

Research Article

Research on College English Teaching Evaluation Based on Neural Network

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Aiming at the difficulty in adapting the traditional English teaching evaluation model to the new situation of current education development, a research on college English teaching evaluation based on neural network is proposed. The thesis proposes that based on the neural network, from the perspective of teachers and students, while creating a positive and harmonious learning atmosphere, a college English teaching environment with interactive mechanism is established, and a teaching mode of English interactive mechanism is constructed in it. To obtain a better neural network model, to establish the performance evaluation index of college English teaching, to calculate the weight of the performance evaluation index of English teaching, and to realize the evaluation of college English teaching based on neural network, the experimental results show that the use of this method can significantly improve students' English scores, and the method has high approximation accuracy.

1. Introduction

English is a language communication tool. It transmits the information of social politics, economy, culture, and other aspects. It has become an important part of a country's comprehensive national strength. Doing well in English teaching is related to the country's international image, international influence, and international discourse [1]. Cultivate a large number of high-quality engineering and technical talents with strong innovation ability and adapt to the needs of economic and social development, international communication, and international competitiveness [2], which further highlights the importance of English Teaching [3]. In recent years, college English teaching has made great progress [4], but it still cannot meet the market demand for high-level talents, including high-quality skilled talents [5]. On the one hand, social transformation and upgrading requires a large number of highly skilled talents. On the other hand, the technical talents trained by universities are difficult to meet the needs of the society. In order to improve the training quality of college English majors, it is necessary to strengthen the reform of teaching evaluation. As a part of college education, the significance of college English teaching evaluation is highlighted.

As an important part of teaching, teaching evaluation guides various teaching activities to a great extent and is an effective way and method to solve the problems existing in teaching. Relevant scholars have carried out many studies on this. Xie [6] puts forward author evaluation in English Academic Writing Teaching from the perspective of methodology. This study summarizes the main research directions of author evaluation in English Academic Writing Teaching in the past two decades and the main methods used in the field of Applied Linguistics and discusses the advantages and disadvantages of methodological methods in revealing problems. According to the applied analytical framework, four document chains are determined: position chain, metadiscourse chain, evaluation chain, and voice chain. Then, it identifies and discusses the advantages and disadvantages of corpus-based research methods, in-depth text research methods, and ethnographic research methods in exploring the evaluation significance in English academic writing. Lei [7] proposes to consider cross-cultural communicative competence and formulates the evaluation list of teaching materials for English Majors in China. With people's increasing interest in cross-cultural communicative competence in language teaching, how to evaluate the attribute of cross-cultural communicative competence in English

teaching materials has become a matter of great concern. From the reference and expert research, this study finds out the evaluation criteria of ICC attribute in English Majors' textbooks and constructs a checklist to evaluate ICC attribute in Chinese English Majors' textbooks. Although the above research has made some progress, there are still some limitations in the research of college English teaching evaluation. Therefore, this study puts forward the research of college English teaching evaluation based on neural network and uses neural network to evaluate teaching quality, which has a good evaluation effect. Through experimental verification, the effectiveness conclusion is drawn. Improve the quality and efficiency of college English teaching evaluation, and then improve the quality of college English teaching as a whole.

2. College English Teaching Evaluation Based on Neural Network

2.1. Neural Network. Neural network is a multilayer feed-forward network trained according to error backpropagation algorithm. It is one of the most widely used teaching evaluation network models. Neural network is based on function approximation theory. It is a feedforward neural network with strong global optimization ability. It is widely used in the field of college English teaching evaluation. It is composed of forward propagation of teaching evaluation information and reverse propagation of error. The structure is three layers, namely, input layer, hidden layer, and output layer. The specific structure is shown in Figure 1.

In Figure 1, the function of input layer neurons is to receive and propagate input signals. The hidden layer is the internal information processing layer of college English teaching evaluation. The hidden layer structure is set according to the change needs of input signals. If it is a single hidden layer BP neural network [8], the signal is directly transmitted to the output layer for forward propagation. If it is a multihidden layer BP neural network, the last hidden layer propagates the signal to the output layer for forward propagation. The output layer outputs the processing signals of the first two layers [9]. When there is a large deviation between the output value of college English teaching evaluation information and the expected output value, it returns to the process of error backpropagation. The output error updates the weight of each layer by gradient descent and propagates inversely to the hidden layer and the input layer. In the neural network, the three-layer neural network has two weight vectors, in which the weights of the input layer and the hidden layer are static weights, the weights between the output layer and the hidden layer are dynamic weights, and the activation function of the hidden layer is radial basis function. Therefore, the output of the output layer is the weighted sum of the input data after activating the function through the hidden layer. The radial basis function and dynamic weight are the key of RBF neural network. The expression of radial basis function is

$$R(m) = \frac{\|r_n - v_b\|}{y(n)}, \quad (1)$$

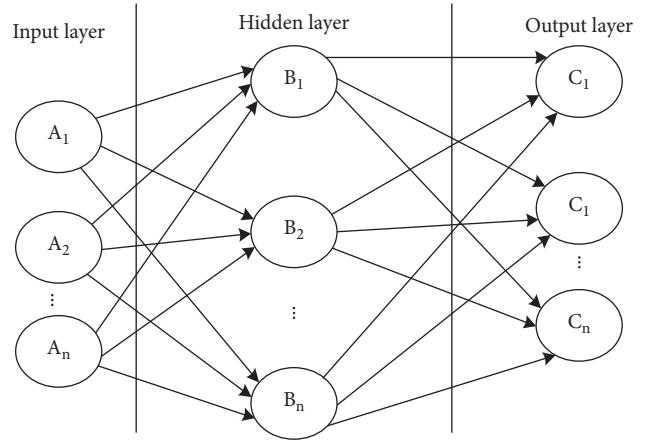


FIGURE 1: Structure of neural network.

where $\|r_n - v_b\|$ represents the norm of $r_n - v_b$ [10], r_n represents the sample data input by the input layer, v_b represents the center of the radial basis function, and $y(n)$ represents the width of the radial basis function. After determining the network weight and radial basis function parameters, the output of the neural network can be expressed as

$$Y(j) = \frac{\|r_n - v_b\|}{y(n)} \times \sum_{i=1}^m q_i, \quad (2)$$

where q_i represents the weight between the hidden layer and the output. According to the solution process of neural network, the network optimization process is to continuously update the dynamic weight and the center and width of radial basis function according to the training data until the whole neural network realizes the required nonlinear function approximation [11, 12].

2.2. Establishing Interactive Mechanism and College English Teaching Environment. When applying neural network [13], we should first establish a new interactive college English teaching environment for students. The interactive mechanism teaching model is not confined to the classroom, but can adopt mobile interaction, human-computer interaction, and other forms at any time and place to promote the interaction between teachers and students. This shows the importance of the establishment of interactive mechanism college English teaching environment.

College English classroom teaching environment is mainly divided into two aspects: material environment and spiritual environment. Among them, the material environment mainly includes classrooms and teaching equipment. The spiritual environment usually refers to the classroom atmosphere and the tension of schoolwork. In the process of teaching tasks carried out by teachers and students centered on teaching objectives, the learning atmosphere generated in the process of this activity is the psychological state of students and teachers in the process of this activity. When the atmosphere between teachers and students is active, the communication between teachers and

students is smooth and pleasant. When one of the teachers and students is unhappy, the communication of poor students is astringent and inefficient. Therefore, to create a positive and good learning environment, we need to establish an interactive mechanism based on a harmonious and stable relationship between teachers and students. The process of college English teaching environment is shown in Figure 2.

When using the interactive mechanism to carry out English teaching, it is necessary to have the interactive mechanism, as shown in Figure 2, and the establishment process of college English teaching environment. Teachers need to seriously understand students' emotions, understand students' needs, regard students as an independent individual, actively integrate into students, and have equal communication, exploration, and discussion with students. And in the process of college English teaching, students are not judged by their achievements, and they are biased against students. In this process, students will actively cooperate with teachers and interact with teachers to achieve the due interactive teaching in English classroom, and the most key is the way of communication with students. Therefore, when there are differences between teachers and students, teachers should avoid being too dominant, but should become a listener, understand what they think from the perspective of students, and look for the significance of students' behavior, so as to regulate students' behavior in a more suitable way, guide students to see more ideas, and learn to think selectively, and in this process, teachers should also give students more encouragement and let students show themselves.

In the interactive mechanism college English teaching environment [14], teachers need to choose situational dialogue that can best mobilize students' interest and enthusiasm according to the characteristics of students in this class, so as to open the interactive door of this class and let students compete to speak. When teachers communicate with students kindly and peacefully, the content of communication is still what students are interested in, which will promote students to have more language output. Therefore, in the process of establishing the teaching environment, as the leader of the teaching task, teachers should create an equal and harmonious teaching atmosphere as much as possible so that students can become the main unit of the teaching task, and teachers should act as organizers and participants in teaching activities, so as to establish a good interactive environment for college English teaching [15–17].

2.3. Construction of Interactive Mechanism Teaching Mode. Using interactive mechanism to carry out English teaching needs to reconstruct the English interactive mechanism teaching mode. The four-fold interactive mode designed for this purpose is shown in Figure 3.

From the interactive mechanism teaching mode shown in Figure 3, it can be seen that the four reinteractive modes are interrelated so that students can have knowledge construction experience between different interactive modes. In the process of college English teaching, we can establish

application scenarios to improve students' enthusiasm, regulate and guide students' learning in this process, and promote students' good interaction with teachers [18, 19]. In the interactive mechanism teaching mode, there are four interaction modes between students, teachers, and teaching materials and web learning resources, between students, teachers, and students, inside and outside the classroom, and between students, teachers, and synchronous or asynchronous media. The interaction types include content, interpersonal, time and space, and media [20–22].

When using interactive mechanism in English teaching, teachers must understand students' ideas, accurately interpret students' behaviors, and provide students with flexible goals of interest according to students' ideas and behaviors, and let students have exploration interest, so as to make them actively participate in teaching activities. Teachers help teachers with English teaching by means of modern information technology and content interaction. When using modern information technology teaching methods, teachers need to design and develop high-quality web learning resources according to their many years of teaching experience, students' ideas and behavior, textbook content, curriculum progress, and so on. The content interaction process between students, teachers, teaching materials, and web learning resources is shown in Figure 4.

In the interactive mode of college English teaching content, as shown in Figure 4, it is necessary to take learning resources as the starting point and generate circular interaction between teachers and students through operational interaction. Teachers constantly guide students to learn, in an auxiliary position, so that students are in a leading position in learning. Teachers' feedback on the teaching evaluation of this course consists of teachers' teaching regulation and evaluation of students and students' information interaction with teachers. Through content interaction, students can constantly improve and enrich their knowledge structure.

Only by forming interpersonal interaction between students, teachers and students, and teachers and teachers can we better carry out college English teaching. From the above content interactive teaching mode, it can be seen that the teacher-student interaction generated by teachers' guiding students is the most basic form of interaction in the teaching process, but this form of interaction is difficult to achieve the maximum teaching efficiency. Therefore, the interpersonal interaction mode is designed in the interactive mechanism teaching mode shown in Figure 4 to form a two-way interaction process between teachers and students. On the basis of content interaction, let students use communication tools to feed back their needs for teachers' teaching and their opinions on teachers' English classroom to teachers, and then, teachers provide learning support services for students according to students' feedback, so as to form a two-way teacher-student interaction process and establish a new interactive mechanism college English teaching environment that directly affects the relationship between teachers and students [23, 24].

In addition to the above, teachers should also take the initiative to provide students with relevant support services

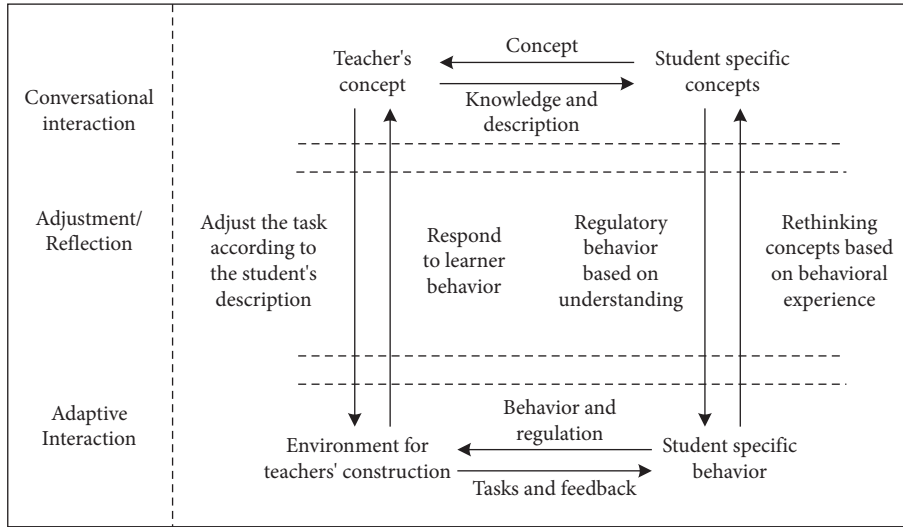


FIGURE 2: The process of establishing an interactive college English teaching environment.

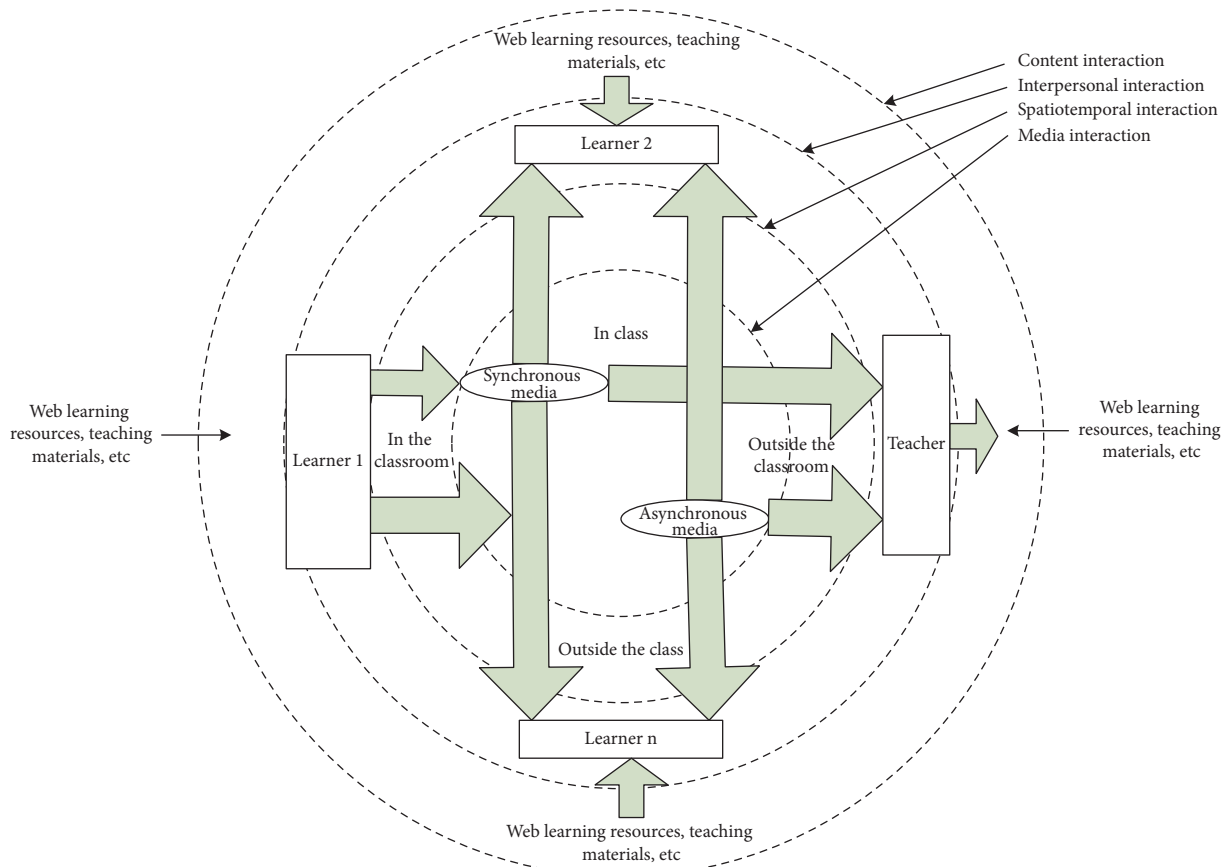


FIGURE 3: Interactive mechanism teaching mode.

not only learning support but also emotional support, so as to help students better overcome difficulties. This process can also enable teachers to grasp students' learning situation in time, find the shortcomings in the process of English teaching, and then adjust teaching strategies in time [25]. The college English teaching mode in the neural network environment is shown in Figure 5.

As can be seen from Figure 5, the essence of college English teaching mode is to introduce neural network into college English teaching, optimize the teaching process, and emphasize the combination of autonomous learning and classroom teaching. The teaching content includes listening, speaking, reading, writing, and translation, which can be organized separately or integrated. Students can get help,

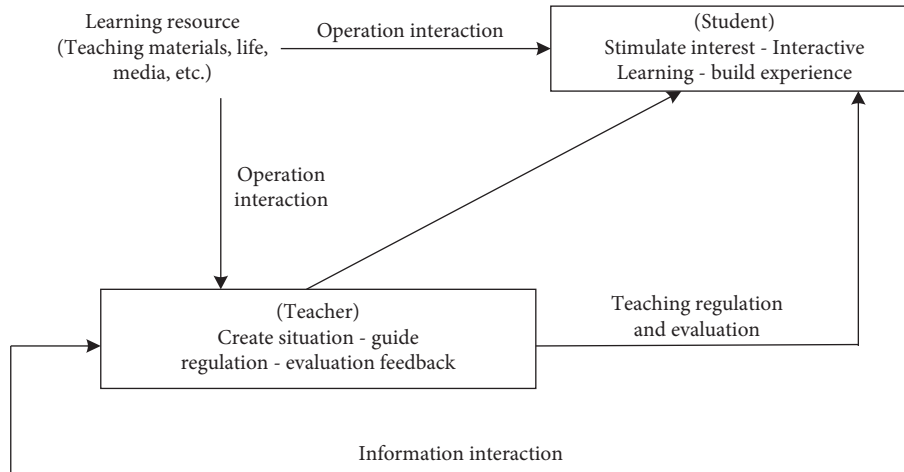


FIGURE 4: Interaction mode of college English teaching content.

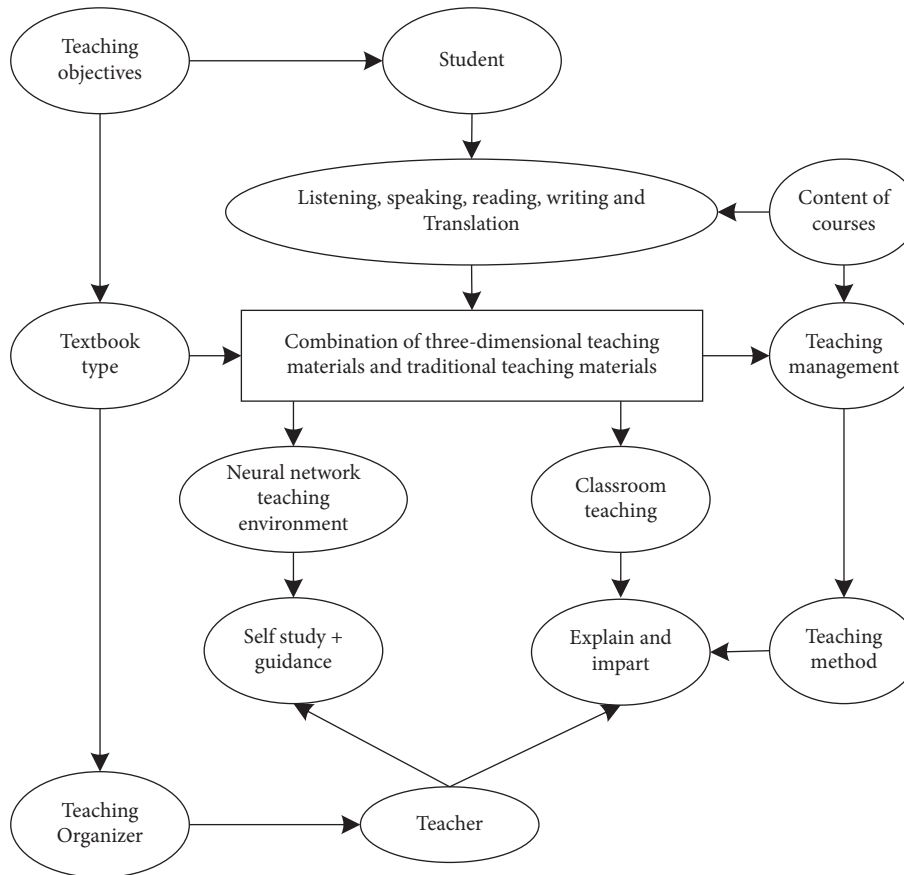


FIGURE 5: Schematic diagram of college English teaching mode under neural network environment.

encouragement, and criticism from their classmates in the process of learning, that is, student-student interaction. Let students test their learning effect through communication. Teacher-teacher interaction is the improvement of teaching resources, course content understanding, teaching methods, and so on. Through this form, teachers can clarify their own teaching level and professional skills, so as to selectively improve and better teach students English learning.

In the process of learning, the interaction mode of students is space-time interaction because they are not limited by time and space. In Figure 4, spatiotemporal interaction means that no matter where you are, you can complete information exchange with teachers in time. Teachers can use the current network to guide students to complete English learning. Under the time-space interaction, students can also flexibly arrange learning time and

complete teaching tasks according to the tasks assigned by teachers.

In the process of task completion, when students have problems that are difficult to solve, they can also seek the help of teachers through the current interactive mechanism to get teachers' suggestions, so as to improve learning efficiency. Therefore, in language teaching, teachers should make full use of the space-time interaction characteristics of the interaction mechanism, make full use of extracurricular time, and draw local materials according to the actual conditions so that students can consolidate their English knowledge at any time.

Media interaction is the necessary intermediary for the two-way interaction between teachers and students in the interaction mechanism. In the current Internet environment, the media interaction workers often used by people include WeChat, QQ, e-mail, and blog, which can become the media interaction forms used by teachers when teaching English. Teachers can use these media interactive tools to design interactive English teaching situations so that students can use various interactive tools to discuss each other. Teachers can also join the discussion team of students, provide students with new ideas, comment on students' views and problems, put forward their own opinions, and guide students to find a new direction. This form of media interaction has the advantages of low cost and real time. The media interaction process is shown in Figure 6.

In the media interaction mode shown in Figure 6, media interaction is divided into synchronous interaction and asynchronous interaction. Synchronous interaction is a time consistent interaction mode, such as classroom and simultaneous online chat. Asynchronous interaction is an interactive mode with inconsistent time, such as after-school homework.

3. Realize College English Teaching Evaluation Based on Neural Network

3.1. Determine the Performance Evaluation Indicators of College English Teaching. Based on the above research, the principles for determining college English teaching evaluation indicators are put forward, and the college English teaching performance evaluation indicators are determined, as shown in Table 1.

3.2. Calculate the Weight of English Teaching Performance Evaluation Indicators. According to the evaluation indexes designed above, after setting the index weight, the judgment matrix is established. It is assumed that the u evaluation index contains n items in total. If both item x and item y belong to n , the judgment matrix J_Z can be expressed as

$$J_Z = (a_{xy})_{n \times n}, \quad (3)$$

where a_{xy} represents the importance of different items, and the scale of judgment matrix is shown in Table 2.

According to the scale determined in Table 2, it can be determined that the pairwise comparison judgment matrix A has the properties of $a_{xy} > 0$, $a_{xy} = 1/a_{yx}$, $a_{xy} = 1$, etc. At

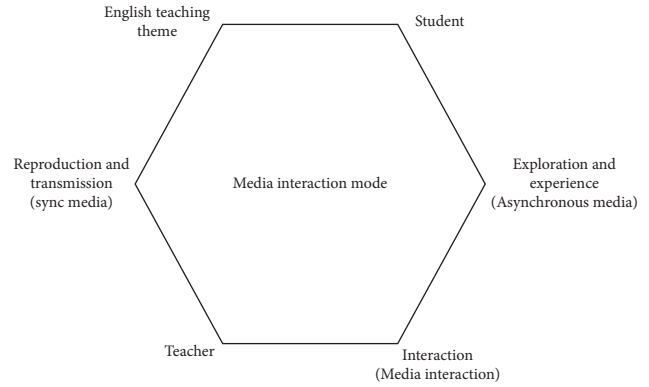


FIGURE 6: Media interaction mode.

this time, the weight of English teaching performance evaluation index can be calculated according to formula (4). That is, in the pairwise comparison judgment matrix J_Z , n elements are calculated through judgment; then,

$$W_i = \frac{1}{n} \sum_{j=1}^n \frac{a_{xy}}{\sum_{k=1}^n a_{kj}}, \quad i = 1, 2, \dots, n, \quad (4)$$

where W_i represents the weight vector of English teaching performance evaluation index and k is an element in the English teaching performance evaluation index u determined. Formula (4) is to normalize the elements in the pairwise comparison judgment matrix J_Z and add the normalized J_Z levels to obtain the added vector. At this time, divide this vector by the number of elements n of the evaluation index u to obtain the weight vector ω of the English teaching performance evaluation index. At this time, to get the weight vector, we also need to conduct consistency test to determine the objectivity of the weight calculation of the evaluation index and the accuracy of English teaching performance evaluation. Therefore, if the consistency index is C and the maximum eigenvalue of matrix J_Z is λ_{\max} , there are

$$C = \frac{\lambda_{\max} - n}{n - 1}. \quad (5)$$

At this time, in the calculated consistency index C , there is an average value R , that is, the average random consistency index R . The consistency of weight calculation results can be determined according to the data proportion C.R.; then,

$$\text{C.R.} = \frac{C}{R}. \quad (6)$$

According to the calculation result of equation (6), when $\text{C.R.} < 0.1$, matrix J_Z meets the consistency requirements. When $\text{C.R.} \geq 0.1$, matrix J_Z must modify the matrix value again and change the English teaching performance evaluation indicators determined in Table 1.

3.3. Evaluation of College English Teaching Performance. According to the index weight obtained from formula (4), the English teaching performance evaluation indexes determined in Table 1 are sorted according to the index weight

TABLE 1: Teaching performance evaluation indicators.

Primary index	Secondary index	Tertiary index	Standard
Classroom culture A	Teacher-student relationship A1	Listen to a11	Give students more opportunities to speak Promote, encourage, and appreciate students by asking questions and suggestions
		Support A12	
Interactive A22	Learning atmosphere A2	Organization A21	Reasonable arrangement of time
		Good interaction and cooperation	
Course structure B	Question B1	Assessment reflection B11	Arrange self-summarizing thinking activities Group report
		AC display B12	
	Question B2	Design scheme B22 Evaluation scheme B21	Make plans through communication and investigation Generate, compare, and evaluate schemes
Question B3	Ask questions B31	Design questions to stimulate students' interest	
	Defining question B32	Let students learn to judge problems	
Course content C	Project characteristics C1	Authenticity C11	It has practical significance Give students specific task requirements Learn to use a variety of new technologies to achieve their goals No restriction on students' task process
		Result clarity C12	
		Chimeric new technology C13	
Course content D	Organization association and application D1	Task ambiguity C14	The knowledge learned is applied in practice Acquisition degree of relevant knowledge after class
		Application D12	
		Knowledge understanding D13	
Creativity D22	Learning orientation D2	Cooperation D21	Cooperate in the form of study groups
		Follow the development of students' thinking and cultivate creativity	

TABLE 2: Proportional scale.

Element comparison	Meaning	Scale
Comparison of element x and element y	As important as	1
Comparison of element x and element y	Element x is more important	3
Comparison of element x and element y	Element x is obviously important	5
Comparison of element x and element y	Element y is very important	7
Comparison of element x and element y	Element y is particularly important	9
—	Judge the above adjacent intermediate values	2,4,6,8
When the importance ratio of element x to element y is a_{xy}	Element x and element y importance results $a_{xy} = 1/a_{yx}$	Reciprocal

level. At this time, the evaluation grade of English teaching performance evaluation index can be determined and the evaluation grading matrix H_e can be established:

$$H_e = \begin{bmatrix} h_{11} & h_{12} & \cdots & h_{1\theta} \\ \vdots & \cdots & \ddots & \vdots \\ h_{\theta 1} & h_{\theta 2} & \cdots & h_{\theta\theta} \end{bmatrix}, \quad (7)$$

where h represents the element level and θ represents the comment. At this time, set the English teaching performance evaluation index set as $u = \{u_1, u_2, \dots, u_j, \dots, u_n\}$, and according to the evaluation grading matrix H_e in formula (7), the determined English teaching performance evaluation index comment θ is

$$\theta = \{h_1, h_2, h_3, h_4, h_5\}, \quad (8)$$

where h_1 represents good, h_2 represents good, h_3 represents average, h_4 represents poor, and h_5 represents poor. According to formula (8), college English teaching performance can be evaluated. The evaluation index system is the basis of English teaching quality evaluation. A scientific and reasonable index system is a powerful guarantee to ensure the performance of college English teaching quality evaluation. At present, there are many principles in the index system of evaluating teaching quality, such as the index construction based on teaching content and the index construction based on students' achievement. For the evaluation of English teaching quality, a specific evaluation index system is constructed, and the structure is shown in Table 3.

The evaluation process of college English teaching based on neural network is as follows:

TABLE 3: Evaluation index system.

Project	Evaluation index system
Teacher quality	Clear educational objectives
	Solid professional knowledge
	Teaching and explanation level
Teaching attitude	Coaching patient and positive
	Serious teaching
	Rigorous attitude
Content of courses	The conceptual theory is accurate
	Full content
	Practice
	Depth of expertise
Teaching method	Good at inspiration
	Diverse ways
	Pay attention to personality
	Stimulate innovation consciousness
Teaching effectiveness	Improve learning interest
	Knowledge understanding and mastery
	Problem solving ability
	Comprehensive quality

Step 1: build an evaluation index system and collect relevant data of teaching quality evaluation

Step 2: standardize the data and generate the correlation coefficient matrix of the evaluation index

Step 3: based on the interactive mode of college English teaching content, the evaluation indexes of English teaching quality are selected to remove redundant indexes and realize feature dimensionality reduction

Step 4: use neural network to evaluate the teaching quality and output the evaluation results, so as to realize the college English teaching evaluation based on neural network

4. Experimental Analysis

In order to verify the effect of this study on the evaluation of college English teaching based on neural network, experimental analysis is carried out, and the methods of [6] and [7] are compared with the methods of this study, mainly comparing the English teaching effects of these three methods. Taking the freshmen of a school as the experimental object, 10 freshmen were randomly selected. The methods of this study and [6] and [7] were used for evaluation. During the experiment, the independent sample test method is used to require the compared subjects to be independent of each other, and there is no pairing relationship.

The English scores of 30 freshmen in the school before the implementation of the research and analysis and after the application of different methods are shown in Table 4:

It can be seen from Table 4 that, after the evaluation of college English teaching based on neural network, the students' English performance has been significantly improved compared with that before the evaluation. The students' scores have also improved by the methods of [6] and [7], but the improvement is not obvious. This method is

TABLE 4: Comparison of grades of senior one students.

Serial number	Prestudy results/scores	Paper method/scores	[6] method/scores	[7] method/scores
1	75	91	78	79
2	76	92	80	78
3	74	90	71	74
4	75	89	73	74
5	72	89	78	73
6	71	90	79	79
7	75	91	78	80
8	72	92	80	78
9	73	92	80	80
10	71	91	81	81

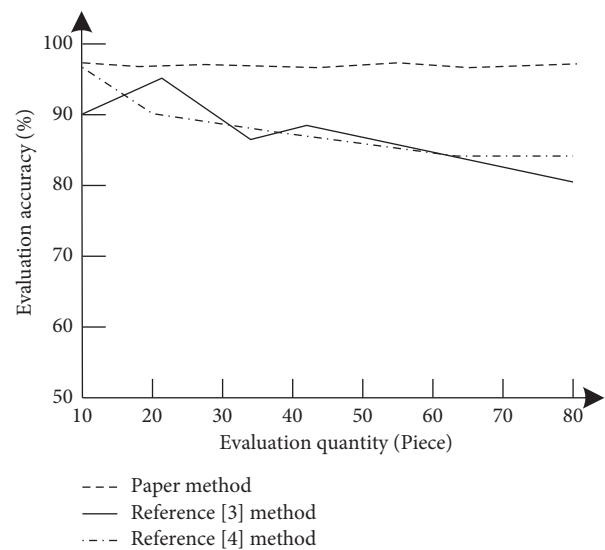


FIGURE 7: Evaluation accuracy curves of different methods.

used to evaluate the English teaching quality. The teaching quality evaluation accuracy of the test object data in the evaluation process is shown in Figure 7:

As can be seen from Figure 7, the simulation results of different models are also different. The method in this study has a good practical effect. The accuracy rate of college English teaching quality evaluation based on neural network is higher than 95%, and the evaluation accuracy rate of this method is always outperforms [6] and [7]. The test results show that, in the 80 test samples, the evaluation accuracy of [6] and [7] methods both show a downward trend to varying degrees, and the change trend of this method is relatively stable, indicating that the method has a higher performance approximate accuracy.

5. Conclusion

College English teaching quality evaluation is an important measure to improve teaching quality. This study constructs a college English teaching quality evaluation based on neural network. This method screens the evaluation indicators, determines the college English teaching performance evaluation indicators, and realizes the high accuracy evaluation

of college English teaching quality. The test results verify that the application of this method can improve students' English performance. The research content provides a new method for the evaluation of college English teaching quality.

The construction of college English teaching evaluation system needs to establish a humanized evaluation concept based on the emotional demands of teachers and students, pay attention to the sustainable development of evaluation objects and the process of pursuing progress, absorb diversified evaluation subjects such as students and teachers, and adopt formative evaluation, diagnostic evaluation, summary evaluation, qualitative evaluation, and quantitative evaluation. Diversified evaluation methods such as self-evaluation need to evaluate the evaluation objects such as teaching content, teaching methods, teaching means, teaching resources, and teaching attitude, so as to improve the level of English language knowledge and skills and non-English language knowledge and skills of the evaluation objects, improve the reliability and validity of college English teaching evaluation, and improve the quality of college English teaching. This can be further studied in the future.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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