education has become more and more extensive. The application of AI in the field of education has changed the mode of transmission of educational information, resulting in great changes in educational ideas, educational models, and teaching methods. China's current educational reform attaches great importance to quality education for students. The goal of quality education is to enable students to form a more reasonable knowledge structure and ability structure, and ability training is the focus of quality education [1]. AI is a branch of computer science and a comprehensive discipline that studies the use of computers to simulate and extend the functions of the human brain. Its precise definition is as follows: a computer system has human knowledge and behavior and has the ability to learn, infer, judge, memorize knowledge, and understand human natural language [2]. Intelligent teaching system overcomes the shortcomings of traditional education. Intelligent teaching system provides students with various teaching resources and shares good

teachers, which greatly improves the quality of teaching and learning [3]. Let students teach and learn on the system randomly. Intelligent teaching system provides students with highly personalized and intelligent learning experience according to learners' cognitive development level and learning style. Intelligence is the new direction of today's social development, and it is also a new feature of the development of informatization [4]. With the rapid development of technologies such as AI, the Internet of Things, big data and cloud computing, smart products, and devices such as smart homes, smart robots, smart toys, and smart buildings have emerged, which have brought great changes to people's life and work styles. It has a huge impact [5]. With the development of AI technology, intelligent technology, communication technology, and multimedia technology, AI teaching has become an important subject of information technology application, and various types of online schools, educational websites, AI education institutes, etc., have sprung up like mushrooms [6]. AI teaching has become a useful supplement to traditional teaching. It not only effectively improves the allocation of teaching resources but also solves the problem of traditional teaching limited by time and space [7]. In

recent decades, with the maturity of AI technology, some of its research results have been successively applied to the field of teaching, which has promoted the process of educational development reform and teaching modernization [8]. It is the most important resource for the development of education, so the development of teachers has always been paid attention to, and our country will also take comprehensively deepening the construction of teachers as the focus of education [9]. With the rapid development of big data, cloud computing, AI, and other technologies, new requirements are put forward for the development of teachers. At present, AI has been able to comprehensively improve the efficiency of teaching and learning, enhance the learning experience, and make personalized learning a reality in all aspects such as learning guidance, teaching evaluation, and teaching space optimization [10]. In fact, educational modernization not only means improving educational facilities but also means updating educational ideas, educational concepts, and educational methods. Digital education is not mainly embodied in “hardware” but is restricted and explained by “software” [11]. The continuous development and improvement of emerging modern information technologies such as AI has further promoted a new round of industrial structure change of modern industrial information technology with cloud computing and Internet information technology platform as the industrial core, intelligent industrial big data analysis system as the technical core, and mobile Internet information technology as the key point of development. The teaching system based on AI can give full play to students’ enthusiasm and initiative. It can not only carry out personalized teaching but also complete collaborative learning or combine “personalized” with “collaborative” [12]. The design of the intelligent system can provide personalized teaching guidance to learners through the analysis of questions and answers and provide learners with a personalized and intelligent learning experience [13]. However, the above research has not well constructed the design and improvement of intelligent courseware management model based on AI, so this paper puts forward the following innovations:

- (1) Based on the personalization and information processing ability of AI technology, according to the nature of teaching materials and courseware, this paper will combine AI technology to build an intelligent teaching materials and courseware management system model. Because teaching materials and courseware have huge data and complexity in the actual teaching process, how to analyze and process data has become the key work of teaching courseware design, and AI technology has advantages in dealing with complex data. In the basic technology, it integrates personalization and intelligence
- (2) This paper will design modules for intelligent textbook courseware management model based on Web and multiagent technologies. Since Web and multiagent technologies have good processing capabilities for individualized and collaborative learning functions, this paper will combine teaching materials

and courseware. The general generation ideas and the understanding of intelligence are integrated with a variety of technologies to achieve the purpose of intelligent design

The chapters of this paper are arranged as follows: the first chapter is the introduction, which discusses the background and significance of the topic selection and expounds the innovation of the article. The second chapter mainly combines the research results of AI technology in the field of teaching courseware management at home and abroad and puts forward the innovative results and research ideas of this paper. The third chapter of this paper is the method part, which deeply discusses the application and principle of related algorithms and puts forward a new intelligent management data analysis and processing model based on the previous research results and the innovation of this paper. The fourth chapter of this paper mainly discusses the experimental part of the algorithm application. Through the results of the experiment, on the basis of sorting out the data, an intelligent management model is established. The fifth chapter of this paper is the conclusion part, which summarizes the research results and related work of this paper. The contributions and deficiencies of relevant scholars’ research are shown in Table 1.

## 2. Related Work

Yang et al. believe that the design of teaching system is based on the research of human beings on communication and learning as the main theoretical basis, including the theories and research results of other relevant disciplines. It is a modern teaching technology that uses systematic methods to analyze the links and elements of the teaching process, determine and solve teaching problems, and realize teaching optimization [14]. Hu believes that cognitive learning theory not only attaches importance to learners’ external stimulus and explicit reaction behavior but also attaches importance to the role of learners’ internal psychological process. People’s learning is at the same level, and different types of learning need different external and internal conditions [15]. Wang’s research shows that the two cores of AI are “artificial” and “intelligent.” Intelligence includes the following: information and knowledge processing, symbol processing, and problem solving. Intelligence can also be said to be a combination of extensive information processing capabilities and information demonstration capabilities [16]. The research of Chong et al., combined with the combing and summarizing of foreign case studies on the application of machine learning education based on real data in recent years, found that the current application of machine learning education mainly focuses on six aspects: student modeling, student behavior modeling, predicting learning behavior, early warning of out of school risk, learning support, and evaluation and resource recommendation [17]. The research results of Thanalai and Ramana show that many countries are currently conducting systematic and in-depth research, which is mainly based on the establishment of a better student model, the modeling of teachers’ teaching strategies, cooperative

TABLE 1: Contributions and deficiencies of relevant scholars' research.

Title	Contribution	Research gap/limitations
A practical teaching mode for colleges supported by AI	It uses systematic methods to analyze the links and elements of the teaching process, determine and solve the teaching problems, and optimize the actual teaching.	It cannot fully reflect the guiding role of teachers in the teaching process.
Teaching evaluation system by use of machine learning and AI methods	It is proposed that cognitive learning theory not only attaches importance to learners' external stimulation and explicit reaction behavior but also attaches importance to the role of learners' internal psychological process.	It cannot automatically adjust the teaching strategy according to the specific situation of students.
AI hypermedia teaching based on cloud technology	Research shows that the two cores of AI are "artificial" and "intelligent."	It cannot fully reflect the guiding role of teachers in the teaching process.
Training opportunities of AI (AI) in radiology: a systematic review	It is suggested that intelligent teaching system should pay attention to the training of process knowledge and skills. Both kinds of knowledge are concrete knowledge.	It cannot fully reflect the guiding role of teachers in the teaching process.
Apple image segmentation using teacher learner based optimization based minimum cross entropy thresholding	The research shows that the development of learning theory can be roughly divided into behaviorism learning theory, cognitive generalized learning theory, constructivist learning theory, and humanistic learning theory.	It cannot automatically adjust the teaching strategy according to the specific situation of students.
Playing on patterns: is it a case of analogical transfer?	It is believed that the network-based teaching system can give full play to students' enthusiasm and initiative. It can not only carry out personalized teaching but also complete collaborative learning or combine "personalization" and "collaboration."	Teaching process is mostly carried out according to the path and content specified by courseware, lacking necessary communication means, and intelligent features.
An AI teaching on AI: experience report	The research shows that both behaviorism-based teaching system design and cognitivism-based teaching system design think that teaching is a process of imparting objective knowledge, the teaching results can be determined in advance, and complex knowledge can be decomposed into some simple knowledge, and these knowledge can be designed accurately.	It cannot automatically adjust the teaching strategy according to the specific situation of students.
British Journal of Educational Technology	It is believed that intelligent teaching system, referred to as intelligent teaching system for short, refers to a software system with knowledge in a certain field and corresponding teaching methods, which can carry out individualized teaching for students.	It cannot fully reflect the guiding role of teachers in the teaching process.

and interactive learning, the mining of students' learning logs, and the application of social and emotional intelligence, aiming at further improving the intelligence and practicality of the system and giving full play to its characteristics [18]. Zaguia et al. pointed out that educational AI is a new research field formed by the combination of AI and learning science. Learning creates conditions, and the research range is wide, including technical research on educational AI, such as robots and artificial neural networks, as well as practical research on applying these technologies to teaching [19]. Schuur et al. believe that intelligent teaching system attaches importance to the training of process knowledge and skills. These two kinds of knowledge are relatively specific knowl-

edge. In addition, there is metaknowledge reflecting the process of knowledge formation or skill application, which constitutes the domain knowledge base [20]. According to Piotrkowicz et al.'s research, when referring to AI, people often confuse it with the concept of robots. The current wave of AI is more a manifestation of the prosperity of deep learning algorithms based on big data, which is not equivalent to the previous "general AI" that tried to restore human intelligence and behavior in the form of robots [21]. Gill and Khehra's research shows that the development of learning theory can be roughly divided into behaviorism learning theory, cognitive generalized learning theory, constructionism learning theory, and humanistic learning theory, so there are corresponding theories of teaching system design based on behaviorism, cognition, constructivism, and humanism

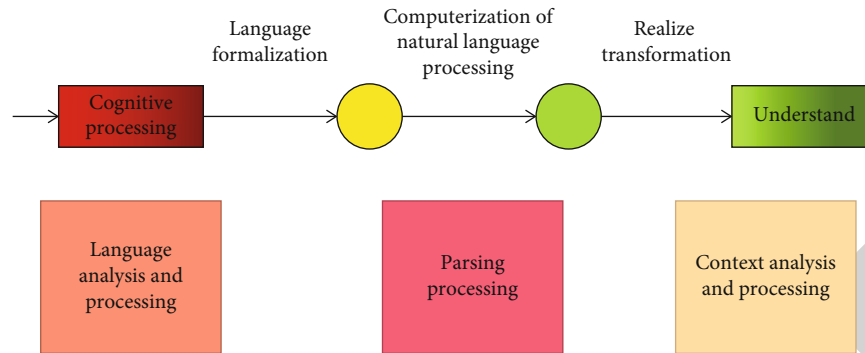


FIGURE 1: Basic model diagram of natural language analysis.

[22]. Singer and Voica believe that the web-based teaching system can give full play to students' enthusiasm and initiative. It can not only carry out personalized teaching but also complete collaborative learning or combine "personalized" and "collaborative" [23]. The research of Medeiros et al. shows that both behaviorism-based teaching system design and cognitivism-based teaching system design believe that teaching is a process of imparting objective knowledge, teaching results can be predetermined, and complex knowledge can be decomposed into a number of simple knowledge, and carry out precise design for these knowledge [24]. Araujo believes that intelligent teaching system, for short, refers to a software system with knowledge in a certain field and corresponding teaching methods, which can carry out individualized teaching for students, automatically adjust teaching methods and teaching speed according to students' understanding and mastery of knowledge, and simulate human teachers' teaching activities to a certain extent [25].

These technologies have played a positive role in promoting the improvement of teaching level, but at the same time, most of them have some drawbacks, such as the following: they cannot fully reflect the guiding role of teachers in the teaching process and cannot automatically adjust the teaching strategies according to the specific situation of students, and the teaching process is mostly carried out according to the path and content specified by courseware, lacking the necessary communication means and intelligent features. Based on the research of the abovementioned related work, this paper determines the positive role of AI technology in the field of teaching courseware, constructs a courseware management model that combines various technologies, makes in-depth analysis and research on the acquired and collected data by using AI technology, makes more effective use of the data, and mines the valuable information hidden behind the data, so as to simplify and make the courseware management model more efficient.

### 3. Methodology

#### 3.1. Analysis and Research on Related Theories

3.1.1. *Application of AI in Teaching.* And the change of resources and environment is the foundation of teaching reform. The development of AI has given birth to many

intelligent teaching tools, learning tools, and intelligent platforms, driving the teaching environment from digitalization to intelligence [26]. Natural language understanding is to study how to make computers understand and produce human language, so as to achieve the purpose of human-computer natural interaction. Figure 1 below shows the basic model of natural language analysis.

Natural language understanding technology has developed from the initial production system and rule system to today's statistical model, machine learning, and other methods. Its earliest application in education is grammar error detection. With the development of technology, natural language understanding has a greater application scenario in teaching. The intelligent teaching system with the above intelligent features is generally divided into three basic modules: domain knowledge, student model and teacher model, and a natural language intelligent man-machine interface module. The three basic modules represent the intelligent activities of experts, students, and teachers, respectively. Compared with traditional classrooms in the era of AI, in addition to traditional elements such as teachers, students, desks and chairs, and teaching resources, intelligent information editing, transmission, and presentation technologies will enter the classroom, deeply participate in classroom teaching and classroom management, and enable classrooms. It becomes an intelligent, highly interactive open learning space that can fully consider the actual needs of teachers and students and meet the individual needs of different individuals.

3.1.2. *The Application of Intelligence in the Design of Teaching Courseware.* Constructivist learning theory holds that learning is a process in which learners actively construct knowledge meaning through collaboration and conversation through certain situational social and cultural background, the help of other teachers or learning partners, and the necessary learning resources. The intelligent teaching courseware system is a technology that integrates AI technology, educational psychology, computer science, and other disciplines to implement effective education for students. It involves AI, computer science, cognitive science, thinking science, and education. It is a comprehensive subject of science, psychology, and behavioral science, which is a new stage of the development of computer-aided education. Realize personalized teaching. Aimed at the shortcomings

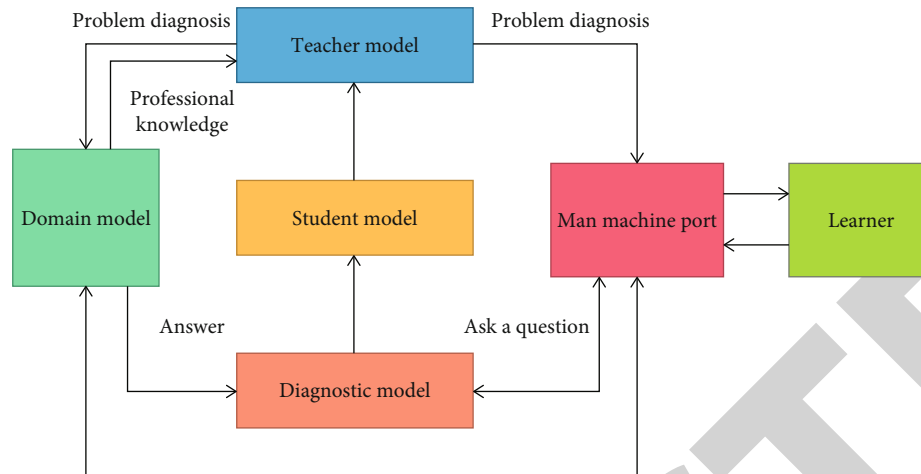


FIGURE 2: Intelligent teaching system model.

of traditional CAI and using advanced information technology, intelligent teaching system puts forward an intelligent teaching system which can guide, evaluate, and give feedback based on learning resources and learning characteristics. Based on this, intelligent teaching system can provide learners with suitable learning resources and teaching strategies combined with learners' cognitive level and learning interest. Using AI technology, the system can automatically diagnose students' learning level in the teaching process, not only find students' mistakes, but also point out targeted counseling or learning suggestions for students' mistakes. The so-called "student modeling" refers to generating a reliable expression to show what the student knows, can do, do not know, cannot do, what he wants to do, and what he should do. This modeling process is based on the student performance to assess his learning needs and mastery of knowledge and skills, as well as his abilities. Figure 2 below shows the intelligent teaching system model.

Therefore, the intelligent teaching system has high requirements for the design of student model, which is not only the direct representation of students' cognitive status, but also the fundamental basis for the teaching module to determine the appropriate teaching objectives and strategies. Teachers control students' learning, master students' learning level, and give timely feedback to decide the next step. The function of teachers' modules is realized by the inference engine of teaching strategies, which can reason according to students' past learning records and current learning state, so as to obtain appropriate teaching strategies, that is, guiding suggestions for students. In order to overcome the shortcomings of covering the student model, experienced teachers analyze and summarize the mistakes made by the students and compare the correct problem-solving methods to obtain the defects corresponding to different error types. In this way, as long as students study for the corresponding weak links, their learning will be more targeted, and the learning effect will naturally be better.

**3.2. Analysis of Information Sharing in Courseware Design Management.** In order to achieve the smooth progress of classroom teaching and achieve the goal of classroom teach-

ing, it is necessary to manage the classroom content of courses. Therefore, teachers' management ability of content of courses has become the core element of classroom management ability. Teachers' management of content of courses is reflected in two aspects: one is the preparation ability of content of courses, and the other is the transmission ability of content of courses. The selection of teaching strategies is determined by the knowledge taught and students' cognitive structure and has strict application conditions, that is, it must meet the requirements of the learned knowledge and be suitable for the specific student model.

With the application of AI in classroom teaching, the content of classroom teaching is no longer just the content of textbooks. The real needs of dynamically generated classroom teaching resources and personalized content of courses have completely broken the original teaching knowledge management model. The content of courses preparation ability and transmission ability put forward higher requirements. Pattern recognition is to make the computer recognize a given thing and attributes it to the same or similar pattern. It mainly studies how the computer recognizes natural objects, images, voice, etc., so that the computer can simulate and realize human pattern recognition ability, such as vision, hearing, touch, and other intelligent perception ability. The value of big data lies in scientific analysis of data, data mining, and intelligent decision-making based on the analysis. That is to say, only by establishing effective models and tools based on big data can the owners of big data give full play to the advantages of big data. The arrangement of teaching sequence should first be organized according to the characteristics of content of courses, and then, the needs of students should be considered. There are seven common types of teaching sequence: chronological sequence, logical sequence, topic-centered sequence, spiral sequence, parallel sequence, reverse chain sequence, and knowledge hierarchy. The preparation management of content of courses is a planning process in which teachers design and organize classroom content of courses according to specific classroom teaching objectives, characteristics of student development, changes in teaching environment, and other factors and formulate specific implementation plans to improve classroom teaching effects.

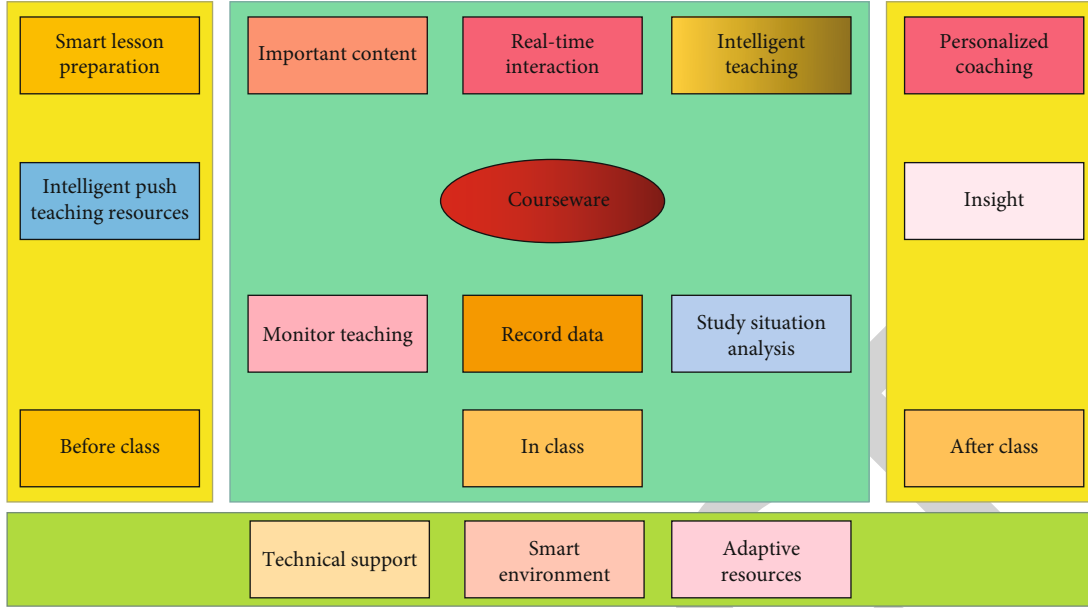


FIGURE 3: Design model of intelligent teaching courseware.

Figure 3 below is the design model diagram of intelligent teaching courseware.

Lesson preparation is a preview of real teaching practice. It is not only a condition to ensure teaching quality, but also a way for teachers' professional development. It is one of the key links of teachers' teaching work. In the process of lesson preparation, teachers should take care of the learning progress of all students as much as possible. On the basis of carefully studying textbooks, teachers use intelligent lesson preparation system to prepare lessons. First of all, the lesson preparation system can recommend excellent lesson plans to teachers according to the information of teachers' teaching materials and the chapters to be prepared, and teachers can absorb advanced teaching methods and ideas by learning the lesson plans. Based on the relationship between classroom time and classroom teaching effectiveness, teachers' management of classroom teachers' time will directly affect teaching effectiveness. The so-called classroom time management ability is the ability of teachers to convert fixed classroom time into operable classroom teaching activity time. Knowledge representation based on AI takes knowledge as the object, takes computer software and hardware, computer science, AI, and expert system technology as the tools, takes philosophy, psychology and logic as the methods and guidance, expresses knowledge into a "knowledge base" that can be directly processed by computer, and uses "computer intelligence" to simulate human experts or "human intelligence" to quick, accurate, and automatic scientific treatment.

**3.3. Analysis of Model Algorithm Design.** Intelligence has always been accompanied by informatization, but with the development and improvement of deep learning algorithms of artificial intelligence, with the continuous improvement of supercomputing technology, big data, and cloud platforms, new "distributed" intelligent artificial intelligence will also

emerge [27]. Now the computing resources of the edge server are allocated according to the amount of data. Since the sizes of  $n$  tasks are different, in the case of a fixed  $S_C$ , they are allocated according to the size proportion of the data volume. Set the total computing resources of the server as  $S_C$  in unit time, and the computing resources successively allocated to the task  $\{T_{Ba1}, T_{Ba2}, \dots, T_{Ban}\}$  corresponding to the data volume sequence  $T_{a1}, T_{a2}, \dots, T_{an}$  as  $S'_{Ca1}, S'_{Ca2}, \dots, S'_{Can}$ , where  $a_1, a_2, \dots, a_n$  is a positive integer which is not equal to each other, and there is a relationship expressed by the formula between the computing resources  $S'_{Cm}$  assigned by the tasks of the edge server and the total computing resources  $S_C$  of the edge server:

$$\begin{cases} S'_{Ca1} = \lambda_1 S_C, \\ S'_{Ca2} = \lambda_2 S_C, \\ \dots \\ S'_{Can} = \lambda_k S_C. \end{cases} \quad (1)$$

Therefore, the  $\lambda$  coefficients can be used as weighting coefficients for resource allocation. The following formula must be satisfied between setting  $\lambda_1, \lambda_2, \dots, \lambda_k$ :

$$\begin{cases} \frac{\lambda_a}{\lambda_b} = \frac{T_{Ba}}{T_{Bb}}, \\ \lambda_1 + \lambda_2 + \dots + \lambda_k = 1, \\ \lambda_x = \left( \frac{T_{BaX}}{\sum_{m=1}^n T_{Bam}} \right) * \delta, \end{cases} \quad (2)$$

where  $\delta$  is the normalization coefficient of  $\lambda_n$ ,  $x \in [1, k]$ . Ignore the sorting time and scheduling time of tasks,

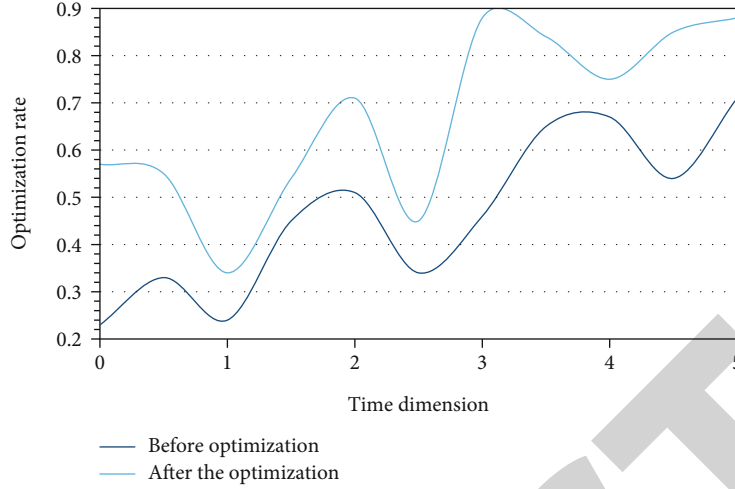


FIGURE 4: Classroom management efficiency before and after optimization.

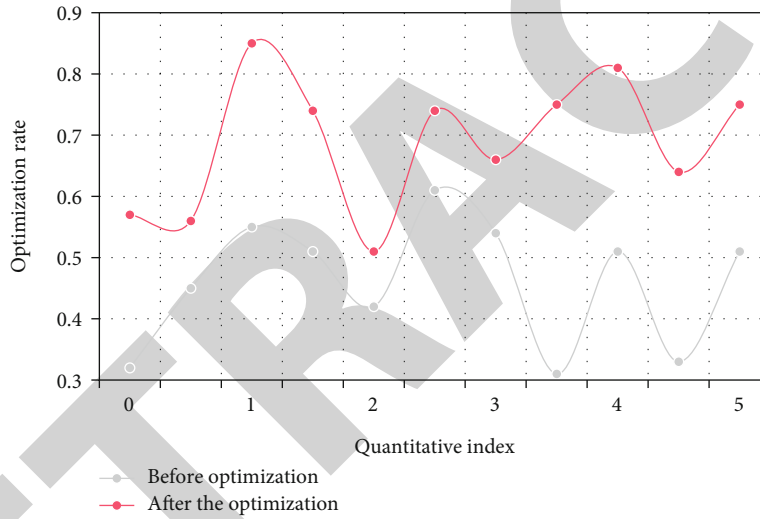


FIGURE 5: Comparison of learning efficiency before and after optimization.

The time  $T_C$  consumed by the edge server to calculate the task can be expressed by the formula:

$$T_C = T_{C1} = T_{C2} = \dots = T_{Cn} = \frac{T_{Bm}}{S_{cm}^t}. \quad (3)$$

In the whole calculation process, each task is independent of each other, so each event can be regarded as an independent discrete event, and the minimization of delay can be transformed into a problem of single objective combinatorial optimization under constraints. Since the position of the weight of Web in the concept network is related to the level, the correlation between the nodes corresponding to the edge of  $\forall c(x, y) \in E$  can be defined as follows:

$$r(e(x, y)) = \frac{1}{\text{depth}(e(x, y))}. \quad (4)$$

Among them,

$$\text{depth}(e(x, y)) = \begin{cases} 1, \\ \text{depth}(e(z, x)) + 1. \end{cases} \quad (5)$$

In  $CT \leq I, E > I$ , for  $\forall x \in I, \forall y \in I$ , the semantic distance between the concept  $x$  and  $y$  is defined as follows:

$$\text{Dist}_{xy} = \begin{cases} 0, & x = y, \\ \sum_{e \in P_{\text{sem}}(x, y)} r(e), & x \neq y. \end{cases} \quad (6)$$

The semantic distance between any two concepts in the concept network described by domain ontology can be calculated. The larger  $\text{Dist}_{xy}$ , the lower the semantic similarity between  $x$  and  $y$ , and the lower the weight contribution to its upper concept during generalization. Between different nodes  $i$ ,



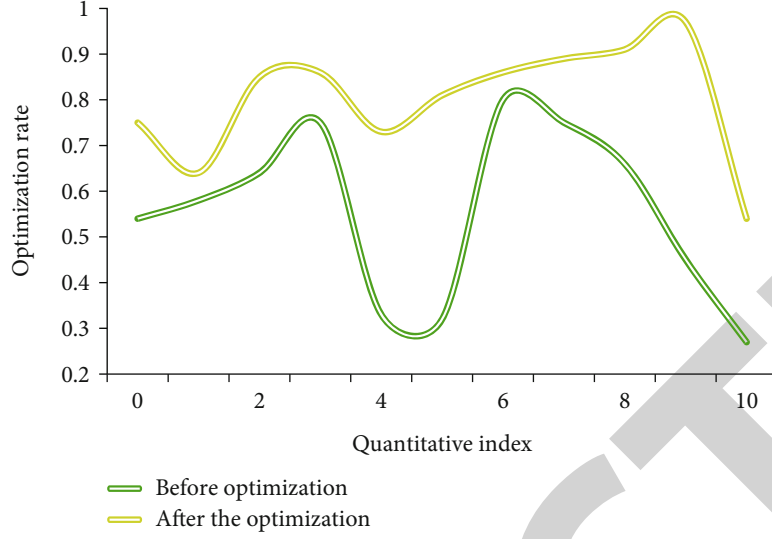


FIGURE 6: Comparison of students' comprehension before and after optimization.

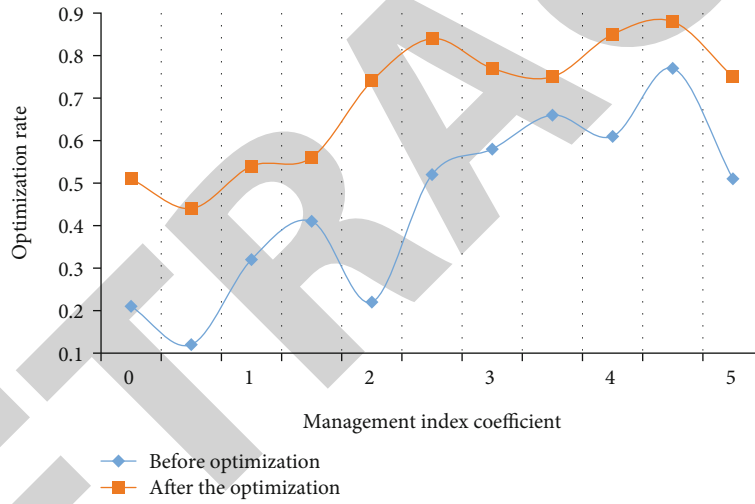


FIGURE 7: Optimization comparison of teaching before and after optimization.

$$w_i = f_i + \frac{1}{n} \sum_{j=1}^n f_j \times \frac{1}{M(i, j)}. \quad (7)$$

If the class set described by the domain ontology is  $\Omega$ , the mapping model between the Web object lists  $OL$  and  $\Omega$  is defined as  $\Gamma : OL \rightarrow \Omega$ :

$$\Gamma(\text{obj}_i) = \begin{cases} X, \\ \Omega_{\text{root}}. \end{cases} \quad (8)$$

Among them,  $X \in \Omega$  represents a class in the domain ontology, and  $\Omega_{\text{root}}$  represents the root class defined in the ontology and represents a top-level concept in a specific domain. The more times a user visits a certain page in a period of time and the longer the stay time, it means

that the user is more interested in the page, and the relevance of the page to the user should also be higher. Therefore,  $h_{ij}$  can be defined as follows:

$$h_{ij} = \frac{\text{hits}_{ij} \cdot \text{time}_{ij}}{\sum_{1 \leq k \leq m} \text{hits}_{ik} \cdot \text{time}_{ik}}. \quad (9)$$

Therefore, by comparing the row vector and column vector of URL user ID incidence matrix, respectively, we can obtain similar page clusters and similar user groups on the site. The similarity between two vectors can be measured by the distance measurement function between two vectors. There are many kinds of distance measurement functions between vectors. In this paper, the widely used included angle cosine distance is used to measure the similarity between two vectors:

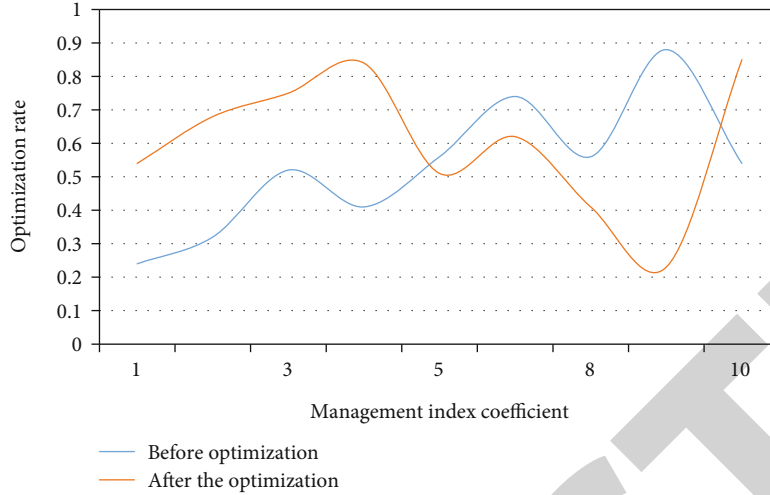


FIGURE 8: Comparison of courseware management levels before and after optimization.

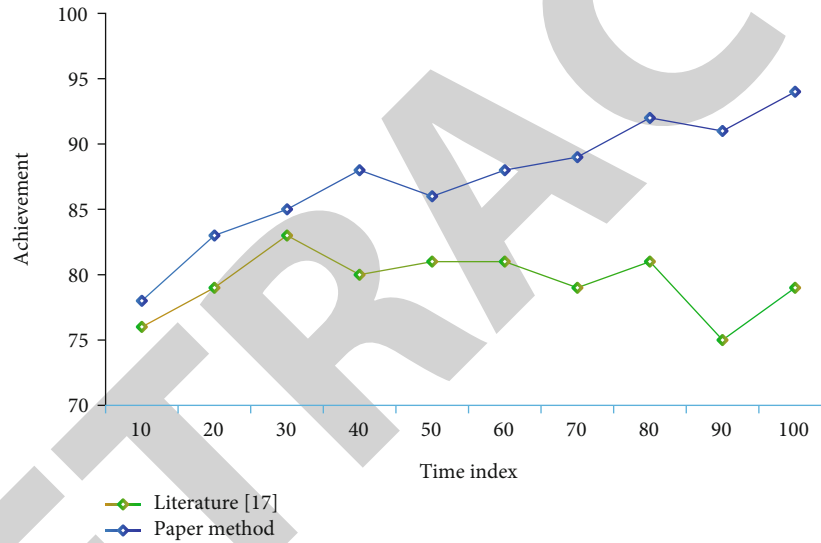


FIGURE 9: The comparison between the algorithm in this paper and the method.

$$d(X_i, X_j) = \cos(X_i, X_j) = \frac{x_{i1} * x_{j1} + \dots + x_{il} * x_{jl}}{|X_i| * |X_j|}. \quad (10)$$

Among them,  $l$  represents the length of the vector;  $|X_i| = \sqrt{\sum_{k=1}^l x_{ik}^2}$ ,  $|X_j| = \sqrt{\sum_{k=1}^l x_{jk}^2}$ . The larger the value of  $d(X_i, X_j)$ , the greater the similarity between the two vectors.

#### 4. Result Analysis and Discussion

Educators must actively change their ideas, explore new forms of combining artificial intelligence with education, promote the deep integration of technology and education, and innovate and develop education and education [28]. Based on the above design and construction of the model, this paper will carry out practical operation to test the oper-

ability and use value of the design model. This paper compares and analyzes the models in classroom management, learning efficiency, improvement of students' understanding, teaching optimization rate, and courseware management and analyzes the optimization effect of teaching courseware management model under the background of AI. Figures 4–6 are the comparison charts of classroom management, learning efficiency, and improvement of students' understanding before and after optimization.

The extensive application of intelligent teaching experiment can not only make students acquire corresponding knowledge points and professional skills more actively but also make students fully experience the whole scientific inquiry process, thus achieving the expected educational effect [29]. Through the comparison of the above Figures 4–6 it is found that in the management of teaching courseware, because the Web mode is adopted in the model design, it shows that after the AI participates in the

classroom teaching and management process, the teacher's classroom management ability is generally in a relatively good state level, but there is still room for improvement. It can be explained that teachers are the best in the management of classroom environment, but they may need to be paid attention to and improved in the understanding and reform of classroom management concepts. The comprehensive improvement is 86.3%, which is of great significance for courseware management. The following Figures 7 and 8 are the comparison of teaching optimization rate and courseware management level before and after optimization.

Because of the superior intelligent management level of AI, it has a good optimization effect for classroom teaching, and it can also provide good help from the aspect of intelligence in daily teaching management. As for courseware management, it is also well reflected in the aspect of personalization due to the intelligent model design, which has improved the management by 74.6%. Moreover, it can be found in Figure 8 that the optimized model has improved in courseware management with the deepening of management. It shows that there is a positive correlation between classroom management ability and school support demand, that is, the greater the school support demand, the stronger the teacher's classroom management ability. Moreover, there is a significant relationship between the concept of classroom management, teachers' self-management ability, students' management ability, classroom management ability, and school support needs.

The comparison between the algorithm in this paper and the method in the literature [17] is shown in Figure 9. It can be seen that the artificial intelligence textbook courseware management system proposed in this paper has positive significance for improving teaching efficiency and student achievement. Teaching and learning process is the process of reasoning the knowledge in the knowledge base and finally getting the required results. Through searching and reasoning the basic knowledge and using the student model to dynamically generate the content and strategies suitable for individual teaching, we can ask questions to students according to their knowledge level and cognitive ability, track their learning progress, make the system achieve the best individualized teaching effect, and fully mobilize the initiative of students to achieve the purpose of teaching students in accordance with their aptitude.

## 5. Conclusions

The intelligentization of education has always been the ideal and goal in the field of education and educational technology. After the emergence of intelligent teaching, new educational theories come out, but with the support of existing technologies, the realization of educational theories is extremely difficult. Therefore, with the blessing of AI technology, this paper puts forward the composition of intelligent teaching system based on Web and multiagent technology and analyzes the functions of each module. And a simple prototype system is implemented. The AI technology and computer technology are introduced into the traditional teaching system, and the design model of

the intelligent courseware management system based on Heduo is proposed. Therefore, the key to the establishment of intelligent teaching courseware system in Web environment is how to integrate heterogeneous data and structurally represent unstructured or semistructured data and extract valuable teaching knowledge and rules from the dynamically changing massive web data. This paper studies and discusses the new characteristics of student model construction and knowledge representation in the intelligent environment and brings teachers into the overall environment of the teaching platform. The intelligent courseware system realizes all-round intelligent education service under the network environment through the intelligent interaction among students, teachers, students and teachers, students and systems, and teachers and systems and through multiuser interaction mode and multiagent cooperation mechanism. However, the system still has some drawbacks, such as the limited scope of its curriculum support. Because the course contents of network courseware are all calling the data in the background database, it can be changed by the administrator to become the network courseware of other courses, which makes the system more practical and vital.

## Data Availability

The data used to support the findings of this study are included within the article.

## Conflicts of Interest

The author declares no competing interest.

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