Hindawi
Mobile Information Systems
Volume 2021, Article ID 5644604, 12 pages
https://doi.org/10.1155/2021/5644604

Research Article

College English Smart Classroom Teaching Model Based on Artificial Intelligence Technology in Mobile Information Systems

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Received 27 July 2021; Revised 23 September 2021; Accepted 1 October 2021; Published 13 October 2021

Academic Editor: Sang-Bing Tsai

With the development of mobile information, artificial intelligence technology has developed rapidly, which is changing everything in our life. Meanwhile, smart education appeared and attracted much attention; however, there is still a lack of systematic discussion on how to take the road of artificial intelligence plus smart classroom. In order to promote the intelligent development of education, this article mainly talks about the application of artificial intelligence technology to college English smart classrooms. In the process of teaching, a new teaching model of college English smart classroom was designed, and the teaching model was carried out through the experimental class and the survey results of the students. The survey results show that students' satisfaction with this teaching model is as high as 80%.

1. Introduction

1.1. Background and Significance of the Research. College English courses are the public basic courses in higher education in China. The quality of college English teaching and student learning effects affect the other teaching activities directly [1]. The teaching reform of college English courses has been implemented for many years, but college English teaching based on traditional teaching models has encountered challenges in terms of student participation and teaching effects. It provides new methods and tools for education and teaching and drives the fundamental transformation of education and teaching mode [2]. Through the in-depth integration and innovation of artificial intelligence technology and college English classroom education and teaching, the smart and efficient classroom teaching can be created, and good value orientation and ideological quality of students can be cultivated better. Based on artificial intelligence, smart classroom teaching with smart technology makes smart education possible [3]. The cultivation of English talents in the college English smart classroom based on artificial intelligence is related to the rapid development of economy and the progress of science and technology.

1.2. Related Content. With the increase of data availability and the latest development in artificial intelligence, developers, providers, and regulators have brought unprecedented opportunities and major challenges in the education field. Hadiana A selected ten mobile information system samples about the education system as specimens suitable for designing the interface of the parenting information system [4]. Multivariate statistical analysis (such as factor analysis (FA) and partial least squares (PLS)) was used to process data questionnaires collected from thirty respondents [5, 6]. Through the research, he found that when designing the user interface of a mobile parent information system, two important emotional factors must be considered, namely, interest and benefit [7, 8]. But these two factors cannot determine everything. Nowadays, novel profound

learning and transfer learning technologies are transforming any data related to people into educational data; for example, transform simple facial pictures and videos into powerful data sources for predictive analysis [9]. Polina provides an overview of the next generation of artificial intelligence and blockchain technology [10] and proposes innovative solutions that can be used to accelerate the research of teaching models and enable learners and teachers to understand their personal data and pass personalized teaching plan with new tools for continuous learning monitoring. However, there may be errors in monitoring [11, 12]. Myeongae understands students' development scores on the platform through modules that meet local wisdom [13, 14]. He used 10 group experiment students and 30 limited field experiment students in his research. His research results show that, after using the local intelligence module for learning, the academic score has increased [15, 16]. His research indicates that the academic scores in experimental classes and control classes are getting higher and higher through local intelligence modules. However, local smart modules cannot be widely used.

1.3. Main Content and Innovation. This article mainly analyzes the combination of artificial intelligence technology with college English smart classroom to achieve a smart teaching mode. The innovation of this article lies in the combination of artificial intelligence technology and college English smart classroom, which has become an intelligent teaching mode and guided the development direction of intelligence, precision, and individualization [17].

2. Principles and Methods of Artificial Intelligence Teaching

2.1. Principles of Artificial Intelligence Teaching. The application of artificial intelligence in the field of education (AIED for short) produced smart teaching in the early stage [18, 19]. The domain model emphasizes the subject of learning; the educator model refers to an appropriate and effective teaching method [20]. This model shows the interaction of computers or machines with learners to determine the most interesting teaching activities and interactions [21, 22]. As the system is constantly accumulating and changing data, the learning behavior and performance of learners in the classroom will be continuously absorbed and fed back by the learner model [23]. The teaching model is shown in Figure 1.

According to the learning needs and personal learning abilities of learners, the most appropriate content is selected and sent to students or teachers [24, 25]. Besides that, the continuous analysis of students' classroom performance (such as the state of students learning in class and competition results) is used to provide evaluation and effect feedback, so as to assist students to have a continuous and stable effect in their learning progress [26, 27]. With artificial intelligence technology, the continuous analysis of the learning results given by the system can be presented to teachers and students [28]. Similarly, the convenience and efficiency brought by these artificial intelligence technologies can help teachers understand students' learning behaviors more quickly, effectively, so as to improve students learning competence [29, 30].

2.2. Questionnaire Survey Method. The questionnaire survey method is adopted to analyze learners' learning effects and self-evaluation before the experiment in this research. In addition, after the teaching experiment, the investigation of learner's satisfaction with teaching model and learners' evaluation of the smart classroom teaching effect can be carried out.

2.3. Experimental Method. Two classes were selected as the experimental class and the control class, respectively, in this study. The experimental class used smart classroom teaching model based on artificial intelligence technology in this paper, and the control class adopted the traditional teaching method. Combined with the comprehensive evaluation before and after the experiment, the paper analyzes the results of the implementation of the smart classroom teaching model designed in this paper in college English teaching, confirms the teaching effects, and further discovers the deficiencies of the teaching model.

3. The Design of College English Smart Classroom Teaching Model Based on Artificial Intelligence Technology

3.1. Construction of Smart Classroom Teaching Mode. This paper mainly studies the college English smart classroom teaching model based on artificial intelligence technology. With the support of artificial intelligence technology, teaching activities are carried out during the whole class. The framework design of the college English smart classroom teaching model based on artificial intelligence technology is shown in Figure 2. The mobile Internet supports real-time interaction between teachers and students. The classroom is equipped with movable tables and chairs. Resources can be transmitted to students before class through the Internet. Teachers can focus on interaction and adjust the classroom layout. When discussing issues, students can move tables and chairs to make a circular layout, which is flexible and convenient for discussion. Group members can discuss questions, draw mind maps, and so on to enhance their communication and interaction with each other through mobile devices.

3.2. Application of Artificial Intelligence Technology to College English Smart Classroom

3.2.1. Language Understanding. In English teaching, the practice of oral English is very important. Natural language understanding is the study of how to enable computers to understand and generate human language and achieve the purpose of human-computer natural interaction [31]. Natural language understanding is mainly divided into two

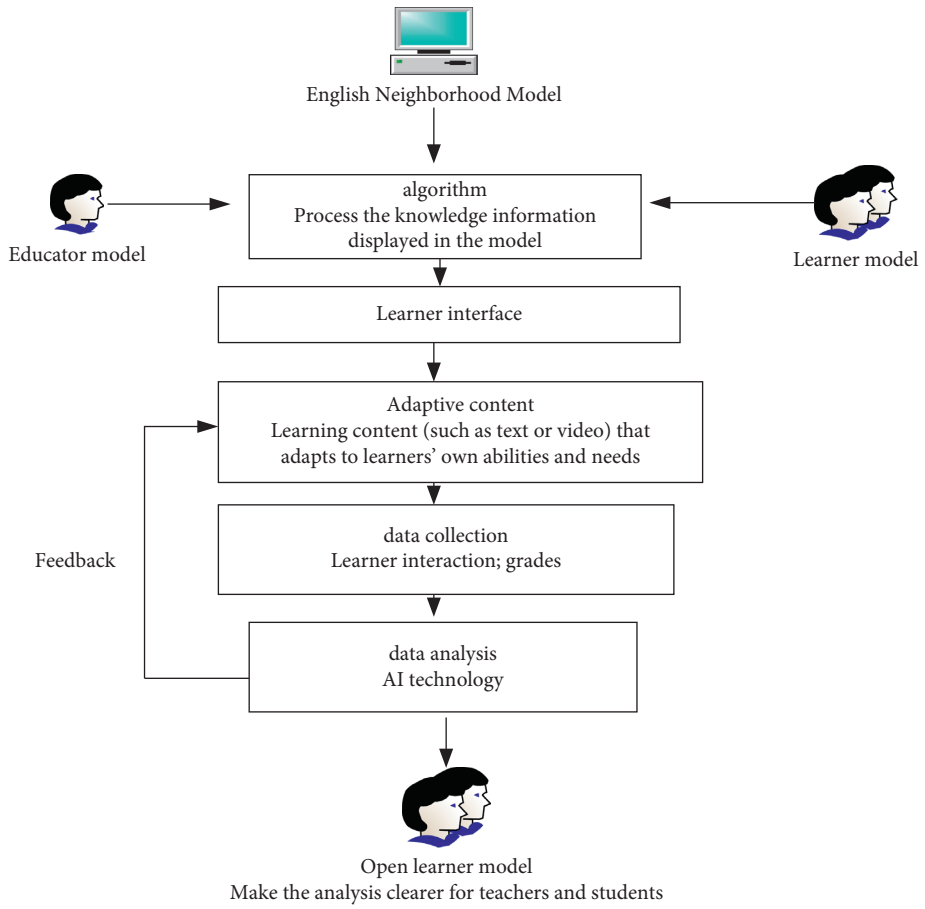

Figure 1: Artificial intelligence teaching model.

categories: verbal language understanding and written language understanding. The process of natural language understanding is shown in Figure 3.

Some researchers summarize the application scenarios of natural language understanding in the education field into four aspects: ① text analysis and knowledge management, such as machine correction work and machine translation; ② natural interaction interface of artificial systems, such as speech recognition and synthesis systems; ③ application of corpus in educational tools, such as corpus and its retrieval tools; ④ application research of English teaching, such as educational games for English learning. Natural language understanding will bring new ways and methods to the learning of English learners in areas such as machine understanding and question answering systems. The question and answer system can act as a virtual assistant to solve students' individualized problems, answering and tutoring students' questions in a natural interactive way [32, 33].

3.2.2. Pattern Recognition. Pattern recognition is to make the computer recognize a given thing. It mainly studies how computers recognize natural objects and so on so that computer simulations can realize human pattern recognition capabilities, such as vision, hearing, touch, and other intelligent perception capabilities. The pattern recognition system mainly consists of four parts: data collection, preprocessing, feature extraction and selection, and classification decision-making. The composition is shown in Figure 4.

In college English teaching, the premise of providing learners with personalized learning support services is to collect learners' voice, emotion, and other physical signs data. By mining and analyzing these data, it provides basic data model support for subsequent personalized learning. The application of pattern recognition in teaching mainly includes the following: in the oral English training class, the spoken language of recognized student can be compared with the standard spoken language to guide the student's spoken language learning, intelligently identify the learning state of the learners, and provide learning help and encouragement timely. Learners can search for learning resources with their voice and so on.

3.2.3. Learning Analysis. Learning analysis is a new concept derived from the rise of big data and data mining. Big data is the basis for learning analysis, and learning analysis can realize the value of big data. The learning rules are designed according to Ebbinghaus memory rules, which show the laws of knowledge forgetting. The technique of modeling is applied to the Ebbinghaus forgetting laws, among which the one-chamber model and the two-chamber model are widely used [34].

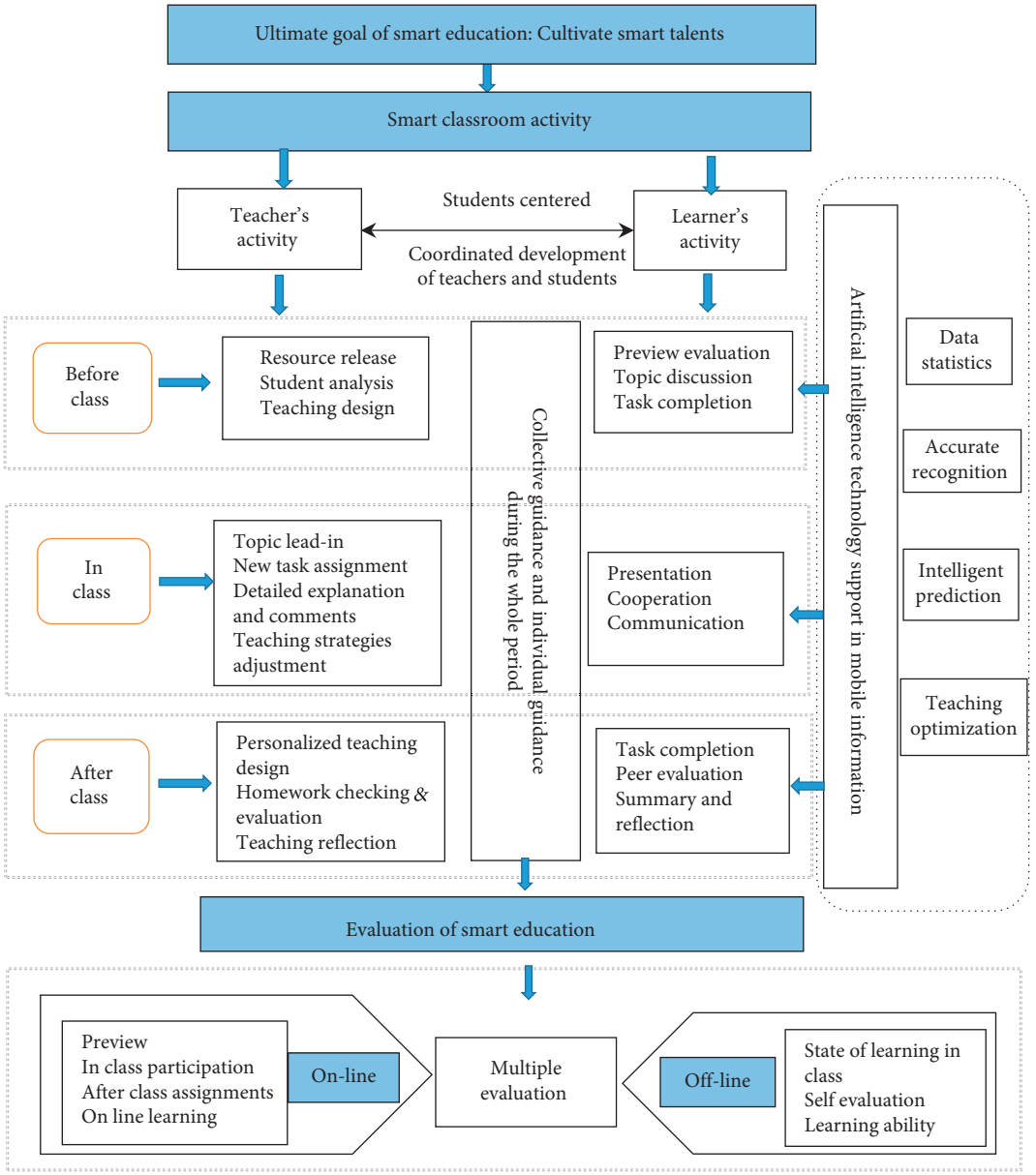

Figure 2: Framework of college English smart classroom teaching mode.

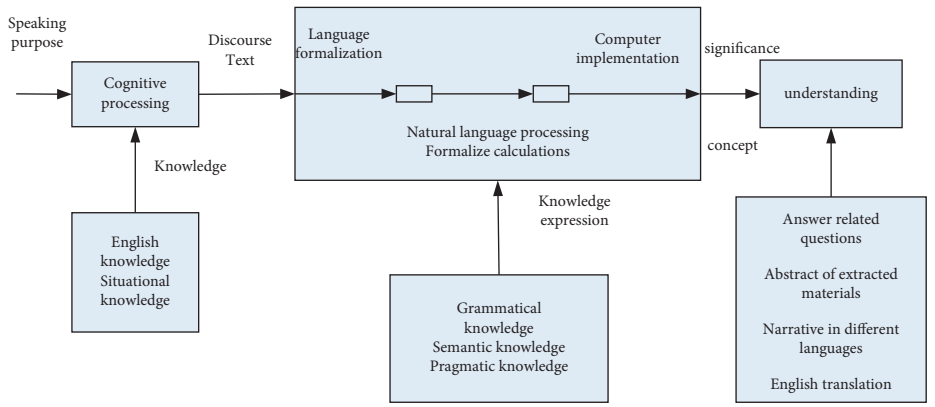

Figure 3: Basic model of language understanding.

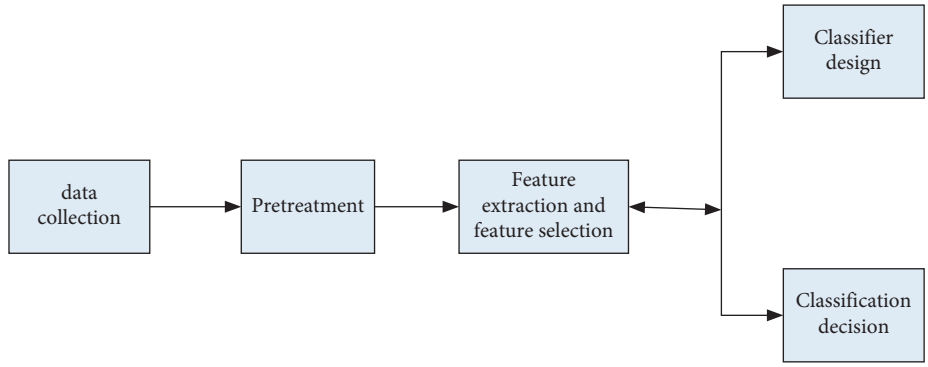

Figure 4: Pattern recognition process diagram.

(1) One-Chamber Model. Regarding the human brain as a room, after a certain amount of Z material is memorized, the amount of memory remaining after time t is $X(t)$. Assuming that the speed of forgetting is constant i, we can get

$$x(t) = Ze^{it}. \tag{1}$$

The curve obtained by this function is consistent with the Ebbinghaus forgetting curve. Plot the measured data and use the least square method to determine a straight line to obtain the specific value of y, which can be expressed as

$$t_{1/2} = \frac{0.69}{y}. \tag{2}$$

In formula (2), one-half of "t" is a constant, which describes the time that the memory retains half of the original amount, which is called the half-memory period. "t" and "y" are both used to reflect the strength of memory ability. The larger "t," the stronger the memory capacity of this kind of material and the smaller the value of "t" at this time.

(2) Two-Chamber Model. According to formula (1), people have proposed a two-chamber model, which regards the brain as two compartments (compartment 1 and compartment 2), which store short-term memory and long-term memory respectively. At time "t," the memory of compartment 1 and compartment 2 is set to X_1 and X_2, respectively, and then

$$\begin{aligned} \frac{dx_1(t)}{dt} &= I_{21}x_2(t) - (I_{12} + I)x_1(t), \\ \frac{dx_2(t)}{dt} &= I_{21}x_2(t) - I_{21}x_2(t). \end{aligned} \tag{3}$$

Among them, "I" is the forgetting rate constant. Considering the initial condition $t = 0$, the solution is

$$x_1(t) = \frac{Z(d - I_{21})}{\alpha - \beta}e, \tag{4}$$

$$x_2(t) = \frac{ZI_{12}}{\alpha - \beta}e, \tag{5}$$

where α and β are determined by the following formula:

$$\begin{aligned} \alpha + \beta &= I_{12} + I_{21} + I, \\ \alpha \cdot \beta &= I_{12} \cdot I, \end{aligned} \tag{6}$$

or

$$\begin{aligned} \alpha &= \sqrt{I_{12} + I_{21} + I - 4I_{21} \cdot I}, \\ \beta &= \sqrt{I_{12} + I_{21} + I - 4I_{21} \cdot I}. \end{aligned} \tag{7}$$

Make

$$\begin{aligned} A &= \frac{Z(\alpha - I_{21})}{\alpha - \beta}, \\ B &= \frac{Z(I_{21} - \beta)}{\alpha - \beta}. \end{aligned} \tag{8}$$

Then, formulas (4) and (5) are reduced to

$$x_1(t) = Ae^{at} + Be^{\beta t}. \tag{9}$$

According to the laws of memory forgetting, we can get a model that is very consistent with the Ebbinghaus forgetting curve:

$$S(t) = \frac{1}{1 + vt}. \tag{10}$$

We can get

$$t(s) = \frac{(1/s) - 1}{v}. \tag{11}$$

Formula (11) shows that the amount of memory is only related to the forgetting speed of the specific content; that is, the forgetting speed "V" is a variable, not a constant, which conforms to the characteristics of human memory. In this model, the only parameter to be determined is "V," which is the initial rate of long-term memory forgetting.

The purpose of learning analysis is to optimize the learning process, which generally includes four stages. The process is shown in Figure 5.

As shown in Figure 5, the four stages of optimizing the learning process are describing learning results, diagnosing the learning process, predicting the future development of learning, and intervening in the learning process.

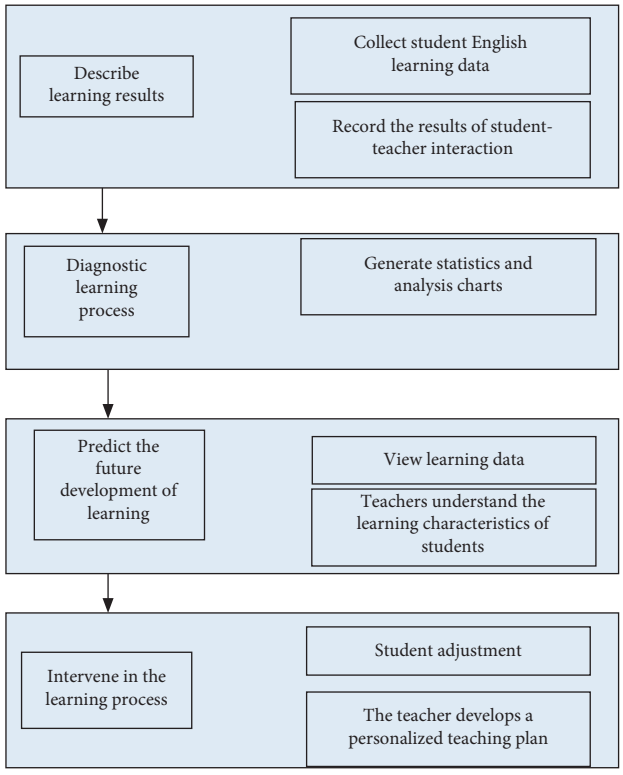

Figure 5: Learning analysis process.

3.3. Application Goals and Teaching Goals of College English Smart Classroom Based on Artificial Intelligence

3.3.1. Application Goal of College English Smart Classroom Based on Artificial Intelligence. Artificial intelligence is the research and development of emerging technologies and sciences for simulating, extending, and expanding human intelligence. Machines are used to simulate human intelligence so that machines can "think and act like humans" and finally realize that machines can do what they used to be only for humans. The application form of artificial intelligence in education is divided into two categories: subjectivity and auxiliary. Artificial intelligence technology has different application goals for different personnel in the teaching process, such as students, teachers, teaching managers, and course or software developers, which can be shown in Table 1.

3.3.2. College English Smart Classroom Teaching Goals. This research draws on Bloom's taxonomy of educational goals in the cognitive domain to design teaching goals. Bloom's teaching objective classification system is composed of a "two-dimensional model," which is knowledge dimension and cognitive process dimension. The intersection of the knowledge dimension and the cognitive process dimension constitutes a grid of the classification table, which is shown in Table 2.

In the knowledge dimension, Bloom divides knowledge into four categories: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. Because the topic of this paper is in line with the part of factual knowledge and other knowledge categories are relatively large, this paper only discusses factual knowledge. In the cognitive process dimension, Bloom divides the cognitive process into six levels from high to low, which is shown in Figure 6.

From the perspective of cognitive process, Bloom gave a more detailed verb effect checklist, which is helpful for the classification and analysis of goals in teaching practice as shown in Table 3.

According to Bloom's taxonomy of educational goals, the teaching goals of college English smart classroom based on artificial intelligence in this research are designed:

(1) Memory: recognize and write applied vocabulary for college English majors. Identify the meaning of the same word in different sentences

(2) Understanding: summarize the content of college professional articles and translate college professional articles

(3) Application: activities related to college English majors

(4) Analysis: compare articles for college English majors

(5) Evaluation: make relevant assessments based on students' English scores

(6) Creation: create some more interesting ways to learn English in the classroom

3.4. Implementation of the Teaching Mode and Teaching Evaluation

3.4.1. Specific Implementation. According to the design of the previous teaching model, this paper conducts the traditional college English teaching model for the control class, and the experimental class conducts a one-and-a-half semester college English smart classroom teaching. The whole textbook is arranged according to the same unit structure. We only conduct smart classroom teaching in listening, speaking, reading, and writing of each unit of the experimental class. In the experimental class, teachers carried out three major teaching activities: curriculum introduction, independent listening and speaking, and discussion and exchange. The teaching activity frame of the experimental class is shown in Figure 7.

As shown in Figure 7, the materials before the class should be reading materials of each unit, and the micro-videos of reading materials are used for background learning in class to lead in topics through enlightenment, inquiry, and guidance, which can broaden students' background knowledge of the topic, understand the students' cognition of related knowledge, and pave the way for the subsequent development of listening activities. The teacher sends the listening materials and the learning tasks to the smart platform. Students adjust the speed of records to complete the task according to their own rhythm. The system gives immediate feedback on the results. The whole process of autonomous listening is as follows: after the students listen to the records ⟶ complete the exercises ⟶ the system

Table 1: Application goals of artificial intelligence for different teaching stakeholders.

Objects	Machine learning application goals
Student	Realize personalized learning and promote learning performance. Recommend adaptive learning resources and learning tasks based on individual characteristics such as learning interest and ability to improve learning efficiency.
Teacher	Grasp the overall situation of teaching and get teaching feedback. Analyze students' learning performance and predict student performance; find students with learning difficulties and implement teaching interventions; reflect on teaching methods and discover learning patterns.
Manager	Evaluate teachers' teaching performance, improve management system, and scientifically allocate educational resources.
Course developer	Support course or software developers to accurately evaluate and maintain online courses and teaching systems.

Table 2: Classification of Bloom's educational goals.

Knowledge type	Cognitive process					
Factual knowledge Conceptual knowledge	Memory	Understanding	Application	Analysis	Evaluation	Process

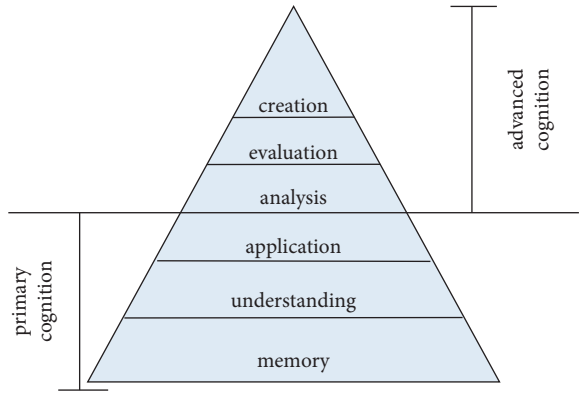

Figure 6: Bloom's cognitive process.

Table 3: Verb checklist for cognitive process dimension.

Cognitive process	Related verbs
Memory	Name, describe, related, find, roll, and write
Understanding	Interpret, compare, discuss, restate, predict, and transform
Application	Show, complete, use, classify, test, and give examples
Analysis	Interpret, compare, contrast, test, identify, and investigate
Evaluation	Adjudicate, grade, select, construct, certificate, and evaluate
Creation	Create, invent, plan, organize, construct, and design

gives immediate feedback ⟶ then students listen to the records again. At the same time, teachers will give guidance and illustration through pictures and texts, which deepens students' understanding of English reading materials again. Teachers can create situations to guide students to participate in communication activities. Here, the importance of thinking is emphasized and students are required to think for a minute. In order to further deepen learning, teachers should set some topics related to real life so as to stimulate students' motivation of language expression. At the same time, teachers may assign man-machine dialogue tasks, so as to make every student open his mouth to speak. After class, teachers should encourage students to participate in the evaluation and error-correction activities. After the two stages of listening and communication, students have enough knowledge to input. And then, make students participate in other activities so as to put what they have learned into applications, for example, doing some speaking practice first and then writing practice. The more knowledge they acquired, the higher-level cognition can be promoted.

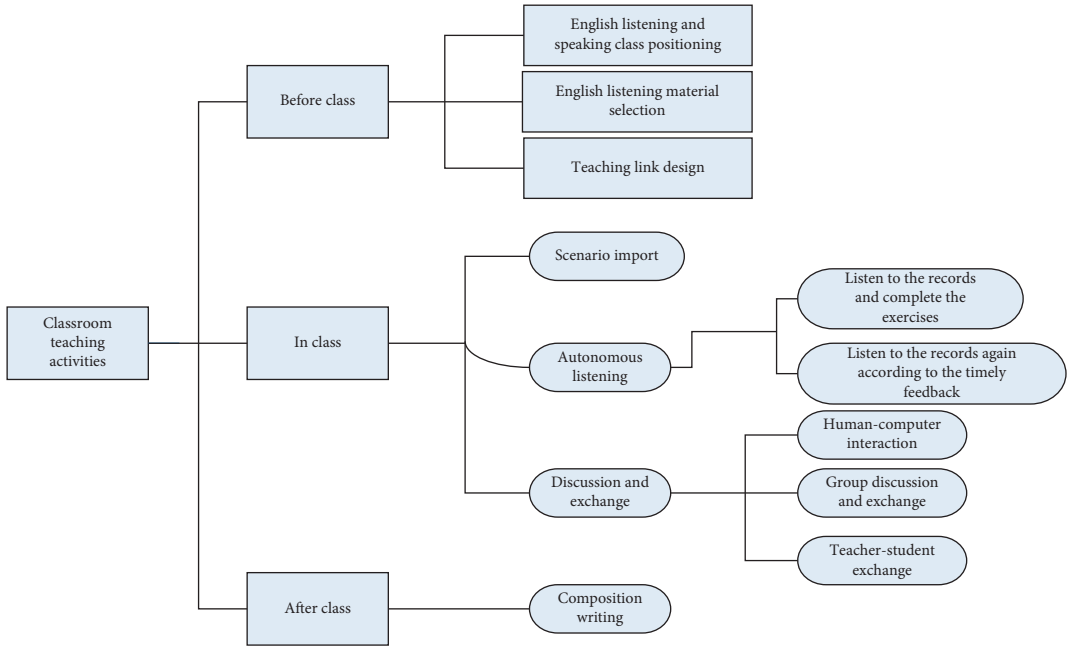

Figure 7: Framework of teaching activities.

3.4.2. Teaching Evaluation. From focusing on teachers' "teaching" to students' "learning," teachers and students should cooperate with each other and make progress together. Therefore, the teaching evaluation scale is shown in Table 4.

4. The Experiment of College English Smart Classroom Teaching Model Based on Artificial Intelligence Technology

4.1. Student Learning Effect

4.1.1. Comparison of Results. After a semester of teaching practice in the control group and the experimental group, the results of the two classes have changed significantly. The results are shown in Table 5.

It can be seen from Table 5 that the score difference between the experimental class and the control class before the experiment is obvious. After the experiment, the average score increased by 10 points, while the average score of the control class only increased by 3 points after the experiment. Regarding the passing rate of classroom teaching mode experiment, the experimental class has increased by 29% after the experiment, while the control class only increased by 10%. Therefore, the conclusion can be arrived that the teaching model of college English smart classroom based on artificial intelligence technology can improve students' learning abilities.

4.1.2. Comparison of Student Self-Evaluation before and after Implementation. For students' learning effects, besides the evaluation of learning performance, it is necessary to consider their interest, participation, confidence, the degree of understanding and application of knowledge, and the awareness of cooperation and communication in learning throughout the learning process. The main object of evaluating learning effects is not only teachers but also parents and students themselves. Student self-evaluation can not only mobilize their learning enthusiasm but also promote their self-education. Therefore, in addition to teachers' evaluation of students' performance, students should also be encouraged to make self-evaluation of their own learning. This paper conducted a questionnaire survey on the experimental class through the above-mentioned aspects and conducted a survey on the experimental class before and after the implementation of smart college English teaching model to analyze the changes in the learning effect of the students. The results are shown in Figures 8 and 9.

Through the comparison of Figures 8 and 9, it is found that the students' self-evaluation of the learning effect in the experimental class has undergone significant changes before and after the experiment. First of all, from the two aspects of students' interest in learning, participation, and self-confidence, the number of students who like to take English classes has increased from 20% before the experiment to 60% after the experiment, a significant increase, and only 10 students dislike it; students who can actively participate in classroom activities have also increased from 30% before the experiment to 80% after the experiment; students who are confident of learning English well have increased from 30% before the experiment and to 80% after the experiment, but still 10% of students are not confident. This shows that English learning has become more interesting; students' interest has been aroused after adopting the smart college English classroom teaching model. Secondly, from the perspective of understanding and mastery of knowledge, the number of students who can basically

Table 4: Evaluation scale.

Evaluation	Classification	Index	Comment content
Process evaluation	Before class	Participation attitude	Attendance, learning duration, preview volume, test completion volume, and test score
		Quality of participation	Feedback volume, communication response volume, question-answer, and test scores
	In class	Participation	Activities participation, achievement sharing, times of replies, and times of praise
	After class	Curriculum learning effect	Test scores, total hours online learning, self-evaluation, teacher's evaluation, evaluation from peers, and works
Summative evaluation		Final learning effect	Total test score, total learning time, self-evaluation, teacher's evaluation, peer evaluation, works, and midterm and final results

Table 5: Comparison of results before and after the experiment.

Class	Average score before experiment	Average score after experiment	Passing rate before classroom teaching mode experiment (%)	Passing rate after classroom teaching mode experiment (%)
Experimental class	55	65	21	50
Control class	54	57	20	30

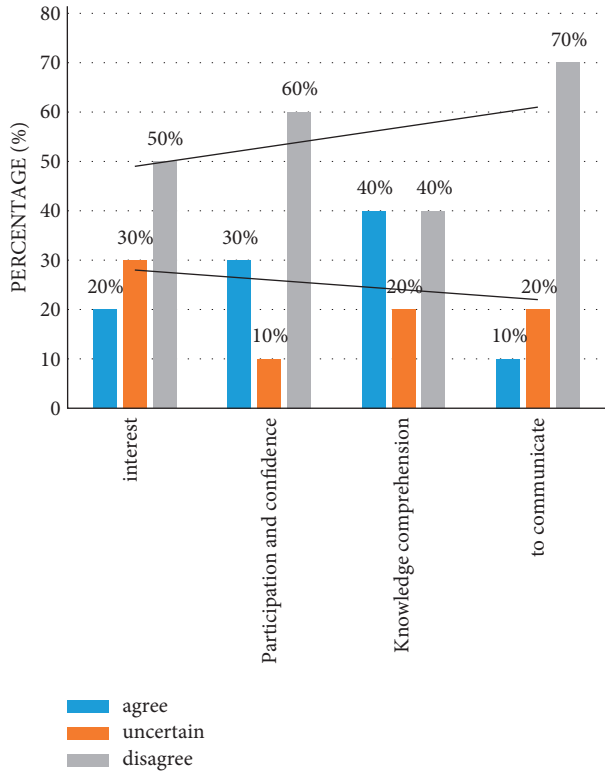

Figure 8: Self-evaluation statistics of the experimental class before the experiment.

understand what the teacher said has increased from 40% before the experiment to 70% after the experiment. The understanding and mastery of "Mute English" has improved significantly. Finally, from the perspective of communication and cooperation with others, 70% of the students did not have the habit of cooperative learning before the experiment. After the experiment, this data dropped to 10%. This is because when the smart classroom teaching mode is adopted, teachers often assign group cooperative learning tasks before and after class, and the classroom often adopts cooperative learning teaching methods and task-based teaching methods. In this way, students not only improve their language communication skills but also cultivate a sense of teamwork.

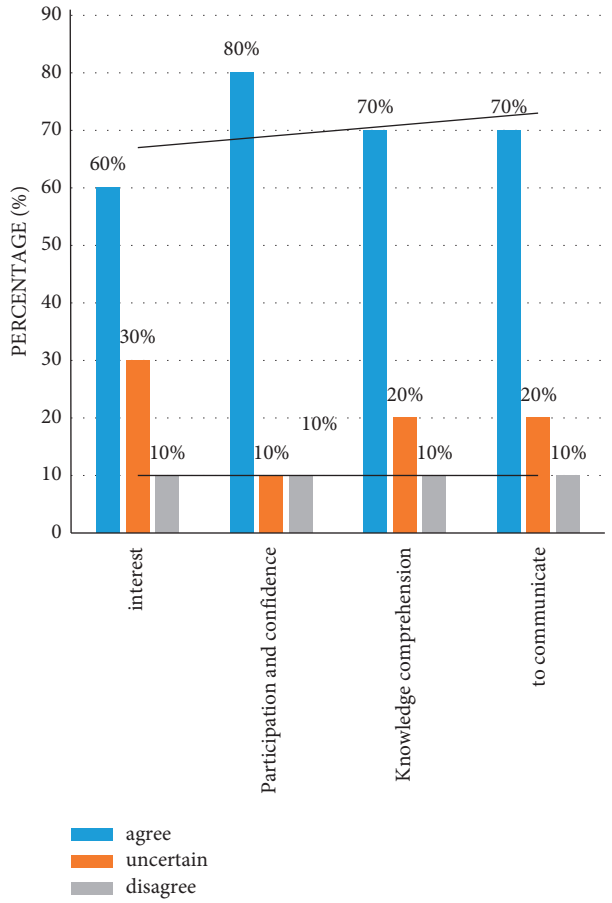

Figure 9: Self-evaluation statistics of the experimental class after the experiment.

4.2. Teachers' Teaching Effect. Because the main object of the teaching model is students, the effect of its implementation should mainly depend on the students' satisfaction with the course. Therefore at the end of the semester, we designed a questionnaire concerning English course satisfaction. The questionnaire is divided into three parts: teaching content, teaching mode, and overall teaching evaluation. Each item reflects the teaching effect through teachers and students' answers, which reflects the actual teaching effects. The main content of the questionnaire includes the function and interest of teaching contents, the effect of teaching methods on language communication ability, and students' overall evaluation of the teaching mode. Figure 10 shows the results of the students' satisfaction with the course of experimental class.

As shown in Figure 10, from the perspective of teaching content, in terms of the role of teaching content, 70% of students believe that the content of learning resources released by teachers on the smart platform is helpful for English learning, but 20% of students are not sure, and 10% of students hold the opposite opinion. From the perspective of teaching mode, in terms of English language communication skills, 65% of students believe that their English language communication skills have improved, 20% of students are uncertain, and 15% of students believe that they have not improved. From the overall evaluation of teaching, 90% of students said that they liked this teaching model, 5%

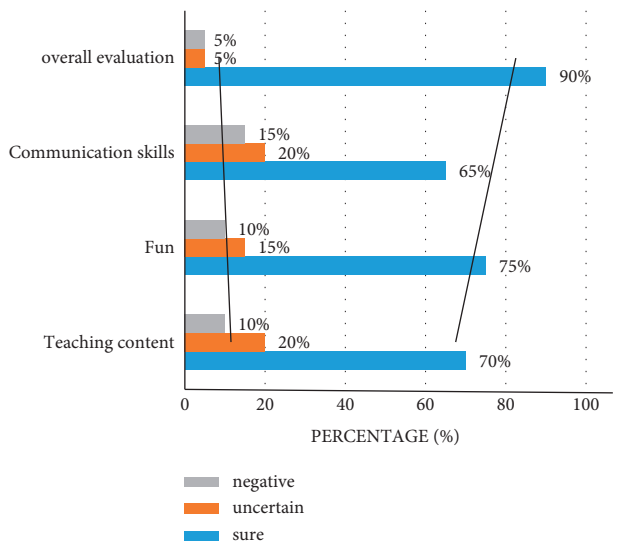

Figure 10: Results of students' satisfaction with the English course.

of students were not sure, and only 5% of students did not like this model. Therefore, although most students like the smart classroom teaching model, some students still dislike it. Future research should explore why some students do not like it so as to further improve the teaching model. However,

the overall data shows that the teaching model is generally helpful to improve students' autonomous learning ability, helps students acquire and expand more English language knowledge, promotes teacher-student interaction, and improves English language communication ability to a certain extent.

5. Summary

Artificial intelligence is an intelligent system that can perform tasks in complex and changeable environments without special manual intervention. This paper mainly studies the teaching mode of smart college English classroom based on the artificial intelligence technology in the mobile information system. The questionnaire surveys and experimental methods were applied in the research to conduct teaching experiments and verify the reliability of this teaching model.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare no conflicts of interest in this study.

Acknowledgments

This work was supported by the project of Shaanxi Federations of Social Science in 2020: Construction and Application of College English Smart Teaching Model under the Background of Big Data (20WY-47). This work was also supported by the Key Project of the 13th Five-Year Plan of Shaanxi Educational Science in 2020: Research on Classroom Teaching Reform in Universities of Shaanxi Province in the New Era (SGH20Z017).

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