

# *Design of College English Teaching Model under the Background of Artificial Intelligence + Big Data*

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**Abstract:** As economic globalization develops and the people's cultural literacy level improves, English is more and more important in work and life. However, there are some common problems in today's college English teaching model (ETM), which are not conducive to students' improvement of English proficiency. Therefore, colleges urgently need to change the existing teaching methods and models. Artificial intelligence (AI) realized a high degree of intelligence of computer functions. Anthropomorphic thinking enabled computers to play a human role in teaching, intelligently guided students in oral language teaching, and promoted personalized teaching and automated management. BD realized the analysis of students' learning behavior, helped to find problems, timely improved learning behavior and teaching behavior, and improved course teaching. This paper will study the application of AI and BD technology in college ETM, and explore the effect of college English teaching after introducing AI and BD through a series of computing processes such as neural networks. The college ETM researched and designed in this paper was applied and tested in schools, and the results were obtained: the effect of college English teaching under the action of AI and BD has increased by 7.91%, students' learning efficiency and teaching satisfaction have been improved, and the attendance rate has also been improved. Attendance has also been guaranteed, and this technology has significantly promoted college English teaching.

## **1. Introduction**

With the rapid expansion of the global economy, the society has higher and higher requirements for language proficiency. College English, as a compulsory course in colleges and universities, has attracted great attention from people from all walks of life. English is inseparable from people's life and work. However, there is still a certain gap between the current college ETM and the development requirements of the times. Many college students cannot communicate fluently in English after graduation. This result has a lot to do with the teaching mode of college English. Driven by the times, the use of AI and BD technology to strengthen the reform of college English teaching is urgent.

Today, the reform of college ETM has been preliminarily verified. Wang Y proposed the English listening and speaking model of layered teaching, which provided a new idea for solving the

English listening and speaking problem in the "Internet +" era, comprehensively improved the level of English teaching in colleges, and promoted the vigorous development of English subject teaching [1]. Pan Y studied the effects of gender, grade, self-perceived English proficiency and overseas study experience on the use of metacognitive reading strategies. The results showed that self-perceived English proficiency can significantly predict learners' strategy use, and overseas study experience was negatively correlated with learners' strategy use [2]. Li C studied the influence of Internet buzzwords on school English education, and introduced the specific application of Chinese-English translation of Internet buzzwords in English teaching from three aspects: teachers, teaching and activities [3]. Bingham S used an intelligent software system in the university language laboratory, and established at least 36 hours of calling laboratory parameters and 2 to 3 hours of extracurricular work to improve students' English language skills [4]. Yang Y studied the impact of using English on college English courses, combined with students' professional characteristics and career planning, aroused students' attention, and improved college students' comprehensive English ability [5]. Du T T researched on literary problems in college English courses, and the results of the survey found that the experience of mother tongue literature and the experience of other countries' languages and literature were limited [6]. College English courses were rich in content and were an effective teaching method to guide college students to acquire and improve their language skills.

Existing research has shown that AI and BD technologies have made outstanding contributions to the development of various industries. Rongpeng applied AI and BD technology in radio connection, smart grid and supply chain management to improve grid intelligence and promote the standardization process of 5G cellular network [7]. Krittanawong C found that in smart medicine, the use of BD and AI technology can significantly improve the accuracy of surgery, and assist patients in diagnosis and treatment, rehabilitation and health management. Medical robots can also help distribute medicines, move patients, and reduce the burden on doctors and nurses [8]. Swpu P found that the application of AI and BD technology in the petroleum industry has penetrated from the upstream of exploration, development and production to the downstream of management, sales and investment, which has bestially improved the efficiency and profit of the industry [9]. Szabadfidi I applied AI and BD to smart agriculture, using information technology to track agricultural production, processing and sales. It can monitor the growth of agricultural products, improve agricultural productivity, and achieve efficient and sustainable development [10]. listyaningsih T used AI as a decision support system to monitor and control river pollution in the industrial sector. BD helped managers make faster and more accurate policies and decisions to improve surface water quality in rivers [11]. Reddy R used BD and AI neural network to test machines in tennis, cricket, football and other fields, which was helpful for the exploration of sports talents [12]. Today, with the increasing development of data mining and professional technology, BD and AI technologies have gradually been integrated into and changed the traditional development system.

For a long time, college English has been following a teaching method, which has led to the slow development of college English. With the advancement of AI and BD technology, there has been a turning point in the reform of college English teaching. In order to make this turnaround in a good direction, this paper studied a college ETM that incorporated AI and big data (BD).

## **2. College English in the Background of AI + BD**

### **(1) College ETM**

English is the most widely taught, learned and used other countries' language in schools, but many students still have unsatisfactory results after studying college English for 1-4 years. The

bottom line is that students do not have the ability to use English. At this stage, the ETM of colleges and universities in general is still centered on teachers. Teachers speak and students listen. Due to the large size of the class and the large number of students, it is difficult for teachers to take into account every student. As a result, the knowledge learned in the classroom cannot be consolidated and fed back in time, which directly reduces the learning effect and quality. The existing college ETM is shown in Figure 1.

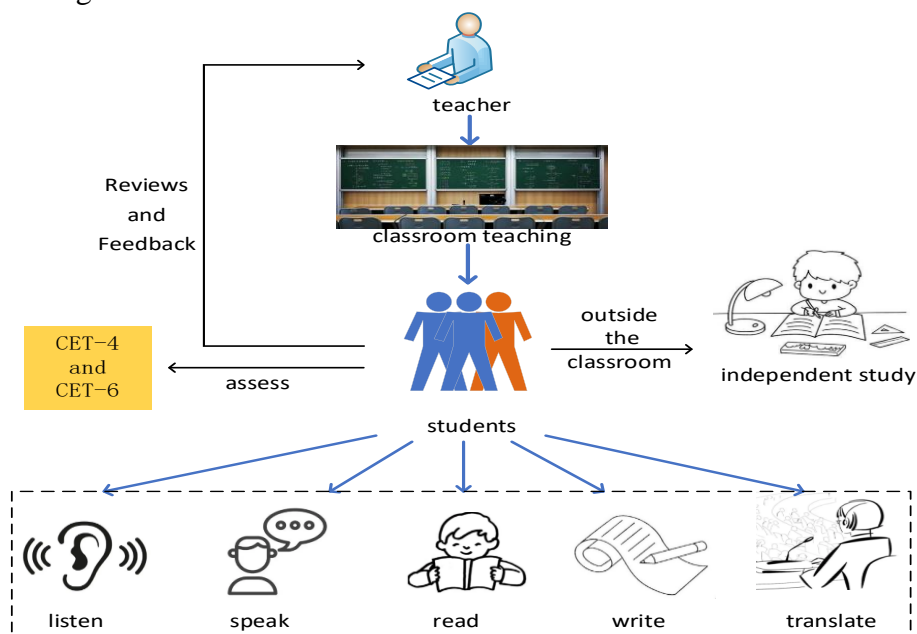


Figure 1: College ETM

As shown in Figure 1, traditional college English takes the classroom as the center. Students passively accept knowledge in the classroom, and consolidate knowledge through autonomous learning outside the classroom, in order to achieve the teaching goals of "listening, speaking, reading, writing, and translation". For a long time, the only way for universities to assess students' English ability is CET-4 and CET-6. Some schools even pursue the passing rate as a criterion for teachers' performance assessment. The lag of these teaching methods and teaching concepts has resulted in students only staying in grammatical structure. Reading and speaking skills are difficult to improve. The lack of close connection with other fields such as political current affairs, hot news, boring teaching content and single evaluation system make college English teaching fall into a vicious circle, and adversely affect the quality and effectiveness of teaching [13].

According to the analysis of the current college English teaching situation, the traditional college English education model is not suitable for the teaching situation in the new era, and the effectiveness of the modernization reform of college English is not optimistic.

## (2) AI and BD

AI is a technology that imitates and extends people. It is changing the existing life. At present, various universities generally use multimedia for English teaching. Although it provides support for classroom interaction, from the perspective of the training goal of comprehensive development, this teaching mode has great limitations. The emergence of AI breaks through these constraints and realizes the two-way development of students' language skills and knowledge ability. The infrastructure of AI is shown in Figure 2:

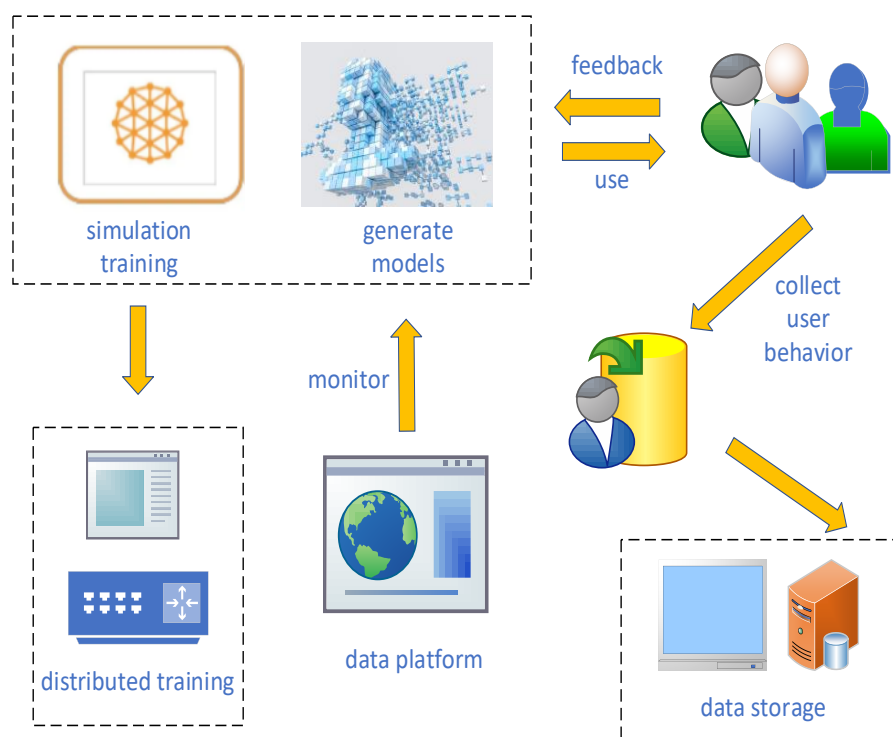


Figure 2: AI architecture diagram

AI is a way of interaction, learning and growth between people and machines. It constantly changes people's cognition of the world by promoting the common progress of both parties. AI technology is the core technology of information-based teaching reform. Through AI software, personalized teaching can be achieved, the barriers between face-to-face communication and online communication can be removed, and the previous way of learning English can be overturned [14].

### (3) BD

The role of BD is not to master huge data, but to finely process these data [15]. Reasonable use of modern Internet technology and equipment derived from BD for education and teaching can achieve better teaching effects. For example, teachers can play video clips to relax the classroom atmosphere and increase memory points, and students can also access learning resources in a BD environment through the Internet and conduct teamwork and group learning.

### (4) Construction of college ETM based on AI + BD

The layered teaching mode is a teaching based on the actual situation of students, and formulates differentiated teaching tasks, teaching students in accordance with their aptitude to promote personality development. Hierarchical teaching creates a good learning atmosphere and opportunities for students at different levels, and promotes the common progress of teaching and learning [16]. This paper intends to design a teaching model by using a layered teaching method. For high-level students, this method sets the goal of passing CET-6 and having a strong listening and speaking ability to speed up the teaching progress and increase the depth of teaching content. For low-level students, the goal of passing CET 4 and having general English listening and speaking ability is set, and the teaching progress is arranged scientifically and reasonably. Based on this, the college ETM in the context of AI and BD is shown in Figure 3.

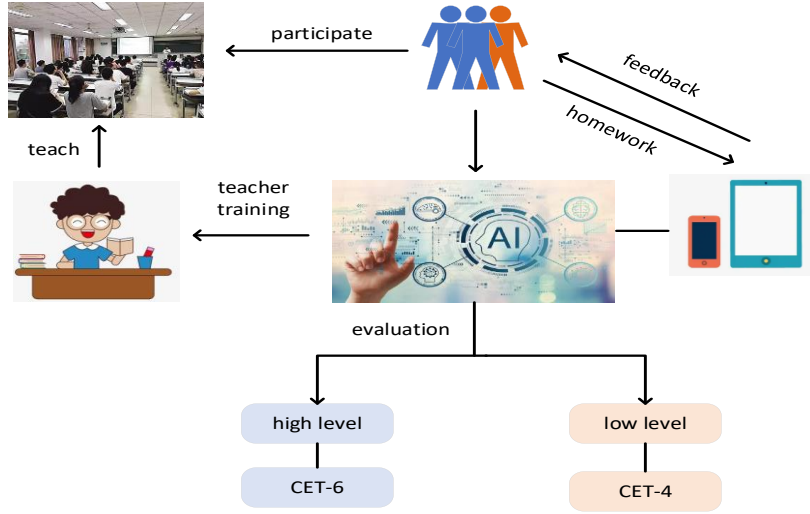


Figure 3: Model design of college English teaching

As shown in Figure 3, in the design model, through the AI software, the homework will be automatically generated on the smart device after the students finish the class, and the software will automatically generate feedback after the students complete the homework. In the follow-up, it can also push appropriate topics according to the different ability levels of each student, realize personalized teaching, and provide strong and effective feedback and intelligent guidance for students' oral practice.

### 3. Model Design of College English Teaching

#### (1) Neural network model

Neural network are composed of a large number of neurons, which are interconnected with each other to form a dynamic system. It is an abstract imitation of biological systems and a new and important research area of machine learning. The purpose of studying neural networks is to enhance the sensitivity of the nervous system and the comprehensive analysis ability of the brain, so that machines can learn by themselves [17].

Assuming that there are  $A$  input nodes, the input value is  $x_1, \dots, x_A$ . Assuming that there are  $B$  output nodes, the output values are  $y_1, \dots, y_B$ , and the ideal output is defined as  $K$ , then:

$$K_i = \begin{cases} +1 & A, B \in i \\ 0 & A, B \notin i \end{cases} \quad (1)$$

The input values are weighted to get:

$$S_n = \sum_{m=1}^M d_{mn} x_m - \lambda_n \quad (2)$$

The actual output function is computed:

$$y_n = f(S_n) = \frac{1}{\exp(-S_n) + 1} \quad (3)$$

The values and thresholds for each weight are corrected as:

$$d_{mn}(t+1) = d_{mn}(t) + \mu \theta_n x_i \quad (4)$$

$$\lambda_n(t+1) = \lambda_n(t) + \mu \theta_n \quad (5)$$

## (2) Restricted Boltzmann machine

Deep learning is machine learning using deep neural networks. A restricted Boltzmann machine, a common component that makes up other deep neural networks, is a randomly generated neural network that learns probability distributions from an input dataset [18].

The weight matrix is A, then the energy function can be expressed as:

$$D(m, n) = -i^T n - j^T m - m^T A n \quad (6)$$

Among them, m and n are the state vectors of neurons in the hidden layer and visible layer, respectively, and i and j are the bias coefficient vectors.

## (3) Gradient descent

Gradient descent is one of the elements of machine learning, and it is the algorithmic optimization of neural networks. When solving the minimum value in this paper, the gradient descent method can be iterated by gradient descent. The minimized loss function and model parameter values are finally obtained [19].

The loss function for a single sample is defined as:

$$-\ln(D(n)) = -\ln\left(\frac{1}{Q} \sum_m e^{-D(m,n)}\right) \quad (7)$$

The gradient of i is computed:

$$\frac{\partial(-\ln D(n))}{\partial i_x} = \frac{1}{\partial i_x} \partial \ln\left(\sum_{m,n} e^{-D(m,n)}\right) - \frac{1}{\partial i_x} \partial \ln\left(\sum_m e^{-D(m,n)}\right) \quad (8)$$

Among them,

$$\sum_m P(m|n) = 1 \quad (9)$$

Similarly, the gradients of D and j can be obtained:

$$\frac{\partial(-\ln D(n))}{\partial j_x} = \sum_n D(n) D(j_x = 1|n) - D(j_x = 1|n) \quad (10)$$

$$\frac{\partial(-\ln D(n))}{\partial A_{xy}} = \sum_n D(n) D(j_x = 1|n) n_y - D(j_x = 1|n) n_y \quad (11)$$

The gradient sum can be calculated according to the obtained gradient loss of each sample.

## (4) MLLR adaptive algorithm

Adaptive algorithm refers to the automatic adjustment of processing methods, sequences, parameters, boundary conditions or constraints according to the characteristics of the processed data in processing and analysis. In order to obtain optimal processing results, it is a process of corresponding to the processed statistical distribution features and structural features [20].

Among them, W is the transformation matrix,  $\sum_{ab}^{-1}$  is the covariance matrix of the output probability distribution function of state ab, Y is the extended mean vector, and X is the eigenvector.

The transformation matrix is dimensionally reduced, so that:

$$A_i = \sum_{i=1}^I \partial_{ab}(i) \sum_{ab}^{-1} \quad (12)$$

Then the result after dimensionality reduction is:

$$vec(T) = \left[ \sum_{j=1}^J kron(A_i, B_i) \right] vec(W) \quad (13)$$

#### 4. College English Teaching Experiment under the Background of AI + BD

##### (1) Experimental method

A school's college English classroom teaching and traditional classroom teaching under the background of AI and BD were selected as the objective test environment. The 80 students were divided into two classes, A and B, with 40 students in each class. Among them, class A used the college ETM constructed by AI and BD, and class B used traditional teaching methods. The use and attitude of teachers and students to college ETM designed in the article were studied by means of questionnaires, and the experimental results were recorded and analyzed [21].

##### (2) Data evaluation

###### 1) Student attendance

This paper intends to use the observation method to collect students' attendance information. After observation from Monday to Friday, the results of the attendance records of the two classes are shown in Table 1 and Figure 4:

Table 1: Class attendance comparison

Day	Class A	Class B
Monday	35	34
Tuesday	37	35
Wednesday	38	32
Thursday	40	33
Friday	40	31

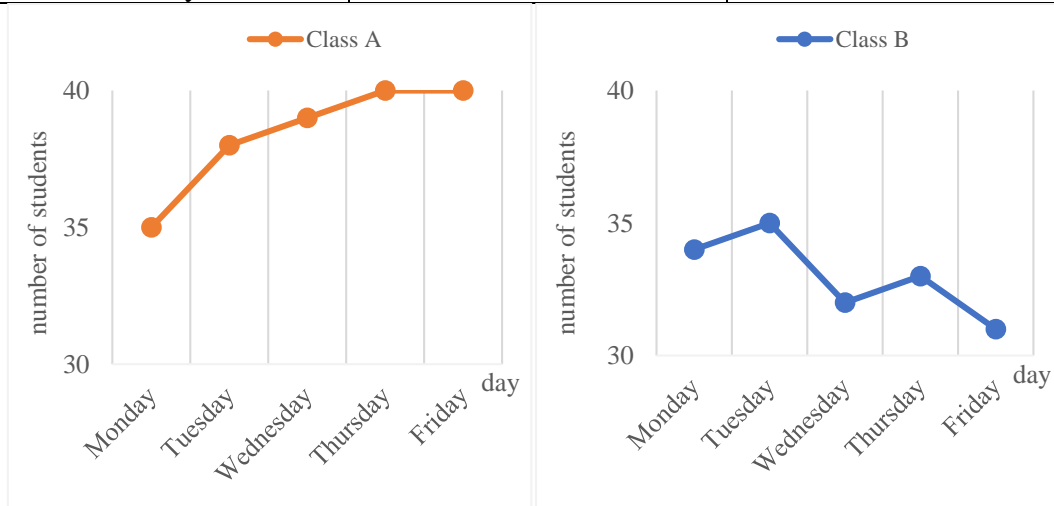


Figure 4: Class attendance comparison

As can be seen from Figure 4, the attendance rates of classes A and B before the start of the experiment were basically at the same level. However, after a week of study, it can be clearly seen

that the attendance rate of class A was on the rise. In the end, all the members of the class were kept in place. Class B showed a gradual downward trend. With the progress of teaching work, the number of attendance was getting smaller and smaller. By comparison, the teaching mode researched in this paper was more attractive to students and can effectively improve the attendance rate.

### 2) Teaching satisfaction

10 students were selected from each of the two classes to conduct a satisfaction survey. The results are shown in Figure 5:

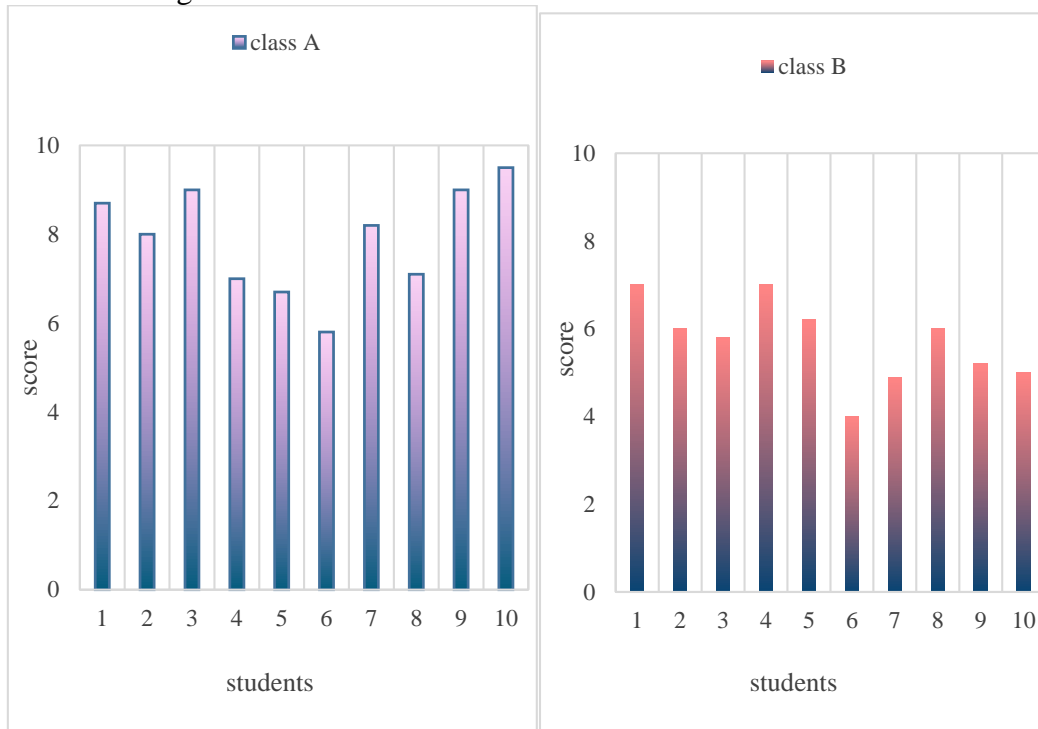


Figure 5: Teaching satisfaction comparison

It can be seen from the Figure 5 that most of the students in the two classes highly affirm the teaching effect of the teachers, but some students' evaluations show that the teachers may be disadvantaged in some aspects. After calculation, the average score of class A is 7.9 points, and the average score of class B is only 5.7 points. The satisfaction of class A is higher than that in class B, which means that the application of these assistive technologies can make up for the deficiencies of teachers in the classroom, improve students' satisfaction and overall English quality, and promote the common progress of college students in all directions. It is recommended that teachers use AI, multimedia and other teaching aids in teaching, and schools introduce high-quality teaching methods.

### 3) Teaching effect

The data from three aspects were synthesized, and the teaching effect of the teaching model designed in the paper and the existing teaching model were compared. The results are shown in Figure 6:



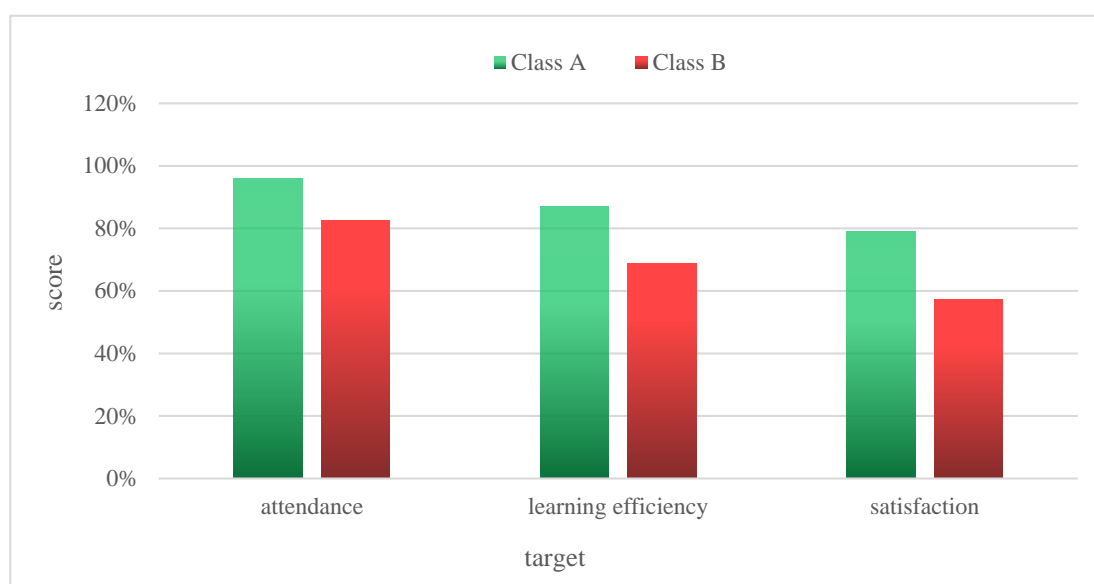


Figure 6: Comparison of teaching effects

As can be seen from Figure 6, from the perspectives of attendance rate, learning efficiency and satisfaction, any one of the indicators is higher than that of class A, and the overall teaching level of class A is better than that of class B. The scores of the two classes are weighted to get the result: the score of class A is 83.72%, and the score of class B is 75.81%. Therefore, the effect of college English teaching under the background of AI and BD technology has increased by 7.91%.

To sum up, in the field of other countries' language education, natural language processing and data mining technologies are becoming more and more mature, and BD and AI are being organically integrated with college English education, providing data support for the overall basic education teaching, and education informatization. The important role of educational informatization in teaching reform is self-evident, but these softwares only play an auxiliary role. The root of education still lies in people. Only the proper application of these methods will ensure the final reform effect.

## 5. Conclusion

The learning of a language needs to follow the laws of nature step by step and perseverance. This means that students should learn self-discipline and hold themselves to high standards. The biggest difficulty in college English teaching is how to mobilize the enthusiasm of students to study independently. The introduction of BD and AI technology has found a new direction and entry point for reform and breakthrough points for the transformation of the current college ETM. This document firstly expounded the development status of college English through the literature research method, analyzed the application of AI and BD in many fields, and then deeply analyzed related technology from four aspects such as neural network and gradient descent, etc. Finally, through the design experiment, it was verified that the college ETM under the background of BD and AI can attract students more, and increase the number of attendance. Students were more satisfied with the teaching process and results, and the teaching quality and effect were steadily improving. In addition, everyone is taught online to recognize new words and grammar, and offline targeted teaching. The organic combination of the two methods provides students with more effective and comprehensive educational services. It has narrowed the sense of distance between students and teachers. The college ETM combining AI and BD should be emphasized and promoted.

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