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Research on Evaluation Algorithm of English Teaching Index Based on Computer Multimodal Artificial Intelligence Technology

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Abstract: English teaching evaluation is based on the objectives of English courses. In the context of China's economic development, English teaching evaluation is also constantly undergoing reform and innovation. To make the evaluation method of English teaching develop better, advanced evaluation techniques must be used in English teaching evaluation to ensure its effectiveness. The article suggested a novel approach to evaluate English teaching, which was based on computer multimodal artificial. The naive Bayesian model built in this study was based on the evaluation of English teaching and was designed in accordance with the features of artificial intelligence. An intelligent English teaching assessment model has been created by fusing the pertinent theories of English classroom teaching evaluation with the application of instances. Through the correlation analysis of Cronbach α coefficient and credibility, it was found that Cronbach α coefficient was above 0.95. It showed that the evaluation was highly reliable, which had certain reference value for the evaluation and analysis of current English classroom teaching.

1. Introduction

Many scholars have studied these problems in English teaching evaluation. The issue that a sizable amount of data in conventional English teaching assessment techniques cannot be appropriately categorized must be resolved. Chen Z adopted the method of combining fuzzy K-means clustering with information fusion to establish the index function and statistical analysis model of English teaching evaluation, so as to improve the quantitative prediction ability of English teaching evaluation [1]. Lu C employed a genetic algorithm to evaluate the quality of English education in light of the issues with the current system and used examples to demonstrate the method's accuracy and timeliness [2]. In the phenomenological model, Tavoosy Y evaluated 26 English volunteers from 7 different regions of Stampur in English teaching using AI technology [3]. The goal of Arshad A's study was to examine how different sensory elements may affect the efficacy of English teaching assessment. He found that different sensory expressions had a great relationship with the effectiveness of English teaching evaluation [4]. Nurhamsih Y could see that communication skills should be emphasized in the evaluation of English classroom teaching through the descriptive analysis of the content, language skills, topics, etc. of English textbooks in middle schools [5]. It can be found that the relevant researchers have done a very in-depth study on the evaluation of English teaching indicators, and have discussed many aspects of English teaching indicator evaluation.

Numerous academics have also undertaken pertinent study on the artificial intelligence-based evaluation algorithm of English teaching indicators. As computer and artificial intelligence technology have developed so quickly, Yi B combined high school English curriculum evaluation to explore how to apply artificial intelligence to the practice of high school English teaching evaluation [6]. The application of AI technology provides a new opportunity for the optimization of English teaching evaluation in senior high schools. Yingjie S applied AI technology to English teaching evaluation to improve students' self-identity, independent choice and internal learning motivation [7]. Lestari M, based on the second grade English *Let's Make Friends in English*, explored the use of English teacher assessment in the classroom and its impact on academic progress using AI technology [8]. Through the experiment of evaluating and optimizing the application of AI technology in English flipped classroom, Jiang Y found that new teaching methods could improve students' autonomy and collaboration, thus achieving the evaluation of college English teaching [9]. Reynolds T established an AI evaluation model based on English teaching evaluation by analyzing the case of English teaching in Henan University of Traditional Chinese Medicine. This model could effectively solve the subjective factors and randomness of traditional teaching quality evaluation, so as to better reflect the characteristics of reality [10]. There are comparatively few studies on computer-based multimodal AI technology in English teaching index evaluation, despite the fact that many academics have undertaken pertinent research on AI technology in English teaching evaluation. The evaluation of English instruction employing computer multimodal artificial intelligence technology was covered in this essay. It was combined with multimodal learning to build a naive Bayesian model of English teaching evaluation and make an empirical study of it. Taking School M as an example, a teaching evaluation experiment was carried out, and the first and second level evaluation index systems were constructed for English classroom teaching. By describing the practice of English teaching evaluation, this paper hopes to advance the development of pertinent theories and technologies and enhance the objectivity and scientificity of English teaching evaluation.

2. Evaluation Methods of English Teaching Index

2.1 Evaluation of English Teaching

The systematic assessment of teaching actions and outcomes from the perspectives of teaching objectives, teaching principles, etc. is referred to as teaching evaluation. English teaching evaluation refers to the assessment of English courses conducted by educators in English classrooms when students are learning the language in accordance with the course goals [11].

In the evaluation of English teaching, students can constantly experience their own progress and success, so as to understand themselves to establish self-confidence and develop their comprehensive language application ability in an all-round way. Teachers can get feedback from English teaching and make corresponding adjustments to their teaching behavior, so as to promote the continuous improvement of teachers' teaching quality. The school can timely grasp the implementation of English curriculum standards and improve the teaching management level.

The Position and Function of English Teaching Evaluation

There is a huge difference between the traditional curriculum idea and the modern education idea. The traditional view is curriculum design, followed by curriculum implementation (that is, teachers teach according to the curriculum, textbooks, and a series of activities), and finally curriculum evaluation, as can be seen in Figure 1.

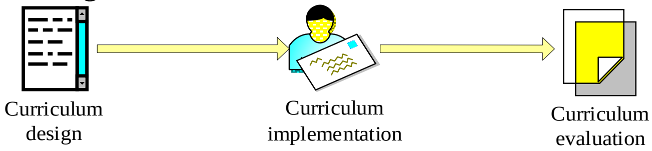


Figure 1. Traditional English curriculum development process

At present, the curriculum development advocated is a circular and interactive process of system operation, which is composed of curriculum design, curriculum implementation and curriculum evaluation. In the course of curriculum development, the function of curriculum evaluation has received more and more attention, see Figure 2.

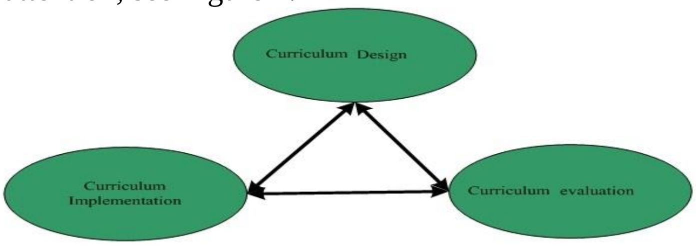


Figure 2. Current English curriculum development process

2.2 Multimodal Learning

Currently, the use of artificial intelligence technology in multimodal data expression has progressed from the traditional intelligence stage represented by characters, voice, and other perceptual cues to the perceptual intelligence stage represented by traditional intelligence based on neural network and genetic algorithm [12].

Significance of Multimodal Learning

With the ongoing advancement of technological models and the creation of artificial intelligence technologies, it has brought new value connotation to learning analysis, making the research of learning analysis no longer limited to data collection and analysis on a simple learning platform. Instead, it should pay more attention to various teaching situations to achieve deeper integration of learning space, so as to understand learners' behavior, cognition and emotional state, and reveal the deep learning mechanism [13].

Multi modal learning analysis based on feature decomposition is shown in Figure 3.

(1) Multi source: Multi supplement of teaching materials

(2) Hierarchical: Teaching ecology of hierarchical decomposition

(3) Situational: Intelligent perception of teaching environment

(4) Time sequence: Teaching analysis of space-time integration

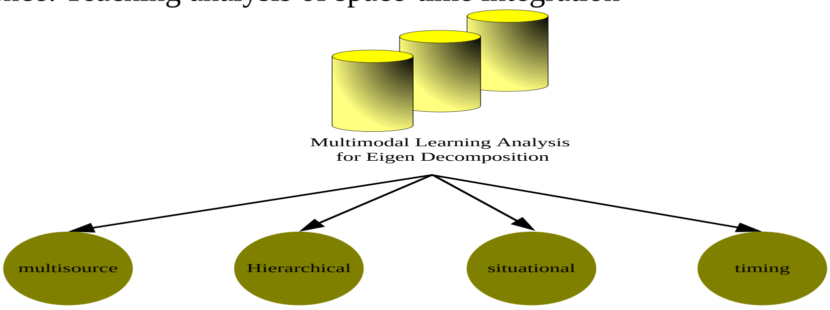


Figure 3. Feature decomposition of multimodal learning analysis

2.3 Artificial Intelligence Technology

Educational Application of Artificial Intelligence

At present, numerous advances have been achieved in the study of how AI may be used in the classroom. From the perspective of application research, it can be divided into four categories: intelligent online learning platform, intelligent teaching assistant, intelligent classroom and intelligent campus, as shown in Figure 4 [14].

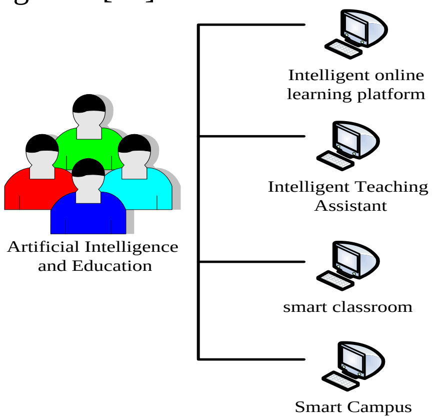


Figure 4. Integration of artificial intelligence and education

Intelligent Model of Classroom Teaching Evaluation

The evaluation and analysis of classroom teaching in intelligent teaching has always been the focus of attention. The analysis of classroom teaching evaluation must be carried out from the aspects of teaching content (knowledge points), intelligent teaching situation, changes in teachers' and students' emotions, etc. It is urgent to study the data collection, behavior representation and analysis, application effect disclosure and interpretation of classroom teaching evaluation. On this basis, combined with previous research results and practical experience, an intelligent analysis model of classroom teaching evaluation based on experimental results is constructed, as shown in Figure 5.

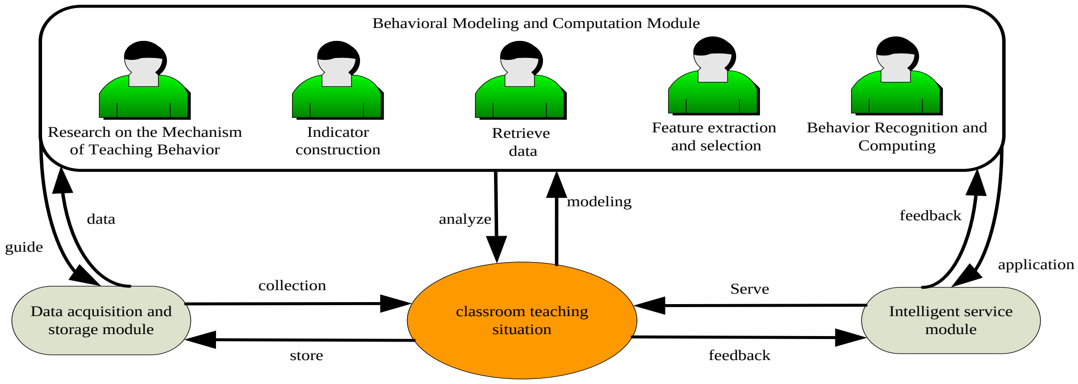


Figure 5. Intelligent analysis model of classroom teaching evaluation

This research takes classroom teaching evaluation as the core. From the aspects of education and teaching theory, artificial intelligence technology, standards, information security and privacy, classroom teaching evaluation data has been studied from the aspects of collection, processing, storage, modeling, analysis and application feedback to fully utilize the practical significance of data from teacher evaluations in classrooms. It increases the scientific rigor of evaluation and analysis of classroom instruction, which eventually raises the caliber of instruction.

Classification of English Teaching Evaluation Based on Naive Bayesian Model

Based on the Naive Bayesian model, an evaluation index classification system is established in English teaching by using the comprehensive weight of English evaluation attribute weight and mutual information quantity.

Basic Definitions

Definition 1: Supposing S is a set of samples, the n-dimensional feature vector $(a_1, a_2, ..., a_n)$ is used to represent each data sample. N measurements described separately by attribute $\{A_1, A_2, ..., A_n\}$. It is supposed that the sample data set contains m classification attributes, which are represented by $C = \{C_1, C_2, ..., C_m\}$ respectively. Given an unknown data sample X, its attribute values are $(x_1, x_2, ... x_n)$, $x_i \in A_i$. In the naive Bayesian model, the most likely object classification of X is :

$$C_{Max} = \arg\max_{c_i \in c} P(C_i | X) \tag{1}$$

Definition 2: On the basis of Bayesian theorem, the definition of posterior probability $P(C_i | X)$ is:

$$P(C_i | X) = \frac{P(X | C_i) * P(C_i)}{P(X)} \tag{2}$$

Definition 3: Assuming that the value of each evaluation attribute is irrelevant, the prior probability $P(X | C_i)$ is:

$$P(X | C_i) = \prod_{k=1}^{n} p(x_k | C_i) \tag{3}$$

Definition 4: According to Formula (2) and Formula (3), the maximum posterior probability $P(C_i | X)$ can be converted into the maximum prior probability $P(X | C_i)$. The target classification of unknown data sampling X is:

$$C_{Max} = \arg\max_{C_i \in C} \frac{P(C_i) * \prod_{k=1}^{n} p(x_k | C_i)}{P(X)} \tag{4}$$

Among them, $P(X)$ is a constant, which can be reduced to:

$$C_{Max} = \arg\max_{C_i \in C} P(C_i) * \prod_{k=1}^{n} p(x_k | C_i) \tag{5}$$

Among them, $P(C_i) = s_i / s$. s_i is the number of samples in the sample data set S whose type attribute is C_i. s is the cardinal number of the S-type sample data set. A prior probability can be obtained from the sample data set $p(x_k | C_i)$.

Definition 5: If A_k is discrete, the prior probability is defined as Formula (5) with $p(x_k | C_i)$. If A_k is continuous, the prior probability is defined on the basis of Gaussian distribution:

$$p(x_k | C_i) = s_{ik} / s_i \tag{6}$$

Among them, s_{ik} is the number of samples of category attribute C_i with value x_k in evaluation attribute A_k. s_i is the number of samples with category attribute C_i in sample dataset S:

$$p(x_k|C_i) = g(x_k, \mu_{C_i}, \sigma_{C_i}) = \frac{1}{\sqrt{2\pi\sigma_{C_i}}} e \tag{7}$$

Among them, $g(x_k, \mu_{C_i}, \sigma_{C_i})$ is the Gaussian density function of attribute A_k. μ_{C_i}, σ_{C_i} are the mean value and standard deviation, respectively.

Definition 6: Due to the different impact of different evaluation attributes on classification, according to the importance of evaluation attributes, for unknown data sample X, the definition of purpose classification is expanded to:

$$C_{Max} = \arg\max_{C_i \in C} P(C_i) * \prod_{k=1}^{n} p(x_k|C_i)^{w_i} \tag{8}$$

Among them, w_i represents the weight of evaluation attribute $A_i (i = 1,2,..., n)$.

Definition 7: Weight w_i of evaluation attribute A_i is defined as:

$$w_i = \alpha * \lambda_i * \delta_i \tag{9}$$

Among them, λ_i can be measured according to the weight of each index in the university discipline evaluation index system. δ_i can be calculated according to the mutual information between evaluation attribute A_i and category attribute $C_j (j = 1,2,..., m)$.

$$\delta = I(A_i, C) = \sum_{a_i \in A_i} \sum_{c_j \in C_j} p(a_i, c_j) * \log \frac{p(a_i, c_j)}{p(a_i) * p(c_j)} \tag{10}$$

α represents the weight coefficient, and $\alpha \in [0,1]$. In the optimal stage of the algorithm, the value of α can be accurately adjusted.

3. Experiment on English Teaching Index Evaluation of Computer Multimodal Artificial Intelligence Technology

3.1 Process of Constructing English Teaching Index Evaluation System

Taking English teaching in a college as an example, this paper constructs a set of organic whole with certain structural levels, which takes English as the core and teachers' English teaching activities as the core. The scientific and comprehensive needs of the English classroom teaching assessment index system are screened out in this study using literature, theoretical analysis, expert consultation, and other techniques. Figure 6 depicts the development of the English classroom teaching assessment index system.

(1) The development of the first level index system for evaluating English classroom teaching in the college.

This research takes English teaching as the starting point. Using the theoretical analysis method, this paper constructs a set of classroom teaching evaluation index system that conforms to the characteristics of English teaching. On this basis, the index system is constantly improved and adjusted by consulting experts. "Theoretical analysis" means that on the basis of theoretical analysis of evaluation problems, the measurement objects and objectives of the measurement indicators are divided into several different parts or aspects. Through the analysis of the basic factors of English classroom teaching, the first level evaluation indicators are obtained, and thus the evaluation indicators of English classroom teaching are constructed.

(2) The development of the secondary index system for evaluating English classroom teaching in the college.

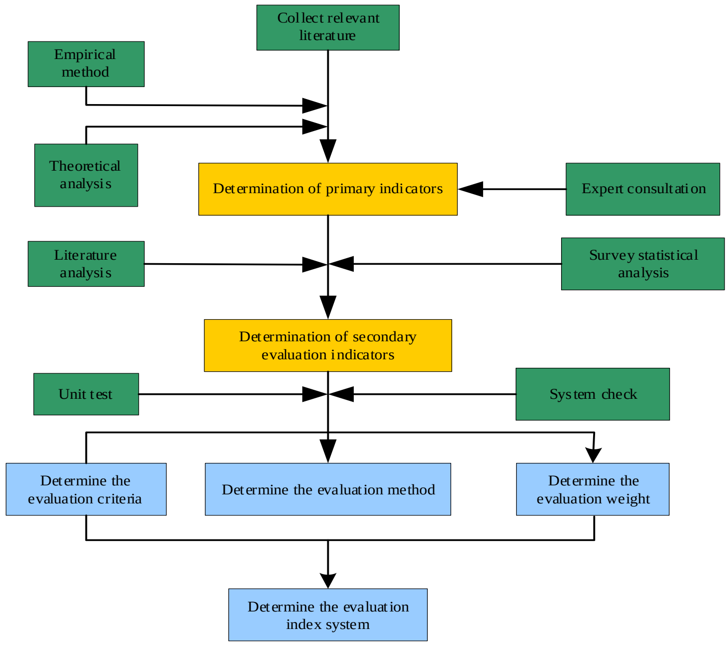


Figure 6. The construction process of the evaluation index system for college English classroom teaching

This essay provides an assessment metric for English instruction based on three factors: preparation, process and effect.

Table 1. Correlation analysis of secondary indicators

Factor	Factor l	Factor 2	Factor 3
Philosophy	0.664		
Objectives	0.865		
Background	0.421		
Design	0.619		
Content		0.731	
Process		0.374	
Style		0.339	
Management		0.426	
Attitude		0.323	
Method		0.769	
Atmosphere		0.651	
Class response			0.643
Feedback			0.618
Reflection			0.344
Standard status			0.671

According to the first level evaluation indicators, as well as reading references, consulting teachers, experts, etc., the second level evaluation indicators are determined. At the same time, the questionnaire method is used to investigate the suitability of each indicator. A total of 60 questionnaires are distributed, including 30 English teachers and 30 graduate students majoring in English teaching. 57 valid questionnaires are collected. The Statistical Package for the Social Sciences (SPSS) software is used to analyze the survey results, so as to check whether the evaluation indicators can be used as secondary evaluation indicators. The results are shown in Table 1.

According to KMO (Kaiser Meyer Olkin) test statistics measurement standard, the correlation degree less than 0.5 indicates that it is weak and cannot be used as a secondary evaluation index. Finally, this paper divides the second level evaluation indicators of English classroom teaching into nine. The evaluation indicators are shown in Table 2.

Table 2. Teaching evaluation index system

Teaching stage	First-level indicator	Secondary indicators
Teaching preparation stage	(A) Preparation	(A-1) Philosophy (A-2) Objectives (A-3) Design
Teaching process stage	(B) Process	(B-1) Content (B-2) Methods (B-3) Atmosphere
Teaching effect stage	(C) Effect	(C-1) Class response (C-2) Feedback (C-3) Standard status

The selected indicators of English teaching evaluation are operable, so they are tested separately and systematically.

First, it is monomer detection. Individual test is a feasibility test for specific indicators.

Second, it is system detection. Systematic inspection includes scientific inspection and important inspection. The goal of importance testing is to remove irrelevant evaluation indicators and maintain indicators that reflect its core content. Delphi method is the main method of importance test. Relevant experts' opinions are solicited by issuing the questionnaire. After the first groups of questionnaires are collected, the overall responses, such as each weight area's average and frequency, are fed back to all professionals immediately after statistical processing. Then, experts can decide whether to revise or keep their opinions according to the feedback, and make the next round of answers. Until the final results are consistent, the evaluation indicators can be comprehensively measured. The implementation steps are as follows. First, the "power allocation consultant form" is formulated. Generally, the importance is divided into five levels, and 1, 2, 3, 4, and 5 are used to indicate not important, slightly important, moderately important, important and very important. Secondly, the "power allocation consultant table" is sent to the review experts to ask them to independently allocate the weight of each indicator and give the corresponding reasons. When retrieving the consultation form, it is necessary to make statistics on these data and calculate the average deviation of each indicator.

$$\tilde{W} = \frac{1}{n}\sum W_j N_{ij} \tag{11}$$

Finally, the above published data and two indicators are fed back to experts respectively, so that they can revise or adhere to their own views according to their own ideas and give more weight in the second round. Then, the information is collected, analyzed and finally evaluated.

$\tilde{W}$ represents the expectation of experts on this indicator, which reflects the importance of this indicator. It is generally agreed that the expectation should be 60% or higher. If not, the index is cancelled.

(3) The criteria and key points of the secondary evaluation index system of English classroom teaching

This paper proposes the evaluation criteria of the secondary evaluation index, which is divided into two stages. The assessment focus is established in the first stage based on the primary contents and features covered by the secondary indicators after the sub indicators have been deconstructed. Secondly, the degree of reaching the standard of each secondary indicator is determined according to the situation of reaching the standard of each evaluation point. With the increase of the grade, the accuracy of classification is getting higher and higher. Therefore, this paper divides it into four levels. The "A", "B", "C" and "D" of the four levels respectively mean "fully achieved", " mostly achieved", " moderately achieved" and "little or none achieved".

(4) Determination of the weight of the evaluation index of English classroom teaching in the college.

The weight of the evaluation indicators is established when the assessment indicators and evaluation criteria have been established. The purpose of AHP is to determine the weight value. It is mainly to compare the evaluation indicators by level and get the priority of the weight of each indicator. It then determines the weight by the feature vector corresponding to its maximum eigenvalue. With the analytic hierarchy process, the weight of each index is determined as follows:

Step 1: First, the goals are classified into different levels.

Step 2: The evaluation matrix is constructed step by step. Generally, the grade of index comparison is divided into five grades, such as A and B. The results are: equally important, slightly important, basically important, really important and absolutely important, which are represented by 1,3,5,7,9 respectively. When the relative importance of two indicators is at a certain level, they are represented by 2,4,6,8 respectively.

Step 3: Calculations are made to determine the decision matrix's largest eigenvalue and related eigenvector. The eigenvector value is the weight of the index in the system. AHP can measure whether the weighted results are reliable by the following C.R. It is calculated as follows:

$$C.R. = \frac{(C.I.)n}{(R.I.)n} = \frac{\frac{\lambda_{\max} - n}{n-1}}{(R.I.)n} \tag{12}$$

In the formula, $(C.I.)n$ is the consistency index evaluated by the n-order matrix, and $(R.I.)n$ is the average consistency index of the n-order matrix. When (C.R.)<0.10, the evaluation is basically compatible and the analysis results are reliable. If (C.R.)>0.10, it indicates that the consistency of the evaluation is not high, and the weight of the evaluation needs to be adjusted. Finally, according to the weight of each indicator, the corresponding score of each level is calculated.

3.2 Practice with the Constructed English Evaluation Index System

This paper is based on an English teaching evaluation experiment carried out in school M. The schools surveyed have a number of high-quality teachers. The main way of evaluation is classroom observation, that is, through in-depth observation of teachers' teaching, a comprehensive evaluation is made.

The evaluation process of English teaching in this paper includes:

(1) Select evaluation courses

Prior to evaluating English instruction, it is important to choose the right courses for review based on the scenario at hand and to implement classroom observation. Teachers' teaching evaluation mainly adopts the method of classroom observation.

(2) Organize English teaching evaluation team

In the English teaching evaluation of School M, with the help of the school and teachers, an English teaching evaluation team is established. The team is composed of five English teachers who explain the evaluation questions to the evaluators before the evaluation, so as to evaluate English teaching.

(3) Obtain and evaluate English teaching evaluation materials

This paper takes the English classes of teachers A and B as examples to collect and evaluate relevant information in English teaching.

Evaluation results of English classroom teaching in the school.

During the two teachers' lectures, five teachers in the evaluation group respectively evaluates their English teaching.

According to the evaluation results, the reliability analysis is carried out using statistical methods. The subjective elements of raters greatly affect the assessment impact of the scoring technique since the instructional scoring method is utilized for scoring. Therefore, the reliability of evaluation should be fully considered when teaching scoring. SPSS is used to analyze the reliability of the evaluation results. The results are shown in Table 3.

It can be seen from the above results that the Cronbach's Alpha coefficients of the evaluation results are all above 0.95, which indicates that the evaluation results have high reliability. Table 4 displays certain factors for teaching evaluation.

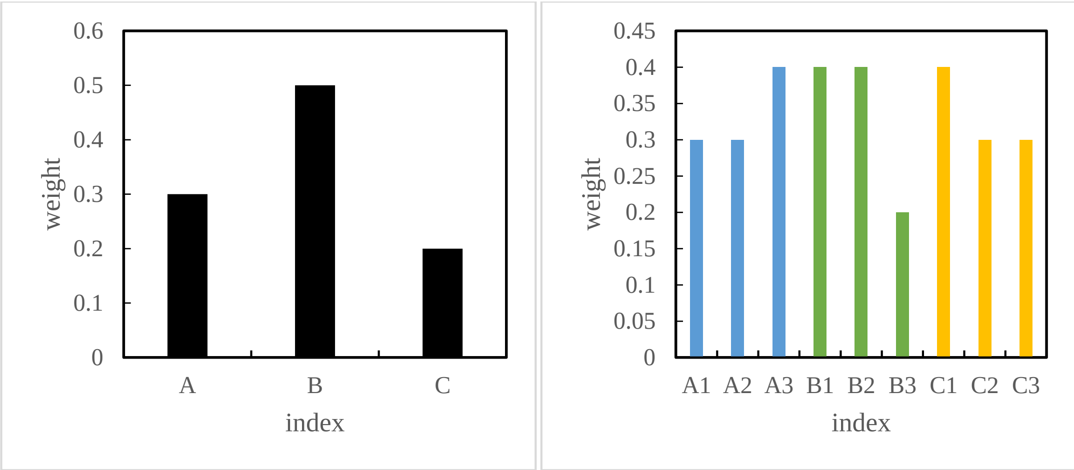
Table 3. Analysis of credibility of teaching evaluation results of teachers A and B

	Cronbach’S Alpha	Cronbach’S Alpha Based on Standardized Items	N of Items
Teacher A	0.964	0.975	5
Teacher B	0.986	0.981	5

Table 4. Teaching evaluation indicators

Teaching stage	First-level indicator	Secondary indicators	Serial number
Teaching preparation stage	Teaching preparation(A)	Teaching philosophy(A1)	1
		Teaching objectives(A2)	2
		Instructional Design(A3)	3
Teaching process stage	Teaching process(B)	Teaching content(B1)	4
		Teaching method(B2)	5
		Teaching atmosphere(B3)	6
Teaching effect stage	Teaching effect(C)	Class response (C1)	7
		Feedback (C2)	8
		Standard status (C3)	9

During the evaluation, because different indicators have different effects on the evaluation results, the indicators are weighted according to the experts' scoring results. The results are shown in Figure 7. Among them, Figure 7A shows the weight of primary indicators and Figure 7B shows the weight of secondary indicators.



A. Level I indicator B. Level II indicator

Figure 7. Distribution of index weights

According to the above evaluation and the evaluation of five experts, as well as the comprehensive calculation of evaluation data, Figure 8 illustrates the findings of the evaluation of English teaching.

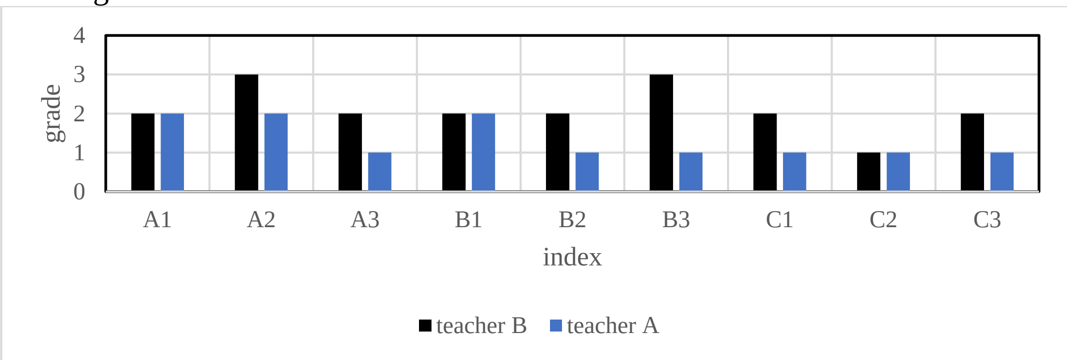


Figure 8. Evaluation of teachers A and B

3.3 Results of College English Classroom Teaching Evaluation

Through the evaluation of the English teaching of teacher A and teacher B, the comprehensive performance of the two teachers in English teaching can be preliminarily understood.

First, in the teaching preparation stage, the "teaching philosophy" of the two teachers is rated as Grade 2. This shows that both teachers are aware of the importance of English teaching, which establishes the basic concept of English teaching. Both teachers have achieved good scores in the teaching evaluation design project, which shows that both teachers can design according to textbooks in English teaching and have more practical teaching plans.

Second, in the teaching process, teacher B's score is higher, while teacher A's overall score is poor. In terms of teaching content, both teachers have been well evaluated. This shows that they have a good understanding, analysis and arrangement of what they have learned. In particular, teacher B not only grasps the content of the textbook, but also expands it well. In terms of English teaching atmosphere, teacher A's teaching style is more traditional. The students in the teaching process show a more cautious attitude, and there is a lack of effective communication in the teaching process. However, teacher B's teaching tasks are varied and her intonation is different. The interest of the teaching environment has stimulated teacher B's English classroom teaching atmosphere.

Third, in terms of various indicators of teaching effectiveness, both teachers have been well evaluated, especially teacher B. In class response, compared with teacher B, the classroom atmosphere of teacher A is not very active. However, they answer the teacher's questions very actively, and their study is more focused. In the teacher's teaching feedback, both teachers' evaluations are excellent. The results show that teachers can timely provide feedback, correct and confirm the questions and needs raised by students, which has been recognized by the scoring teachers, thus promoting students' learning. In terms of meeting the requirements, the two teachers achieve good results. The correct rate of class A students' answers exceeds 75%, and their homework is completed smoothly, basically achieving the expected teaching objectives. In teacher B's class, the students not only successfully completes all kinds of homework, but also are able to do their own work creatively, which is worthy of praise.

One evaluation cannot explain the teaching ability of the two teachers. In this essay, the teaching circumstances of the two instructors are exclusively examined from the standpoint of English education. From the above findings, it can be seen that it is feasible to evaluate English teaching with the English Teaching Evaluation Index. In an effort to further the development of English teaching evaluation, it can gain a basic grasp of the current state of English teaching and identify difficulties from it.

4. Conclusions

An innovative viewpoint on English classroom and teacher assessment has been made possible by AI technology. With the assistance of new technologies, the teaching process and environment were analyzed and optimized to make the educational decision-making more scientific and reasonable. Through the research and discussion of the current English classroom teaching evaluation and artificial intelligence technology, this paper established an intelligent analysis model of the artificial intelligence English classroom teaching evaluation. In practical application, some beneficial results have been received. It also offers a fresh concept for improving the methodology for evaluating and analyzing English teaching. However, due to the constraints of time, environment and other factors, the evaluation system can only be applied and fed back in a very small range, which is difficult to ensure its comprehensiveness. At the same time, English teaching is also a very complex process. How to establish a more universal evaluation index system in English teaching evaluation to ensure the scientificity and rationality of English teaching evaluation system needs further research.

Acknowledgement

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