



# Evaluation of College English Teaching Quality Based on AHP and GWO-ELM

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**Abstract.** For centuries, English has been a means of communication, and it will continue to be used in many years to come. English has become an international language, and people all over the world use it to communicate. The number of people who use English as the main or secondary language has reached a record high. In fact, by 2020, nearly half of the world's population will use English as the primary or secondary language. Teaching quality is the main concern of higher education. Although college English reform has been carried out for decades, there is still a large gap between college students' English language ability and the requirements of employers. Student evaluation of teaching is the most widely used method of teaching evaluation. However, most schools only develop a teaching evaluation index system to evaluate all courses, which is obviously unscientific and reasonable. Since different subjects have different teaching emphases and requirements, it is extremely important to build a college English student evaluation index system.

**Keyword:** College English · AHP · GWO-ELM · Teaching quality evaluation

## 1 Introduction

However, traditional AHP methods rely on the subjective judgment and weight setting of experts, which are easily influenced by subjective bias and information uncertainty, leading to inaccuracy and reliability of evaluation results [1]. The GWO algorithm is inspired by the collective behavior of the gray wolf population and has global search and strong convergence capabilities, enabling it to find the best solution [2]. The ELM model, as a fast trained feedforward neural network, has the characteristic of automatically determining connection weights and hidden layer neuron thresholds. The ELM model can quickly converge and provide good generalization performance.

By constructing an evaluation index system using the AHP method and combining it with the GWO algorithm to calculate weights, we can more accurately determine the relative importance of each evaluation index [3–5]. Meanwhile, through the application of the GWO-ELM model, we can quickly train and optimize the model, and obtain evaluation results with more generalization ability.

This to verify and evaluate the effectiveness of this method in practical applications through empirical research. By improving the accuracy and reliability of the evaluation of the quality of college English teaching, we can provide scientific basis and decision-making support for educational managers and decision-makers, further promoting.

## **2 Related Work**

### **2.1 Definition of Relevant Concepts**

What is teaching quality? People seem familiar with this question, but they can't give a specific and complete answer. For a long time, people's educational practice has been carried out under the guidance of this "fuzzy representation". In fact, quality should be the ideal goal pursued by people in their work practice and should be very specific. If you don't know it before you act, you will lose control of your behavior. For a long time, people have different views and opinions on teaching quality, and wise people have different opinions. Scholars have defined or explained it from different perspectives [6]. This is because the teaching object is "people". The expectations and needs of society for "people" are multifaceted, and the society will transform the educational product—students.

In the future, it will show different forms in the process of combining with labor objects, and the connotation of teaching quality will also be different. Moreover, the research of educational theory involves different fields and focuses on different aspects, and the structure of educational products formed—student quality structure is also different.

### **2.2 Teaching Quality Assurance System**

Quality assurance, quality system, quality assurance system, etc. were originally the series of terms in the ISO9000 series of quality standards. According to the definition of the International Organization for Standardization (ISO). "The quality system is an organic whole of the organization, procedures, processes and resources required for the implementation of quality management." It can be seen that quality management is to carry out various quality activities through system is the core of quality management [7]. There are two forms of quality system. One is the "quality system" used for internal quality management in a non-contractual environment, which is called "quality management system". ISO9004 provides a guide for establishing a quality management system. The other is that under the contract environment, the demander puts forward the demand for quality assurance activities for the supplier, and the supplier adjusts the quality system appropriately to make the supplier's quality system include the demander's requirements, so the supplier's quality system plays a quality assurance role for the demander's requirements, Known as "quality assurance system", ISO9001, 9002 and 9003 provide three assurance system models for this purpose. With the continuous development of the quality assurance movement, the internal quality management and external quality assurance are becoming more and more identical, whether internal or external, can be called "Quality assurance system". In the process of implementing total

quality management and ISO9000 standard certification in China, the word “quality system” is not used, but “quality assurance system” is used most [8]. According to the Glossary of Quality Management Terms issued by the China Association for Quality Management, the definition of quality assurance system is that enterprises take the most economic means to ensure long-term production (provision) of products (services) satisfying users as the goal, and use systematic ideas and methods to organize the quality functions of all stages and links of quality management to form an organic whole that has clear tasks, responsibilities and authorities, and can coordinate and promote each other. The meaning of this definition is consistent with that of the quality system. The data shows that the quality systems established in the total quality management of the United Kingdom, Japan and other countries are called “quality assurance systems”.

### 3 GWO-ELM Algorithm Model

GWO algorithm is an intelligent bionic optimization algorithm inspired by grey wolf hunting. This algorithm is based on the idea of systematization, recursive evolution and hierarchy. Because of its strong convergence performance and fewer parameters, the optimization performance is better than other bionic algorithms [9].

The GWO optimization process includes the steps of hunting, encirclement and attack of grey wolves. The first step in hunting is to surround the prey. The mathematical model is

$$H = |MX_p(t) - X(t)| \quad (1)$$

$$X(t + 1) = X_p(t) - NH \quad (2)$$

where: 1 is the current iteration number; M and N are coefficients;  $X_p$  is the position vector of the prey;  $X(t)$  is the current position vector of grey wolf; M and N are updated by dynamic search. The calculation method is

$$M = 2r_2 \quad (3)$$

$$N = 2ar_1 - a \quad (4)$$

Finally, attack the prey, that is, search the optimal solution obtained by GWO optimization, and this step is completed through the linear descent of a. In order to optimize the ELM algorithm model and overcome local optimization problems, this paper introduces the GWO (Grey Wolf Optimization) algorithm. The GWO algorithm utilizes the deep learning characteristics and strong convergence performance of the ELM algorithm to update the position in the grey wolf population through error feedback of the ELM model [10].

By combining the GWO algorithm with the ELM algorithm, the performance and accuracy of the ELM model can be improved. The GWO algorithm can globally search for the optimal solution and adjust it according to the error function of the ELM model to obtain the optimal connection weight and hidden layer neuron threshold. This combination can fully utilize the deep learning characteristics of ELM algorithm and the

global search ability of GWO algorithm, resulting in better performance and robustness of the model.

In summary, this article introduces the GWO algorithm to optimize the combination of ELM models, combining the deep learning characteristics of ELM algorithm and the strong convergence performance of GWO algorithm. Update the position in the gray wolf population through error feedback from the ELM model to achieve a global optimal solution. This method aims to improve the performance and accuracy of ELM models, overcome local optimization problems, and provide better results for training and learning processes. The algorithm flow is shown in Fig. 1.

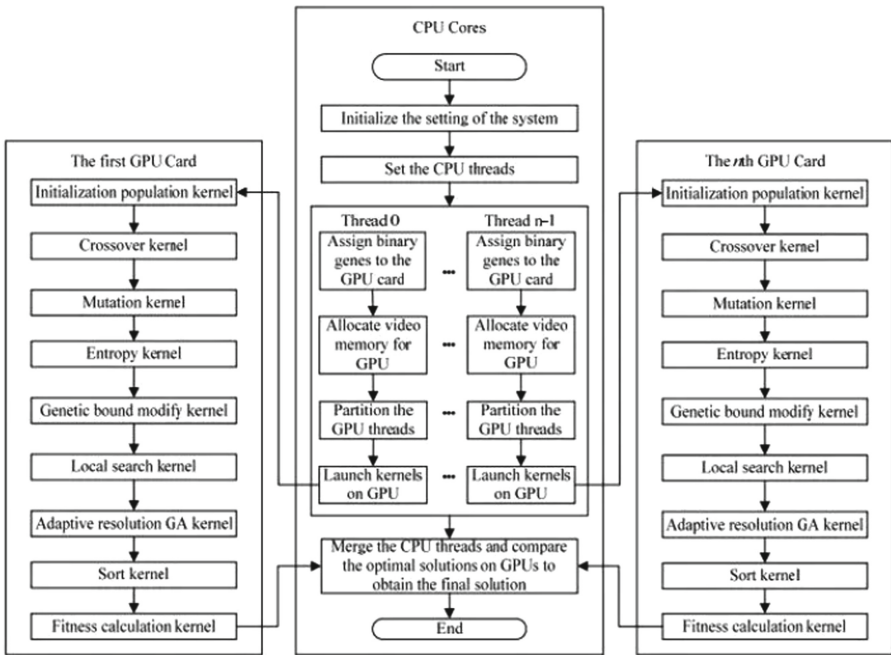


Fig. 1. GWO-ELM algorithm flowchart

#### 4 Evaluation of College English Teaching Quality Based on AHP and GWO-ELM

Has the ability to simplify complex systems into pairwise comparisons and simple calculations between elements. This article quantitatively analyzes the factors that affect the quality of English teaching using the AHP method, and clearly calculates the weights of each influencing factor.

In this study, a hierarchical structure was first constructed to divide. Then, the researchers compared these factors in pairs and used scales to evaluate their relative

importance. By calculating the weighted average of each row in the comparison matrix, the weight of each factor can be obtained.

Through quantitative analysis of AHP, the researchers obtained the weights of various influencing factors, thereby clarifying the relative importance of different factors in the quality of English teaching. This quantitative analysis helps to evaluate the quality of English teaching and provides a basis for decision-makers to develop strategies to improve and enhance teaching quality.

The calculation process of AHP is:

The hierarchical model is established, and then the target layer, criterion layer and scheme layer are distributed.

The judgment matrix is constructed, and the scaling method in AHP is used to compare the various causative factors, and the scaling value between each causative factor is given with reference to the relative importance. In the judgment matrix scale, "1" represents that two factors have the same importance for the same attribute; "9" represents between two factors, one of which is more important than the other; "2, 4, 6, 8" means that the importance of this factor lies between the two.

## 5 Conclusion

In the research, the AHP method was first used to construct. Then, the weight of each indicator is calculated using the GWO-ELM algorithm to obtain the importance of each indicator to teaching quality. Next, based on data such as teacher-student evaluations and student grades, the calculated weights are used to evaluate teaching quality and analyze the results.

The can accurately and comprehensively evaluate teaching quality. Compared to traditional evaluation methods, this method combines subjective and objective factors, avoiding subjective bias and simple quantitative calculation problems. Meanwhile, the application of GWO-ELM algorithm improves the efficiency and accuracy of weight calculation.

It has important guiding significance in the field of education and provides strong support for educational decision-making. Further research and application can further improve and promote this method, promoting the improvement of the quality of college English teaching.

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