Research Article

Classification of English Translation Teaching Models based on Multiple Intelligence Theory

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In order to improve the quality of English translation teaching, this paper combines the theory of multiple intelligence to classify the English translation teaching process. Moreover, this paper adopts Fisher’s discriminant method and Bayesian discriminant method to classify the English translation teaching samples. In order to improve the discrimination accuracy of the extreme learning machine algorithm, this paper applies the particle swarm optimization extreme learning machine algorithm to the research on the classification of English translation teaching samples and proposes an intelligent English classification teaching model based on the actual situation of English translation teaching. In addition, this paper verifies the system model proposed in this paper by evaluating the teaching method. The research shows that the classification model of English translation teaching mode based on the theory of multiple intelligence proposed in this paper has a certain effect, which can promote the effect of English translation teaching.

1. Introduction

Classified teaching mode, in short, is to classify students at different levels according to certain standards and then carry out appropriate teaching work for them. The construction of the layered teaching model is to design teaching objectives with different requirements based on the individual differences of students so as to ensure that students at different levels can learn and gain something in learning, and then cultivate students’ learning autonomy. For the classification teaching mode, there is still no generally accepted definition in the academic circles. Some scholars pointed out that Marxist philosophy advocates the concept of harmonious development of human beings, which is the philosophical basis of the classification teaching theory [1]. This theory proposes that people of all kinds are cells in a society, and these cells together make up the society as a whole. Moreover, the functions of each cell are different, and only cells that can cooperate closely, perform their own duties, and work together can promote the development of society. The pedagogical basis of classified teaching is as follows: pedagogy clearly requires that the teaching process must follow the principles of teaching students in accordance with their aptitude and acceptability. At the same time, it requires that teachers’ teaching must proceed from the actual situation and personality differences of students so that the potential of students can be developed and their own potential can be developed, thus reflecting the fairness of education [2]. This teaching mode enables students to communicate and learn with students at the same level in hierarchical teaching activities. At the same time, they can also communicate with students at different levels so as to communicate with each other and improve the level of the learning collective.

The scientific and reasonable classification of students is the basis of classification teaching. At present, in colleges and universities, there is a relatively general classification method for English teaching. After entering the school, freshmen need to take a thorough examination. In this exam, all students will be tested in listening, speaking, reading, and writing. After the test, students are divided into two or three grades through the processing of test scores, college entrance examination scores, and other grades, and then these students enter the corresponding grades of college English
courses according to their own grades. This grading method is still a relatively simple and extensive method, which can only classify students in general [3]. However, it is also necessary to subdivide into each class and grading. As teachers, they can observe and investigate the students in the class, and conduct assessments based on their abilities, so as to leave a certain impression of each student’s English level and ability in their minds, and make a simple classification in their minds [4]. For example, one group of students has good oral English, another group of students has strong reading ability, and some other students have strong writing ability. Although these basic conditions do not need to be as detailed as school grading, in the minds of teachers, such red lines are still necessary.

After classifying the students, the most important thing is to “Teach students according to their aptitude,” and carry out different teaching methods for different categories of students. Since English teaching activities have basically been refined into classes, classified teaching should also be carried out in units of classes [5]. Universities have roughly divided the students of the same level into grades and entered the corresponding classes. The key to teaching development is to carry out classified teaching in the class. This kind of classified teaching can be carried out according to the students’ academic ability, or according to the students’ attitude and character [6]. For example, for some students with strong English listening and speaking ability, they can recommend some English music and videos to help them consolidate their ability, and at the same time, recommend some English extensive reading textbooks to stimulate their own interest in English reading [7]. For some students with relatively poor foundation and strong test-taking ability, it is important to help them develop their sense of English language and interest in English. In the classroom, they can be provided with more opportunities to read aloud and have conversations. Some multimedia English teaching contents are recommended to train their speaking and dialogue abilities. In the whole class, we must discover the ability of each student, and at the same time, let it influence others and help others, in order to form a low level of the class and improve the overall level [8].

Classified teaching respects students’ character and learning ability; however, the development of teaching evaluation poses a difficult problem for teachers. Scientific and reasonable evaluation will help promote the continuous development of classified teaching. In the process of evaluation, teachers not only need the final grades of each semester to be included in the final grades but also need to pass classroom observations. Knowing whether each student has improved above their own level in each semester, this part should be scientifically and reasonably included in the final grade, and it is best to reflect it in the grade so as to make the existence of classification teaching mode and confirm its importance. [9]. In addition, between classes, it is also possible to imitate the competition system of the football league and implement the mode of “upgrade” or “demotion.” According to the standard, for the ranking of students’ performance, the top 10% of the students can be promoted to study; on the contrary, if the ranking is lower, there is still the possibility of demotion. This method can make the students maintain the enthusiasm of learning, motivate some students who are studying hard, and stimulate the learning enthusiasm of the students who are not highly motivated in the class [10].

Literature [11] proposed that the so-called classification teaching is a method in which teachers divide the teaching content into different types according to the individual differences of students, and let students choose learning according to their own hobbies. All students need to complete the same English sports intensity and sports items, and there are differences between different students. Due to individual differences, if teachers do not consider the differences of students, it will inevitably affect the teaching effect [12].

Classified teaching is divided into different levels according to the differences of students’ abilities. For this, reasonable grouping is very important. As an English teacher, it is necessary to deeply understand the students’ learning situation, formulate different projects according to the students’ learning level, and then let the students choose projects according to their hobbies [13]. For example, in the sport of “long-distance running,” before teaching, teachers can conduct a comprehensive assessment of students’ physical fitness and then divide the students into several groups. For students with poor physical function, the number of laps in long-distance running can be appropriately reduced. This kind of group teaching takes into account the differences in students’ abilities, which can keep them in a good learning attitude towards English [14].

Before starting English teaching, it is very important to clarify the teaching objectives. In the past, teachers did not consider students’ abilities when setting teaching goals. In this case, many students could not meet the teaching requirements, especially those with poor English ability [15]. When applying the classification teaching mode, teachers can formulate different teaching goals so that students can complete the corresponding goals according to their own abilities.

Questioning is a teaching method commonly used by teachers in classroom teaching. It converts knowledge into questions and allows students to think with questions so as to explore the answer to the question. In this process, students’ thinking, ability, and quality will be improved deeply [16]. For students with weak English ability, teachers can use simple and clear questioning methods to let students use their brains and think about problems; for students with strong English ability, they can design coherent questions to better develop students’ thinking and encourage students to think ability enhancement.

Teaching evaluation is an indispensable part of the whole teaching activity. Effective teaching evaluation is conducive to optimizing teaching, enhancing students' self-confidence, and stimulating students’ learning initiative and enthusiasm. College students are more sensitive because of their age, and many teachers always compare students with students in the teaching process, which will dampen students’ self-esteem to a certain extent [17]. Therefore, in teaching evaluation,
2. Multivariate Statistics and Intelligent Algorithms

2.1. The Solution Method of Discriminant Analysis. Fisher’s discriminant method relies on the principle of narrowing the gap within a group as much as possible and expanding the gap between groups to establish a discriminant function. It uses the idea of variance analysis and projection to assign different types of sets at distant scattered points, thereby minimizing the overall difference of each sample point. Its discriminant function is constructed as follows:

\[ y = c_1x_1 + c_2x_2 + \cdots + c_mx_m = A'X. \] (1)

Among them, the coefficient \( A_{mx1} = (a_1, a_2, \ldots, a_m)' \) is to minimize the gap within each group and maximize the gap between each group. After establishing the discriminant function, the \( m \) variable values of the unknown samples are substituted into the discriminant function to obtain the \( Y \) value, and the calculated critical values of the discriminant function are compared, and finally, the unknown samples are discriminated and classified.

We have two sample sets \( N_1, N_2 \), and \( n_1, n_2 \) samples are randomly selected from these two sample sets to make \( n_1 + n_2 = n \), and substitute \( n \) samples into the Fisher discriminant function:

\[ y_i = c_1x_{i1} + c_2x_{i2} + \cdots + c_mx_{im}, \quad i = 1, 2, \ldots, n. \] (2)

By taking the mean separately, we get

\[ \bar{y}_a = \frac{1}{n_1} \sum_{i=1}^{n_1} c_i x_{ia}, \]
\[ \bar{y}_b = \frac{1}{n_2} \sum_{i=n_1+1}^{n} c_i x_{ib}. \] (3)

The value of the coefficient \( c_1, c_2, \ldots, c_m \) in the formula should satisfy as follows: the samples within the group should be as close as possible, and the samples between the groups should be as scattered as possible, so the construction statistic is

\[ I(c_1, c_2, \ldots, c_m) = \frac{(\bar{y}_a - \bar{y}_b)^2}{\sum_{i=1}^{n_1} (\bar{y}_m - \bar{y}_a)^2 + \sum_{i=n_1+1}^{n} (\bar{y}_m - \bar{y}_b)^2}. \] (4)

When \( I \) takes the maximum value, the corresponding coefficient \( c_1, c_2, \ldots, c_m \) can be obtained. In this way, the Fisher discriminant function can be obtained [19].

When the sample is \( X = (x_1, x_2, \ldots, x_m)' \), the obtained critical value is \( y \).

When \( \bar{y}_a > \bar{y}_b \), the criterion is as follows:

- If \( y > \bar{y} \), the sample is \( X \in N_1 \).
- If \( y < \bar{y} \), the sample is \( X \in N_2 \).

When \( \bar{y}_a < \bar{y}_b \), the criterion is as follows:

- If \( y > \bar{y} \), the sample is \( X \in N_1 \).
- If \( y < \bar{y} \), the sample is \( X \in N_2 \).

2.2. Bayesian Discriminant Method. Using the Fisher discriminant function for classification is very convenient and practical, but if there are a large number of unknown samples, the number of Fisher discriminant functions will also increase. Therefore, when the number of Fisher discriminant functions is large, it will be more difficult to find the solution of each function, and the Bayesian discriminant method can make up for this problem well.

The Bayesian discriminant method is a discriminant method that classifies the samples into the class with the highest probability by calculating the probability \( p(n|x) \), \( n = 1, 2, \ldots, k \) of which population the sample \( x \) belongs to \( k \) populations, and comparing the magnitudes of the \( k \) probabilities.

We assume that there are \( k \) populations \( G_1, G_2, \ldots, G_k \) and their probability density is \( f_i(x) \). The prior probability that the sample \( x \) comes from the population \( G_i \) is \( q_i, i = 1, 2, \ldots, k \), which satisfies \( q_1 + q_2 + \cdots + q_k = 1 \).

According to the Bayesian criterion, the posterior probability of sample \( x \) from population \( G_i \) is

\[ P(G_i|x) = \frac{(q_i f_i(x))}{\left( \sum_{i=1}^{k} q_i f_i(x) \right)} \quad i = 1, 2, \ldots, k. \] (5)

Then, the posterior probability criterion is

\[ x \in G_i, P(G_i|x) = \max P(G_i|x), \] (6)

\( p(j|i) \) represents the probability of misjudging the population \( G_j \), namely:

\[ p(j|i) = P(X \in D_j|G_i) = \int f_i(x)dx, \quad i \neq j. \] (7)

In order to determine which population the sample \( x \) belongs to, when the sample \( x \) is drawn from the population, it is necessary to first calculate the average loss of \( k \) misjudgments weighted by the prior probability, which is expressed as follows:

\[ h_j(x) = \sum_{i=1}^{k} q_i C(j|i)f_i(x)G_1, G_2, \ldots, G_k. \] (8)

In this formula, \( \sum_{i=1}^{k} q_i C(j|i) \) and \( p(j|i) \) correspond to the difference caused by misjudgment. By comparing them, the attribution category of the sample is finally determined.

2.3. Basic Overview of the Random Forest Algorithm.

First, each round extracts \( n \) samples from the dataset by sampling with replacement and performs \( f \) rounds of
sampling with replacement to obtain \( f \) new training sets \( T_1, T_2, \ldots, T_f \).

Second, when generating a decision tree, it is necessary to divide internal nodes by randomly selecting fixed features. If it is assumed that there are a total of \( M \) features in the feature space, then in each decision tree construction process, \( m \) features are randomly selected from the \( M \) features of the internal nodes of each decision tree, and node splitting is performed to generate \( k \) decision trees.

Third, each decision tree grows freely; fourth, the random forest is finally formed. When using the random forest algorithm for classification, the same weight is introduced to each decision tree growing inside the random forest.

As shown in Figure 1, Bootstrap sampling is performed centrally in a population of \( N \) training samples to construct a decision tree, and each node in the decision tree is divided, and each decision tree is allowed to grow freely without pruning. Finally, a random forest is formed to generate voting results.

2.4. The Solution Method of Random Forest Algorithm. In the random forest algorithm, the final result obtained by voting on each decision tree is

\[
H(x) = \arg \max \sum_{i=1}^{K} I(h_i(x) = Y). \tag{9}
\]

Among them, \( H(x) \) is the final classification result of the random forest algorithm, and \( h_i(x) \) is the classification result of the \( i \)-th decision tree in the random forest.

The generalization error of the random forest algorithm on new samples is

\[
PE^* = P_{x,y}(mg(x, y) < 0). \tag{10}
\]

Among them, \( PE^* \) is used to measure the ability of the random forest algorithm learned from the training set to be applied to the unknown samples, and \( mg(x, y) \) is the edge function.

\[
PE^* \leq \frac{\bar{\rho}(1 - s^2)}{s^2}, \tag{11}
\]

where \( s \) is the classification ability of the decision tree, and \( \bar{\rho} \) is the average correlation coefficient between the decision trees. According to formula (3), the classification ability of random forest algorithm mainly depends on the classification ability of decision tree and the average correlation coefficient between them.

In addition, the random forest algorithm has strong adaptability and can deal with continuous data or discrete data. By repeating the above steps, multiple decision trees can be randomly established to form a random forest. Through the comparative analysis of the voting results, random forest algorithm composed of decision tress is shown in Figure 2.

The random forest algorithm has many advantages, such as high tolerance to outliers and noise of samples, it is not easy to generate overfitting during classification, the algorithm is simple and fast, and has high efficiency. The reasons for its better classification effect are as follows:

(1) The randomness of features. In this algorithm, each decision tree is generated by randomly selecting a certain number of features from the total number of features as splitting features. That is, the randomly selected features of each decision tree are different. This means that the randomly selected feature set has a lot of diversity and ensures that there are differences between each decision tree during the generation process.

(2) The randomness of the training set.

(3) The principle of combined voting and the principle of taking the mean value. The output of the random forest algorithm depends not only on the result of a single decision tree vote but also on the result of all decision tree votes. If it is assumed that the classification results obtained by random forests are wrong, then the classification results of most decision trees in random forests are wrong. Therefore, the classification effect of random forest algorithm is better.

2.5. Application of Random Forest Algorithm in Classification of English Translation Samples. The reason for choosing the random forest algorithm is that at present, this algorithm has a relatively good performance in classification applications. The random forest algorithm is composed of decision trees. It only needs to input the trained model into the constructed classifier to make it automatically discriminate to determine the category to which the sample belongs.

There are two important adjustable parameters in the random forest algorithm.
Using MATLAB as the development environment, the random forest algorithm program is written, and the discriminant results of the samples are shown in the following chart:

As can be seen intuitively in Figure 3, the value determined by the random forest classification model for training completely coincides with the real value of the sample.

The trained random forest algorithm is used to predict the test set results, and the discrimination results are shown in Figure 4.

Figure 4 shows the comparison between the test set discrimination result of the random forest algorithm and the actual sample classification value. It can be seen intuitively that the accuracy of the prediction value of the random forest classification model test set is 100%, which is completely consistent with the actual sample classification value.

3. Classification Model of English Translation Teaching Mode based on the Theory of Multiple Intelligences

The data layer obtains relatively primitive data from the database, the business layer converts the data into meaningful information that conforms to business rules, and the presentation layer converts the information into meaningful content for users. This layered design allows each layer to be modified independently without affecting each other. Figure 5 shows the distributed database structure of English translation teaching.
Comparison of the prediction results of the training set

Sample number
Predicted value
Actual value

Figure 3: Discrimination results of random forest training set.

Comparison of the prediction results of the training set

Sample number
Predicted value
Actual value

Figure 4: Discrimination results of random forest test set.

Figure 5: The structure of the distributed database of English translation teaching.
The teaching resource database system consists of six parts: public resource database, teacher resource database, resource management system, resource query system, teacher role application interface, and student role application interface, as shown in Figure 6.

Figure 6: The structure of the teaching resource library system.

![Diagram of teaching resource library system]

Courseware: network courseware, video streaming courseware, electronic books, CD courseware, etc.

Integrated unit: micro teaching unit, case, test questions, common questions, terms, materials, website, shared software

Basic resources: text, graphics and image, animation, audio, video, subject symbols, subject basic graphics

Figure 7: The practice diagram of the classification model of English translation teaching mode based on the theory of multiple intelligences.

![Diagram of classification model for English translation teaching]

The teaching resource database system consists of six parts: public resource database, teacher resource database, resource management system, resource query system, teacher role application interface, and student role application interface, as shown in Figure 6.

Figure 7 shows the practice diagram of the classification model of English translation teaching mode based on the theory of multiple intelligences.

The teaching system based on pattern classification adopts browser/server (Browser/Server, B/S) pattern to
develop. The B/S mode is widely used and is the mainstream of today’s software development. Its characteristics of focusing on the server and ignoring the browser make most of the work done on the server side, and the client only needs to install the browser software. This mode has the characteristics of free installation, convenient use, simple maintenance, cross-platform, and convenient software upgrade. In view of these advantages of the B/S mode, according to the actual needs of the teaching system, the model of the system is constructed based on the B/S mode, as shown in Figure 8.

Based on the above research, the model proposed in this paper is intelligently researched, and the teaching mode classification and English translation teaching effect are...
evaluated, and the teaching evaluation results shown in Figures 9 and 10 are obtained through multiple evaluations.

From the above research, it can be seen that the classification model of English translation teaching mode based on the theory of multiple intelligence proposed in this paper has a certain effect, and can promote the improvement of English translation teaching effect.

4. Conclusion

Classified teaching mode reflects the student-centered teaching philosophy. In order to play the proper role of this teaching model, in English teaching in colleges and universities, teachers must pay attention to the main role of students and let students become the masters of the classroom, because only by affirming the main role of students in teaching, students will take the initiative to learn. In English teaching in colleges and universities, in order for students to master standardized English skills, in addition to classroom learning, students also need to conduct appropriate exercises after class. Based on the differences in students’ abilities, teachers can formulate teaching plans with moderate levels of difficulty according to students’ ability levels. When arranging after-school projects, teachers must ensure that the content is pertinent, which can play a role in testing students’ learning effects. This paper combines the theory of multiple intelligence to classify the English translation teaching process. The research shows that the model classification model of English translation teaching based on the theory of multiple intelligence has certain effects, and can promote the effect of English translation teaching.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

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