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Research Article

Evaluation Method of English Innovative Thinking Teaching Effect Based on BP Algorithm

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Aiming at the problems of poor generalization ability, low evaluation accuracy, and correlation coefficient in evaluating the teaching effect of English innovative thinking, this paper puts forward the evaluation method of English innovative thinking teaching effect based on BP algorithm, confirms the evaluation indexes of English innovative thinking teaching effect on the basis of clarifying the evaluation principles, and uses conditional information entropy to screen a large number of evaluation indexes. Establish the evaluation of English innovative thinking teaching effect of BP algorithm and finally optimize the parameters of BP algorithm through differential evolution algorithm, so as to complete the evaluation of English innovative thinking teaching effect. The experimental results show that the proposed method can effectively improve the generalization ability, evaluation accuracy, and correlation coefficient.

1. Introduction

Personal innovation, innovation quality, and innovation ability have become the basic characteristics and inevitable requirements of talents in the new century [1]. Implementing national innovation, scientific innovation, and innovative education and cultivating students' innovative spirit, innovative consciousness, creative thinking, and innovative skills are not only an important task of quality education but also the entry point and breakthrough of innovative education [2, 3]. The outline of basic education curriculum reform clearly points out that curriculum reform should focus on improving people's qualities, cultivating students' innovative spirit and practical ability, and cultivating students' desire and ability for lifelong learning [4, 5]. Therefore, teachers should follow the principle of creativity in teaching, that is, not only to enable students to master certain basic English knowledge and form certain language application abilities, but also to cultivate students' observation, memory, thinking, imagination, and innovative spirit, and cultivate students' creative thinking ability [6, 7]. Under the new situation of basic education curriculum reform, what teachers should do to cultivate students' creative thinking ability is to establish a classroom teaching model, which can effectively combine the main role of students with the leading role of teachers, make things easier, and realize the effective innovative input of language. In essence, education is a kind of service behavior. Teaching quality is the index to evaluate the quality of educational behavior. The quality of teaching is related to the survival and development of education. Establishing a scientific and reliable teaching quality evaluation system [8, 9] plays a vital role in improving the teaching quality of innovative thinking.

Reference [10] improved RVM on the basis of feature extraction and empirical mode decomposition of acllmd method, and established classroom theoretical teaching quality evaluation model and experimental teaching quality evaluation model based on RVM algorithm. Reference [11] proposed an improved chicken swarm optimization algorithm, improved the rooster update equation and a new constraint processing mechanism, and applied it to teaching optimization. Reference [12] established a special evaluation organization to optimize the evaluation mechanism; strengthen the management of teaching quality evaluation process and improve the execution of evaluation; innovate the talent introduction mode and improve the quality of

existing managers; reconstruct the teaching evaluation system and scientific teaching evaluation standards; standardize the evaluation process and improve the reliability and validity of evaluation results; and comprehensively use the feedback results to give full play to its maximum utility. Reference [13] uses the method of educational production function. After controlling the characteristics of students, teachers, and schools, the difference between the predicted value of students' performance and the class average can be regarded as the net effect of teachers' teaching on students' academic development. The aggregate average of this residual value at the class level is the effect quantity of teachers' teaching quality. This method uses a multilayer linear model to predict students' performance based on the data collected by the research group in Hubei and Guangdong provinces. Combined with the decomposition technology of student achievement residual, this paper discusses the effect quantity difference in teaching quality of Chinese, mathematics, and English teachers.

In order to further improve the teaching effect of English innovative thinking and achieve the purpose of cultivating creative thinking consciousness and improving creative thinking ability, this paper uses BP algorithm to evaluate the teaching effect of English innovative thinking on the basis of screening the evaluation indexes of English innovative thinking teaching effect.

2. Select the Evaluation Index of English Innovative Thinking Teaching Effect

There are a large number of evaluation indexes in the evaluation system of English innovative thinking teaching effect, and each evaluation index has different degrees of importance. Among them, there are some indexes that have little impact on the evaluation results. For the evaluation of English innovative thinking teaching effect, these indexes have little significance, but these redundant indexes increase the workload of evaluation and affect the effect of evaluation [14, 15]. Therefore, it is necessary to select the more important indicators among the many evaluation indicators for recombination and build a more easy to follow-up calculation of English innovative thinking teaching effect evaluation index system.

2.1. Selection Principle of Evaluation Index. In order to ensure the rationality and objectivity of the evaluation of the teaching effect of English innovative thinking, the selection principles of the following indicators should be made clear at first:

2.1.1. Scientific Principle. The selection of evaluation indicators for the teaching effect of English innovative thinking should be combined with the reality of English teaching, in the form of field investigation or research, and it adopts the index election method to select the evaluation indicators, so as to reduce the difference of human subjective selection and ensure that the selected evaluation indicators can correspond to the teaching overview [16].

2.1.2. Principle of Integrity. The selection of evaluation indexes for the teaching effect of building English innovative thinking must be comprehensive and systematic. The established evaluation index system for the teaching effect of building English innovative thinking must reflect the overall situation of English innovative thinking teaching and have a substantive impact on the whole evaluation.

2.1.3. Independence Principle. The comprehensive and systematic construction of English innovative thinking teaching effect evaluation indicators can truly reflect the overall situation of English innovative thinking teaching, reduce the great difficulty brought by redundant and complex information to the evaluation work [17, 18], control the overlap and lack of English innovative thinking teaching effect evaluation indicators, and establish independent and interrelated index individuals. Therefore, in the primary selection of the evaluation index of English innovative thinking teaching effect, if there are problems of overlapping and missing indicators, it is necessary to optimize and improve the evaluation index system of English innovative thinking teaching effect.

2.1.4. Principle of Operability. According to the current situation of specific English innovative thinking teaching, combined with the theoretical knowledge and construction experience of relevant research scholars, analyze the indicators in the form of questionnaire survey, quantify the qualitative evaluation indicators with scientific methods, and discuss the quantified evaluation indicators, so as to further optimize the index evaluation system.

2.1.5. Principle of Combining Dynamic and Static. Dynamic and static are two interrelated and independent characteristics. Combined with the above characteristics, it is constructed as the spatio-temporal coupling principle to ensure that the quality evaluation index system can carry out more real quality analysis and pingaji in the face of dynamic data and static information, and further measure the quality evolution trend of English innovative thinking teaching in different stages. Therefore, it is required that the designed index system should not only give comprehensive consideration of the time series but also evaluate and judge the effect level of English innovative thinking teaching from the spatial series.

2.1.6. Principle of Comparability and Pertinence. The quality evaluation index system is designed to provide targeted data for the evaluation work through the comparison of English innovative thinking teaching progress and quality in different directions.

2.2. Establish the Evaluation Index of English Innovative Thinking Teaching Effect. According to the index selection criteria and relevant literature at home and abroad, this paper establishes an evaluation team. Combined with the teaching objectives of English innovative thinking, the evaluation index system of English innovative thinking teaching effect preliminarily determined by the team members is shown in Table 1. It includes that under this teaching mode,

Table 1: Preliminary draft of evaluation indicators.

Primary index	Secondary index	
Content	Serial number	Content
Virtue	1	Political literacy
	2	Moral character
Ability	3	Professional skills
	4	Organization skills
	5	Executive ability
	6	Learning ability
	7	Innovation ability
Diligent	8	Working attitude
	9	Service consciousness
	10	Responsibility
Achievement	11	Number of teaching tasks completed
	12	Work quality
	13	Benefit
	14	Work difficulty
	15	Academic achievements
Cheap	16	Observe discipline and law
	17	Integrity and self-discipline

students should have five qualities: morality, ability, diligence, performance, and honesty.

Based on Table 1, the evaluation indexes of the teaching effect of English innovative thinking are preliminarily determined. In order to further optimize the evaluation effect and improve its evaluation accuracy, the evaluation indexes are screened by the method of information entropy [19, 20].

2.3. Screening the Evaluation Indicators of English Innovative Thinking Teaching Effect. The information entropy method can eliminate the redundant information in the evaluation index of English innovative thinking teaching effect in Table 1 and improve the accuracy of the evaluation index. Therefore, this paper combines this method to screen the evaluation index of English innovative thinking teaching effect.

Let G and J represent the conditional attribute set and decision attribute set, G and J the division on the universe U are represented by P and Q, and $P = U/ind(G)$ and $Q = U/ind(J)$, then the following probability distribution is composed of G and J on the subset of U:

$$P_\alpha = \begin{bmatrix} P_1 & P_2 & \cdots & P_n \\ p(P_1) & p(P_2) & \cdots & p(P_n) \end{bmatrix}, \quad P_\beta = \begin{bmatrix} Q_1 & Q_2 & \cdots & Q_n \\ p(Q_1) & p(Q_2) & \cdots & p(Q_n) \end{bmatrix}, \tag{1}$$

where $p(\cdot)$ represents the probability of occurrence of elements, and $p(P_i)$ and $p(Q_j)$ are the cardinal numbers of geometry. According to the above conditions, the information entropy $H(G)$ of G is calculated as follows:

$$H(G) = \lg\left(p\left(P_\beta\right)\right)\sum_{i=1}^{n} p(P_\alpha). \tag{2}$$

Calculate J relative to G and conditional entropy $H(J|G)$ in combination with formula (2).

According to the above information, the evaluation indexes of English innovative thinking teaching effects are selected. $S = (s_1, s_2, \cdots s_n)$ represents n evaluation indexes of English innovative thinking teaching effect to be screened, $K = (k_1, k_2, \cdots k_m)$ represents m evaluation condition attribute index vectors [21, 22], and $K(S) = (k_1(S), k_2(S), \cdots, k_m(S))$ represents the total target set of English innovative thinking teaching effect evaluation. In function $K(S)$, each conditional attribute index has different effects on the evaluation of English innovative thinking teaching effect. For the attribute evaluation index of decreasing function, the higher the attribute value, the worse the corresponding evaluation result [23, 24]. Therefore, the conditional attribute index is divided into l increasing function K_+ and $m - l$ decreasing function K_- for calculation:

$$\begin{cases} K_+ = k_1(s), k_2(s), \cdots, k_l(s) \\ K_- = k_{l+1}(s), k_{l+2}(s), \cdots, k_{m-l}(s) \end{cases}. \tag{3}$$

Since different conditional attributes will have different effects on the evaluation results of English innovative thinking teaching effect, it is necessary to give different weights W and $W = W_1, W_2, \cdots, W_m$ to the conditional attributes. W_i represents the weight of the i-th attribute and w_i represents the weight of the i-th attribute. The relationship between $W_i > 0$, $\sum_{i=1}^{m} W_i = 1$, W_i, and w_i is as follows:

$$W_i = \sum_{i=1}^{m} w_i. \tag{4}$$

Under the constraint of relative advantages and disadvantages, the least ideal points of each conditional attribute are filtered [25], and the unsatisfactory set $\widehat{K}$ is obtained as follows:

$$\widehat{K} = \left(k_1^-, k_2^-, \cdots, k_{l+1}^+, k_{l+2}^+, \cdots, k_m^+\right). \tag{5}$$

Use the filtered condition attributes to build a new relative advantage and disadvantage matrix V, the elements in V are represented by v_{ij}, and the definition of V is as follows:

$$V = \left(v_{ij}\right)_{m\cdot n} = \left(F_i\left(s_j\right)\right)_{m\cdot n}. \tag{6}$$

$D(s_j)$ is used to represent the weight set comprehensively considered for all evaluation indexes, $D(s_j) = (W_1(1 - v_{1j}), W_2(1 - v_{2j}), \cdots, W_m(1 - v_{mj}))$, and the L2 norm value $d(s_j)$ is used to describe the advantages and disadvantages of the evaluation indexes of English innovative thinking teaching

effect [26, 27]. The calculation method of $d(s_j)$ is as follows:

$$d(s_j) = \sum_{i=1}^{m} W_i^2 (1 - v_{ij})^2. \quad (7)$$

In the above formula, the larger $d(s_j)$ is, the better the corresponding evaluation index is. The evaluation indexes are arranged in order according to the value of $d(s_j)$.

In order to further verify the effectiveness of screening indicators, the following aspects are analyzed:

2.3.1. Research on Index Reliability. Expert authority [28]: described by the authority coefficient C_r, the authority mainly depends on the expert's evaluation basis C_a for the index and the degree of familiarity C_s with the index. The calculation formula is as follows:

$$C_r = \frac{C_a + C_s}{2}. \quad (8)$$

The value of authority coefficient is usually in the range of 0~0.95. The higher the value is, the higher the credibility of expert opinion is, the corresponding index is reliable, and $C_r \geq 0.7$ represents the acceptable credibility.

2.3.2. Research on the Correlation of Indicators. Relevance [29, 30] mainly evaluates the concentration, dispersion, and coordination of expert opinions.

Concentration: it is described by the average M_j of the index importance assignment. The higher the value, the higher the opinion concentration. The calculation formula is as follows:

$$M_j = \frac{1}{m_j} \sum_{i=1}^{m_j} C_{ij}. \quad (9)$$

In the formula, M_j represents the average value of the index j, m_j describes the number of experts participating in the evaluation, and C_{ij} is the evaluation result of expert i on index j.

Discreteness [31]: expressed by standard deviation σ_j, the calculation formula is as follows:

$$\sigma_j = \sqrt{\frac{1}{m_j - 1} \sum_{i=1}^{m_j} (C_{ij} - M_j)^2}. \quad (10)$$

Coordination: it can reflect whether experts have great differences on the evaluation results of various indicators. The variation coefficient V_j and the coordination coefficient are usually used for calculation. The calculation formula of V_j is as follows:

$$V_j = \frac{\sigma_j}{M_j}. \quad (11)$$

The coordination coefficient can show whether the evaluation opinions of all m experts on n indicators are consistent. The value range of this value is $[0, 1]$. The larger the value, the better the coordination. The calculation formula is:

$$W = \frac{m^2 (n^3 - n)}{m \sum_{i=1}^{m} T_i} \sum_{j=1}^{n} S_j^2. \quad (12)$$

In the formula, L represents the quantity of the same grade in the evaluation results of all experts, and S_j is the difference between the grade of index j and the sum of all index grades.

Combined with expert opinions, use the above calculation formula and statistical software to obtain whether the primary index is reasonable. The analysis results of primary indicators are shown in Table 2.

If the judgment index can be used, it needs to combine two factors: the mean value > 3.0 and the coefficient of variation < 0.25. It can be seen from Table 2 that the average value of all primary indicators is higher than 3.0, indicating that the opinions given by experts are relatively concentrated, and the coefficient of variation is lower than 0.25, indicating that the coordination is very good. It can be inferred that the five first level evaluation indicators are more reasonable and can be used in the teaching effect of English innovative thinking. Use the same method to judge the secondary indicators, and the results are shown in Table 3.

It can be seen from Table 3 that among the 17 secondary indicators, only the average value of work difficulty and academic achievement is lower than 3.0, and the expert opinions of other indicators are highly concentrated and well coordinated. Therefore, remove the above two indicators and take the remaining indicators as the indicators of the effect of this English innovative thinking teaching. Combined with the actual needs, select an appropriate number of evaluation indicators to establish the follow-up evaluation.

3. Evaluation of Teaching Effect of Establishing English Innovative Thinking

Combined with the selected evaluation indicators, BP algorithm is used to construct the evaluation of English innovative thinking teaching effect [32, 33]. When the parameter optimization of BP algorithm is actually a training sample, it constantly updates and optimizes the dynamic weight, radial basis function center, and expansion constant to obtain the process that meets the nonlinear approximation conditions [34–35]. Therefore, using BP algorithm to design the teaching effect evaluation of English innovative thinking needs to set the initial weight, radial basis function center, and expansion constant in advance to meet the requirements within the framework. In the evaluation method of English innovative thinking teaching effect based on BP algorithm, differential evolution algorithm is introduced to obtain the optimal parameters of BP algorithm.

The structure of BP algorithm is shown in Figure 1:

Table 2: Analysis of primary indicators.

Serial number	Index	Mean value	Standard deviation	Coefficient of variation	Coordination coefficient
1	Virtue	3.13	0.43	0.05	
2	Ability	4.23	0.31	0.02	
3	Diligent	4.72	0.35	0.09	0.68
4	Achievement	4.95	0.22	0.10	
5	Cheap	3.15	0.36	0.04	

Table 3: Analysis of rationality of secondary indicators.

Serial number	Index	Standard deviation	Coefficient of variation	Coordination coefficient
1	Political literacy	4.02	0.34	0.02
2	Moral character	3.94	0.32	0.01
3	Professional skills	3.01	0.19	0.10
4	Organization skills	3.75	0.36	0.11
5	Executive ability	3.38	0.38	0.13
6	Learning ability	3.99	0.34	0.16
7	Innovation ability	4.08	0.24	0.06
8	Working attitude	3.93	0.26	0.08
9	Service consciousness	3.31	0.28	0.03
10	Responsibility	3.38	0.30	0.04
11	Number of teaching tasks completed	2.99	0.25	0.15
12	Work quality	3.04	0.38	0.17
13	Benefit	3.16	0.41	0.10
14	Work difficulty	2.53	0.32	0.13
15	Academic achievements	1.35	0.24	0.15
16	Observe discipline and law	3.98	0.26	0.06
17	Integrity and self-discipline	4.04	0.41	0.01

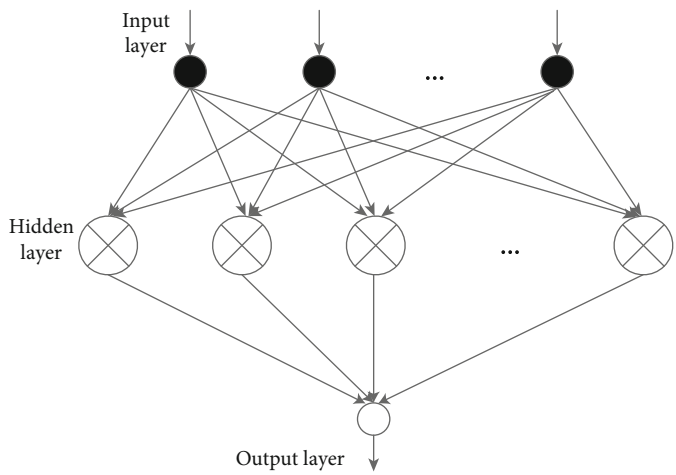

Figure 1: Structure of BP algorithm.

There are a static weight and a dynamic weight between the input layer and the hidden layer, and there is a radial basis function in the hidden layer. a represents the input sample data, c_i represents the center of the radial basis function, $i = 1, 2, \cdots, n$ and $\|a - c_i\|^2$ represent the L2 norm of $a - c_i$, ξ represents the expansion constant of the radial basis function, and the value of ξ is inversely proportional to the selectivity of the radial basis function. The calculation method of the radial basis function is as follows:

$$RBF(a) = \exp\left(-\frac{\|a - c_i\|^2}{2\xi^2}\right) \tag{13}$$

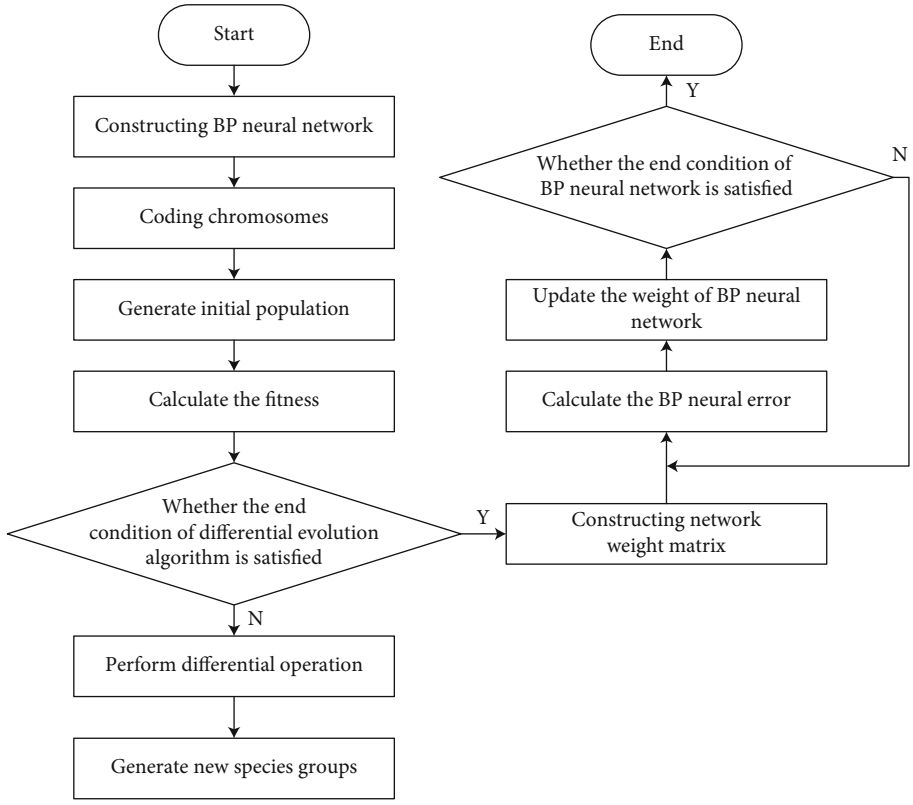

Figure 2: Flow chart of differential evolution algorithm BP algorithm.

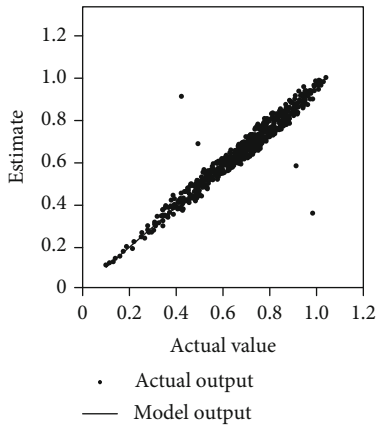

Figure 3: Correlation curve between actual output and output of the proposed method.

Set the weight of the hidden layer output as w_{ij}, combined with the weight of BP algorithm and formula (13), and establish the English innovative thinking teaching effect evaluation f_{RBF} as follows:

$$f_{RBF} = \sum_{i=1}^{h} w_{ij} \exp\left(-\frac{\|a - c_i\|^2}{2\xi^2}\right). \tag{14}$$

Differential evolution algorithm generates population individuals by using floating-point vector coding. In the process of differential evolution algorithm optimization, firstly, two individuals are selected from the parent individuals to generate the difference vector; secondly, another individual is selected to sum with the difference vector to generate the experimental individual; then, the parent individual and the corresponding experimental individual are cross operated to generate new offspring individuals; save the operation between the individual and the next generation to meet the requirements of the last generation. Combining this algorithm with BP algorithm, it can better realize parameter optimization. Therefore, differential evolution algorithm is introduced into BP algorithm to select the optimal parameters through selection, crossover, and mutation operations. The floating-point chromosome coding method eliminates the need for decoding and coding for subsequent selection, crossover, and mutation operations, and reduces the computational complexity of the convergence process.

During the implementation of BP algorithm, the fitness function H is constructed based on the output expected value and the reciprocal of the mean square deviation of all individuals in the population. Let the i output expected value and the output actual value be E_i and Y_i, respectively, and the total number of chromosomes is J. The smaller the gap between Y_i and E_i, the better the corresponding chromosome is. The expression of H is as follows:

$$H = \sum_{i=1}^{J} (E_i - Y_i)^2. \tag{15}$$

The fitness value of all chromosomes can be obtained

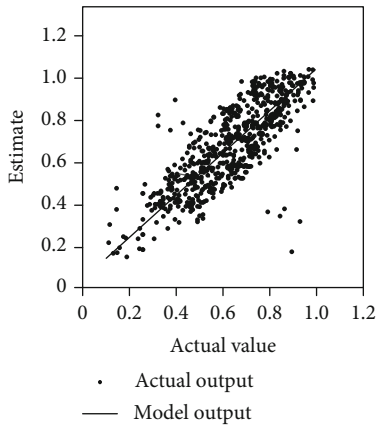

Figure 4: Correlation curve between actual output and output of the method in reference [10].

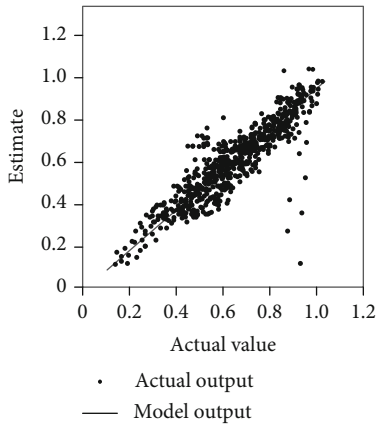

Figure 5: Correlation curve between actual output and output of the method in reference [11].

through formula (14). Let the overall fitness value of all chromosomes be $\dot{H}$, the fitness value of chromosome d be H_d, and the probability of d being selected be $P(d) = H_d/\dot{H}$. In order to avoid falling into the local optimal solution, some chromosomes with small fitness are retained in the subsequent calculation.

Crossover operation is mainly to increase the diversity of the population, exchange some genes encoded by chromosomes according to certain rules, and get two new chromosomes. Suppose that the maximum fitness of a chromosome to be crossed in the parent population is $H_{\max}$, the mean fitness of chromosome is $\bar{H}$, the minimum and maximum values of crossover probability are set as $P_{c\,\min}$ and $P_{c\,\max}$, respectively, in advance, and the current number of iterations and the maximum number of iterations are $iter$ and $iter_{\max}$, respectively. The set value of crossover probability P_c is obtained as follows:

$$P_c = \begin{cases} P_{c\,\max} - \dfrac{P_{c\,\max} - P_{c\,\min}}{iter_{\max}} \times iter, H_{\max} \geq \bar{H} \\ P_{c\,\max}, H_{\max} < \bar{H} \end{cases}. \quad (16)$$

In mutation operation, high mutation probability is conducive to large-scale optimization, but high mutation probability has an adverse impact on chromosomes with large fitness value, while low mutation probability is conducive to retaining high-quality chromosomes. Let the minimum and maximum values of mutation probability set in advance be $P_{m\,\min}$ and $P_{m\,\max}$, respectively, and the mean value of chromosome fitness to be mutated in the parent population is $\bar{H}'$. The set value of mutation probability P_m is as follows:

$$P_m = \begin{cases} P_{m\,\max} - \dfrac{P_{m\,\max} - P_{m\,\min}}{iter_{\max}} \times iter, H \geq \bar{H}' \\ P_{m\,\max}, H < \bar{H}' \end{cases}. \quad (17)$$

In the process of differential evolution algorithm, formula (16) is used to dynamically adjust the mutation probability to improve the optimization ability of differential evolution algorithm.

The BP algorithm is optimized by differential evolution algorithm, and the optimal parameters are selected to complete the evaluation design of English innovative thinking teaching effect based on BP algorithm. The specific process is shown in Figure 2:

4. Experiment and Results

In order to verify the overall effectiveness of the evaluation method of English innovative thinking teaching effect based on BP algorithm, it is necessary to test the evaluation method of English innovative thinking teaching effect based on BP algorithm.

4.1. Experimental Preparation. Each of the 4000 College English teaching evaluation data sets is divided into three groups as the original evaluation data set. The teaching effect of English innovative thinking is evaluated by the proposed method, reference [10] method, and reference [11] method, respectively.

4.2. Result Analysis. Establish the actual output and output correlation curves of the three methods and test the generalization ability of the three methods. The stronger the generalization ability, the more suitable the corresponding methods are for actual calculation. The corresponding curves of the three methods are shown in Figures 3–5:

Analyze the correlation curves between the actual output and output in Figures 3–5. In Figure 3, the actual output values of the proposed method fluctuate around the output line and are closely spaced, and only four data points are separated from the output line, indicating that the actual output of the proposed method meets the expectation, has good generalization ability, and is relatively stable; in Figure 4, although the actual output value of the method in reference [10] also fluctuates around the output, it is far away from the output line, the distribution is relatively scattered, the volatility is also large, and there are many separated data, indicating that the generalization ability of the method in reference [10] is poor and the stability is not strong; in Figure 5, the method in reference [11] is slightly

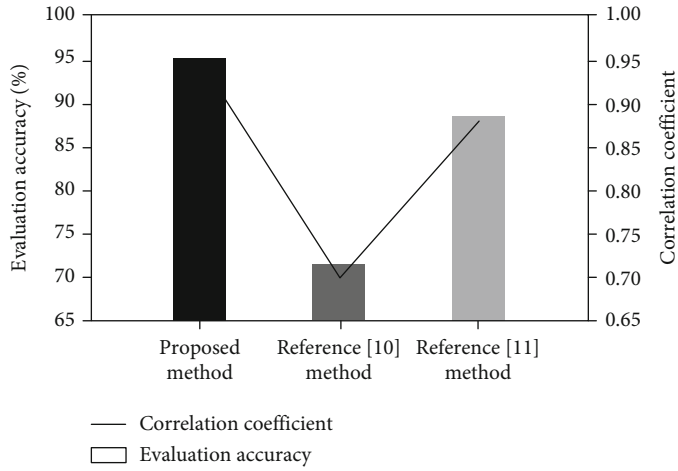

Figure 6: Evaluation capability test results.

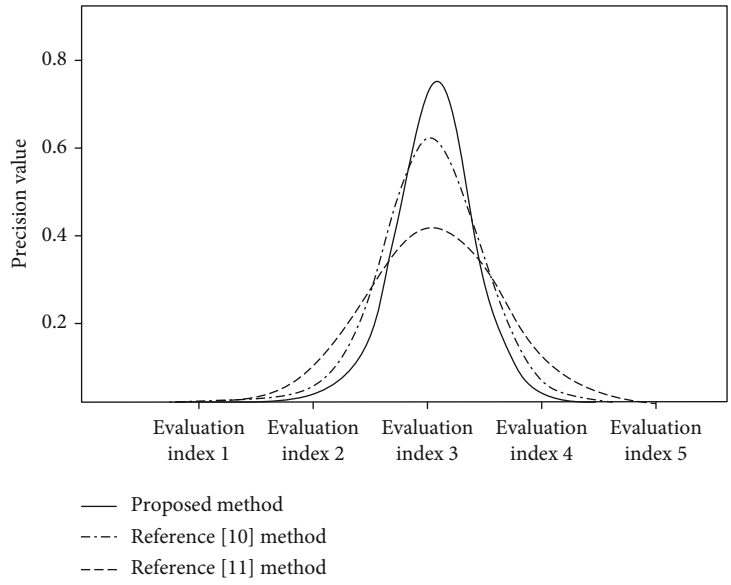

Figure 7: Accuracy values calculated by three evaluation methods.

stronger than the method in reference [10], and the actual output numerical output line is relatively close, but it is still inferior to the proposed method. The points separated from the line are less than the method in reference [10], but it is still significantly more than the proposed method. Therefore, it can be seen that the proposed method has the strongest generalization ability, followed by the method in reference [11] and the method in reference [10]. Because the proposed method arranges a large number of evaluation indexes of English innovative thinking teaching effect and uses conditional information entropy to select, so as to remove the redundant indexes with minimal influence and improve the generalization ability of English.

In order to further verify the ability of the proposed method, reference [10] method, and reference [11] method to evaluate the teaching effect of English innovative thinking, the evaluation accuracy, and correlation coefficient are selected as experimental test indicators to evaluate the proposed method, reference [10] method, and reference [11] method. The greater the evaluation accuracy and correlation coefficient, the more accurate the evaluation result of the corresponding method on the teaching effect of English innovative thinking. The calculated experimental results are shown in Figure 6:

As can be seen from Figure 6, the rating accuracy of the proposed method is significantly higher than that of the methods in reference [10] and reference [11], reaching more than 95%, while that of the method in reference [10] is about 70%, and that of the method in reference [11] is higher than that of the method in reference [10], which is about 88%, but still lower than that of the proposed method; the correlation coefficient of the proposed method is also higher than that of reference [10] and reference [11], which shows that the proposed method has better evaluation ability and is more suitable for the actual evaluation of English innovative thinking teaching effect. The main reason is that the proposed

method uses conditional information entropy to screen a large number of evaluation indicators for English innovative thinking teaching, which improves the evaluation effect.

Call the index parameters of the above assignment processing and use the associated Legendre function to construct the evaluation accuracy of the evaluation method. The accuracy value can be expressed as:

$$\begin{cases} \chi_n = \dfrac{\cos tP_i}{d} \\ \tau_n = \dfrac{\chi_n}{\alpha} \end{cases}, \tag{18}$$

where P_i represents the associated Legendre function, χ_n represents the infinite order function, $\cos t$ represents the orthogonal curve, d represents the class II parameters of the index, α represents the dimensional scale parameters, and τ_n represents the value of evaluation accuracy. According to the accuracy numerical relationship of the above structure, sort out the calculated values. The evaluation accuracy results of the three evaluation methods are shown in Figure 7:

Corresponding to the precision value relationship calculated in Figure 7, the closer the known defined precision value is to 1, the better the precision of this evaluation method. According to the accuracy numerical results shown in Figure 7, the accuracy value in document [11] is 0.4, and the accuracy of the evaluation result is the worst. The accuracy value calculated by the method in reference [10] is 0.6, and the accuracy of the evaluation result is better. The precision calculated by the designed evaluation method is 0.8. Compared with the two selected comparison methods, the designed evaluation method has the best accuracy.

5. Conclusion

Teaching evaluation is an important part of English classroom teaching and the guarantee of effective classroom teaching. Therefore, we should constantly improve classroom teaching evaluation and carry out scientific evaluation from multiple angles and in an all-round way. This can not only enable students to clarify their shortcomings in learning and correct them but also promote the all-round development of students. First of all, teachers' evaluation, students' evaluation, and self-evaluation are organically combined to make the evaluation subject more diversified. Secondly, the evaluation content should include the evaluation of the learning process, learning methods, and learning attitude, rather than just the evaluation of learning results, so as to make the evaluation content more comprehensive. Therefore, this paper puts forward the evaluation method of English innovative thinking teaching effect based on BP algorithm, selects the appropriate evaluation index and establishes the evaluation model of the BP algorithm, optimizes the parameters through differential evolution algorithm, and completes the evaluation of English innovative thinking teaching effect. This method can effectively enhance the generalization ability, improve the evaluation accuracy and correlation coefficient, and provide guarantee for the improvement and development of English innovative thinking teaching effect.

Data Availability

The author can provide all the original data involved in the research.

Conflicts of Interest

The author indicates that there was no conflict of interest in the study.

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