

ARTICLE

English Teaching Ability Evaluation Algorithm based on management, leadership and entrepreneurship including education, Data Fusion and Notch Filtering

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ABSTRACT

All universities and colleges has been offering English as one of the important courses. The effectiveness of English teaching is inextricably related to the quality of talent acquisition and student growth. The term evaluation of teaching quality describes the type of content knowledge in which the focus is to analyze quality teaching. One of the significant aims of every school and university is to improve the English teaching quality and promote the development of English teaching and entrepreneurship. As the existing evaluation algorithms have been facing various problems of fuzzy core dimension characteristics, which result in poor data integrity. Therefore, we proposed an English teaching ability evaluation algorithm based on data fusion, entrepreneurship, and notch filtering. Moreover, for the purpose, to achieve the goal of education entrepreneurship and quality teaching, strengthen of the English teaching quality algorithm is necessary, as well as the leadership and management qualities of the teachers also have a lot of impact on the performance of teaching quality and students working performance and it is a topic worthy of in-depth and significant investigation. We select the explicit indicators that are easy to measure, establish the hierarchical structure system of evaluation indicators, construct the evaluation model by data fusion and notch filtering, obtain multi-source heterogeneous data, extract the core dimension characteristics of English teaching ability, make rational use of teaching resources, convert variables into standard units, and set up the evaluation mechanism by using random walk algorithm. **Experimental results:** the average data integrity of the designed English teaching ability evaluation algorithm is 4.33, and the average data integrity of the other two evaluation algorithms is 1.921 and 1.885, which proves that the English teaching ability evaluation algorithm integrating data fusion and notch filtering technology has a broader application prospect.

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INTRODUCTION

Nowadays with the rapid advancement in the technology and science, the demand to education has also been increased. Education has become essential part of the life. So, the developing society need further advancement in the area of education. Education is key factor to the development of any nation. All of the world's successful countries are only successful because of their well-educated populations. Almost all kinds of Education are crucial in today's world, but education in the field of English is more significant as compared to any other field. Because English has a great popularity as the most widely communicated language all over the world, it is spoken by the majority of the world's population. English education is just as vital as knowing it. A good mastery of the English language is required for a comprehensive understanding of speech. Many Schools and universities all around the world has been focusing on teaching English as a major language and literature to young students at a young age in order for them to have a comprehensive understanding of the English language. Apart from this, various any colleges throughout the world provide a variety of English language courses to educate their students about the English as a major language. The major purpose of teaching the modern generation a good knowledge of English is because English has become the essential language for development in both the present and the future. Under the background of increasingly important talent training, students' evaluation of teachers' classroom teaching work and performance plays an important role in college teaching management, leadership qualities, entrepreneurship as well as teacher abilities evaluation. Students can use the way of teaching evaluation to reflect teachers' classroom teaching situation in the school, and teachers can use the results of students' teaching evaluation to reflect on their teaching effect and improve it [1]. Schools can also understand teachers' personal teaching status and overall teaching ability through the data analysis of students' teaching evaluation, so as to put forward appropriate training plans and effective education management measures. Since the implementation of student evaluation of teaching, it has become a routine work of teaching management in colleges and universities. However, the evaluation of teaching ability still faces many problems. For example, students reflect that although teachers have to be evaluated every semester, they see teachers again next semester. They find that teachers do not understand students' opinions, and

some teachers are ignorant of the results of school evaluation. There are many reasons for this phenomenon, but one thing is certain. The teaching evaluation data obtained by teachers is too simple, which is not conducive to teachers to promote their own professional development according to students' opinions. According to the research on the evaluation of teaching ability at home and abroad, it is found that the information fed back to teachers, including more detailed analysis of teaching ability, is very necessary. The accumulated large number of students' teaching evaluation data can provide more information about teachers' teaching ability through data analysis. Furthermore, for enhancing the quality of teaching, and for the improvement of the leadership abilities, teaching management holds great importance.

In the processing of teaching evaluation results, foreign work mainly includes the following aspects: first, analyze the reliability of teaching evaluation results and judge their objectivity. Secondly, through the statistical calculation of the school evaluation and Statistics Center according to a certain model or requirements, a comprehensive evaluation result is given. The data analysis methods used are mostly fuzzy set, factor analysis and multiple statistical regression methods. Thirdly, reasonably explain the teaching evaluation results and eliminate the interference of influencing factors. When comparing the evaluation results, pay attention to the comparison at the same level of influencing factors [2-3]. Summarize and sort out relevant data, such as the class size of the course, the difficulty of the course, the course materials and the nature of the course, and whether the course is a compulsory course. Finally, whether the results of teaching evaluation are public or not is differentiated among schools. Some schools are more cautious about the disclosure of the evaluation results of new teachers. Schools can usually negotiate with new teachers or make some disclosure appropriately, while some schools require that the results of teaching evaluation must be published by combining the original data with relative ranking. In terms of data analysis of English teaching ability evaluation in China, many researchers use many analysis methods such as mean square deviation, fuzzy mathematics, fuzzy set and fuzzy clustering to analyze students' teaching evaluation data, so as to make the data explain more implicit information [4-6]. Compared with foreign countries, these methods have many and rich attempts. Different methods have their advantages. They can be used to guide students' teaching evaluation. The fuzzy clustering method is used to classify and analyze students' teaching evaluation data, so as to classify the

excellent quality of excellent teachers, and then realize the effective management and effective training of teachers. At present, the academic research on data fusion and notch filtering and English teaching ability evaluation is not very rich, which needs to be further discussed.

Research objectives

In this research article, we studied the importance of learning English as a major course of study and the various strategies have also been investigated in order to enhance the teaching quality by improving teaching management, leadership styles in various colleges and universities of China. Apart from this, we also studied the English teaching ability algorithm, which was based on notch filtering and data fusion, which seems to be the effective algorithm in order to examine the English teaching qualities.

English teaching ability evaluation algorithm based on management, leadership abilities, data fusion and notch filtering

Data fusion

The evaluation of numerous interconnected information which have ability to provide competing information of the same behavior is known as data fusion. The method of fusing and Correlating information from various sources often provides more appropriate conclusions as compared to the examination of a single dataset. Moreover, the process of Data fusion is frequently classified as high, moderate, or low level according to the steps of the processing at which fusion occurs. Data fusion at low level merges various raw sources of data to develop more useful raw data. which seems more informative and useful as compared to the original single dataset.

Teaching management and leadership abilities

For the better performance of the students, teaching management and leadership styles holds great importance. Leadership is concerned with motivation, vision, the future, and the individuals and team within your organization or school. Management provides process and methods that are important to the effective functioning of the school on a daily basis.

Management and leadership are both required for successful development of teaching qualities, entrepreneurship including education and school development.

1.1 Establishing evaluation index hierarchy system

On the basis of data fusion, the construction of the evaluation index system of teachers' English teaching ability must be hierarchical, from top to bottom, from the national level to schools to departments, from macro to micro, and form a closely connected evaluation system. It is important to ensure that the evaluation indicators have certain typical representativeness and reflect the comprehensive characteristics of the indicators as accurately as possible. In addition, the setting of the evaluation index system, the distribution of weight among indexes and the division of evaluation standards should be consistent with the evaluation purpose and evaluation method. The selection of indicators should fully take into account the dynamic characteristics of the evaluation object, and indicators should be set based on the premise of teachers' independent development. Similar to the action principle of notch filtering, the comprehensive applicability and inclusiveness of the system should also be fully considered in the data selection process of the index system [7-10]. Combined with the iceberg theory and the research theme of this paper, the easy to measure explicit indicators, basic teaching skills and teaching research ability correspond to the explicit quality at the top of the iceberg, and the key quality at the bottom of the iceberg is expressed by teachers' basic quality and teachers' personal planning and summary. The theoretical structure of iceberg is shown in Figure 1:

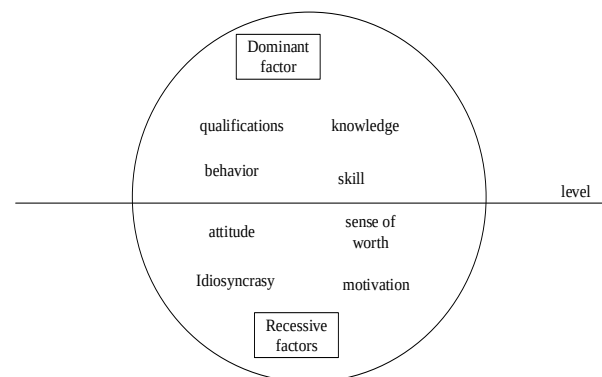


Fig. 1 Theoretical structure of iceberg

According to figure 1, based on the experience and lessons of English teaching ability, this paper expands the relevant levels of data fusion when constructing the hierarchical structure system of College Teachers' teaching ability evaluation index. First, the project of self-assessment was added to promote the practical guidance and development of evaluation indicators [11-13]. Second, based on the iceberg ability structure theory, teachers' personal internal quality and characteristics are more decisive to their teaching behavior, so this index system adds this part of the evaluation index. Third, it enriches the evaluation subject. The data information of the evaluation subject not only covers the traditional superior departments and students, but also

emphasizes the evaluation significance of teachers themselves. Fourth, teachers' optional evaluation index items are added, which can make teachers get what they want to know through teaching ability evaluation. Fifth, the setting of optional indicators increases the diversification and personalization of teachers' English teaching ability evaluation. Level 1 indicators should be differentiated into Level 2, level 3 or even more finely, so as to comprehensively and scientifically reflect the comprehensive quality of teachers' English teaching ability. The specific theoretical comparison of College Teachers' English teaching ability evaluation indicators is shown in Table 1:

Table 1 Comparison of English teaching ability levels

Iceberg capability level	Content	Iceberg capability level	Content
Skill	Expression ability, organization ability, decision-making ability, etc	Role positioning	Managers, experts, teachers
Motivation	Achievement demands	Sense of worth	Spirit of cooperation and dedication
Quality	Integrity, responsibility and honesty	Qualifications	Teaching experience, career planning
Knowledge	Management knowledge, professional knowledge, etc.	Self-cognition	Confident and optimistic

It can be seen from table 1 that when selecting indicators, we should pay special attention to their consistency in the overall scope. The construction of indicator system serves the formulation of regional policies and scientific management. Its calculation measurement and method must be consistent, unify major indicators, be as simple and clear as possible, and facilitate data collection, ensure that it has strong microstructure [14-15]. Taking the student achievement as the statistical data for the evaluation of teachers' English teaching ability, when the student achievement is known, the data calculation formula of the horizontal standard in the iceberg theory is as follows:

$$E = \frac{1}{q} \sum_{u=1}^r d(u) \quad (1)$$

In formula (1), q represents the teaching time of the teacher, d represents the average English score of students, r represents the number of students, and u represents the median total score. In addition, when setting and selecting various evaluation indicators, we must adhere to the principle of scientificity to ensure that the relationship between the performance of the evaluation object and various indicators is truly reflected. The indicators set must be representative, not overly simplified or complicated, so as to avoid information omission, resulting in untrue evaluation results. Moreover, it is necessary to ensure that the data acquisition is relatively simple and the specific operation method is simple and clear. Based on this, the steps of constructing the evaluation index hierarchy system are completed.

1.2 Construction of evaluation model by data fusion and notch filtering

Using data fusion and notch filtering technology to build evaluation model is an important link in algorithm design [16-17]. Teachers' teaching ability is often reflected by the test score on the course. More accurately, it is through the discrimination of test questions answered correctly by students. In terms of difficulty, whether a student's learning ability is strong or weak, in order to accurately evaluate learning ability, we also need to evaluate the English course and the discrimination and difficulty of each section of the course. Data fusion is the core of network security situation assessment, which runs through all stages of situation assessment. Data fusion is the combination of data from multiple information sources [18]. Combined with the principle of notch filtering, these multi-source heterogeneous data are obtained, and the valuable data information required for further decision-making analysis is obtained. This information is more accurate than that of single data source. Based on this premise, this paper proposes a corresponding capability evaluation model. The overall framework is shown in Figure 2:

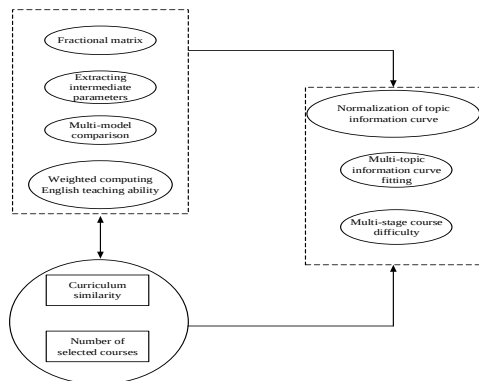


Fig. 2 Evaluation model framework

As can be seen from Figure 2, combining the BIC value of Bayesian information criterion and the simple optimization principle, comparing the training results of multiple IRT models, selecting the implicit variable value calculated by the optimal model to calculate the learners' learning ability, which can preliminarily obtain the teaching ability of teachers in the course. Select the optimal model to calculate the information among of each topic, and fit the information amount curves of all topics to obtain which levels of students the course highly differentiated. We define multiple different peaks as the multi-stage difficulty of the course. The reason

why we want to define the multi-level difficulty of the course is that each course is not only to distinguish the learners in one ability range, but often divides the learners into passing, good and excellent levels. The middle difficulty coefficient is the average difficulty of the course calculated according to the weight of the course test questions. The average difficulty of the course can be used to match learners' learning ability to recommend learning resources. In this way, the recommended results will not make learners feel too difficult or too weak. On this basis, the probability calculation formula of learners' correct answer score 2 is obtained as follows:

$$p = \int_{m=-\infty}^{mi} l \times \sqrt{2\pi} dm \quad (2)$$

In formula (2), m represents the discrimination parameter of the topic, l represents the difficulty parameter, and i represents the number of corresponding topics. When the guessing coefficient is added, formula (2) becomes the following form:

$$p_1 = v_i + (1 - v_i) + l \times \frac{1}{w} \quad (3)$$

In formula (3), l represents the difficulty parameter, w represents the peak value of the normal distribution curve, i represents the number of corresponding questions, and v represents the guess coefficient. At the same time, the multi-level difficulty of the course can also be used to evaluate learners' cross course learning ability. Although formula (2) and formula (3) establish the basic form of the model in theory, it can be seen that the integral form is used in the calculation process, which is not very suitable in parameter estimation and practical application. Therefore, the form of three parameter logistics is adopted instead, specifically:

$$T = v_i + \frac{1 - v_i}{1 + c^{[-Ev_i]}} \quad (4)$$

In formula (4), i represents the number of corresponding questions, v represents the guess coefficient, c represents the type of score, and E represents the average difficulty of the questions. When a student chooses courses in the same field or similar courses later, if there are a large number of English courses, it indicates that the previously

calculated course difficulty is relatively objective, and the approximate level of the student in the course can be estimated through the similarity between courses. If the number of courses selected is small, students of two English courses can be selected as a bridge at the same time, and the transfer relationship of learning ability of the two courses can be obtained by fitting the relevant data, so as to estimate the approximate level of the student in another course. Based on this, complete the steps of building the evaluation model.

1.3 Extracting the core dimension characteristics of English teaching ability

Based on the above comparative analysis of teachers' teaching ability standards and learning from the content of knowledge and teaching skills in each

standard, the teaching ability model to be constructed in this study will be carried out from three links: before class, in class and after class. Before class, it points to the professional basic knowledge and skills that should be possessed and the teaching preparation before teaching activities. The course points to the rational use of teaching resources and appropriate teaching methods to organize and implement teaching. After class, it points to the evaluation and reflection on the teaching process, from which we can continue to learn, so as to promote professional development. Therefore, the preliminary framework of teaching ability mainly focuses on knowledge and skills, teaching design, teaching implementation, teaching evaluation and reflective development. In this paper, the characteristics of capability dimension are summarized into six levels, as shown in Figure 3:

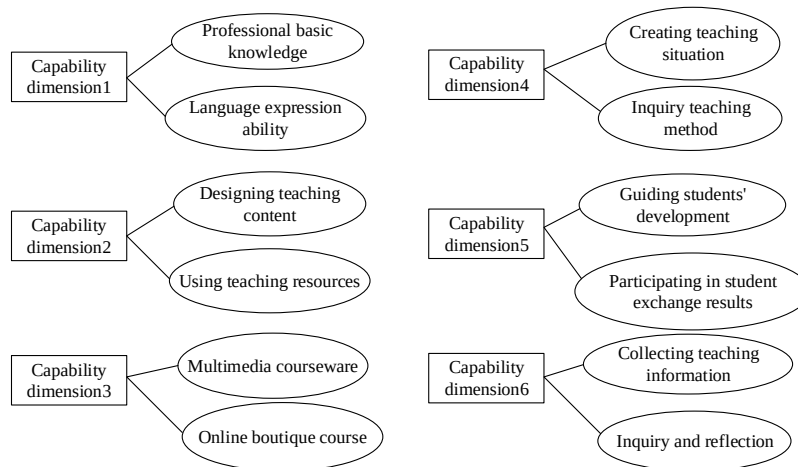


Fig. 3 Core dimension feature structure

As can be seen from Fig. 3, the above six features include more detailed judgment criteria. Professional knowledge includes teachers' educational knowledge, subject knowledge, general knowledge, and familiarity with teaching methods and teaching ideas in different environments [19-20]. Teachers should master certain information technology ability, use corresponding technology to collect high-quality resources, process and process them, and make high-quality courseware and micro course resources, so as to develop online course resources and digital school-based teaching materials with local characteristics, so as to become the creator of resources and the developer of courses. Assuming that the capability parameter distribution follows the normal distribution, the conditional distribution expression formula of the score matrix is obtained as follows:

$$G(\beta|k) = \sum_{a=1}^a (\beta|k) \times aS \quad (5)$$

In formula (5), β represents the parameter of English topic, k represents the number of students with high learning ability value, S represents the likelihood function, and a represents the number of students who answer the specified topic correctly. According to teaching analysis and reflection, formulate teaching development plan, constantly enrich teaching experience, improve professional quality and realize self-development. Based on the above description, complete the steps of extracting the core dimension features of English teaching ability.

1.4 Random walk algorithm setting evaluation mechanism

Teachers need to have the ability to integrate information technology into the teaching process, create a digital teaching situation and provide support for the development of effective teaching. Teachers need to have the ability to design and implement teaching methods that can improve students' high-level thinking and promote students' all-round development. Teachers should have the ability to provide students with personalized learning services through multidimensional and diversified evaluation of students. Teachers should have the ability to achieve self-development and renewal through the evaluation and self-reflection of the teaching process and students. Correlation analysis is to explore the regularity of the correlation between phenomena by means of mathematical statistics, and predict and control accordingly. It is a common statistical method to study the closeness between variables. Combined with the concept of correlation coefficient in random walk algorithm, the calculation process can be expressed as: convert each variable into standard unit, and the average of the product is the correlation coefficient. The correlation coefficient, also known as Pearson correlation coefficient, shows the closeness of the correlation between the two phenomena. On this basis, the relationship between student evaluation and teacher ability evaluation is obtained. The specific expression formula is as follows:

$$f(x, y) = \frac{\delta}{(\sqrt{I(x)I(y)})^{-1}} \quad (6)$$

In formula (6), x, y represents two correlation coefficients respectively, and δ represents the closeness of the evaluation phenomenon. According to the random walk algorithm, there are a large number of interrelated, interdependent and restrictive relationships between things, mainly manifested in two types of relationships: one is functional relationship, the other is correlation relationship. In the analysis of student evaluation data, each index in the student evaluation scale can be regarded as a variable factor, and the expression formula of exploratory factor is:

$$\phi = H + \frac{t^2}{\sqrt{j}} \times \frac{1}{t} \quad (7)$$

In formula (7), H represents the number of teacher samples, t represents the initial variable, and j represents the common factor. Because factors cannot be directly observed and calculated, we can calculate the score of factors on each index and get the calculation formula of contribution variance as follows:

$$Z = \eta^2 \times D^{-1} + g_n \quad (8)$$

In formula (8), η represents the number of factors, D represents the estimated value of factors, g represents the factor load, and n represents the correlation coefficient. Just as doctors diagnose patients and prescribe patients relying on a solid medical theoretical basis, they should give corresponding suggestions to each patient in combination with patients' eating habits and living habits. Similarly, to evaluate or diagnose a teacher's teaching ability, students' evaluation is an important factor, but not the only factor. Students are the direct beneficiaries of teachers' teaching. If students generally cannot recognize teachers' teaching, then teachers' teaching must have problems. Of course, objective factors such as teaching thought, course nature and course content often restrict the innovation of classroom teaching and the exertion of teachers. It is difficult for students to understand and quantify these constraints in the process of teaching evaluation. Based on this, complete the steps of setting up the evaluation mechanism.

Experiment

2.1 Building an experimental environment

In order to verify the effectiveness of the designed English teaching ability evaluation algorithm, an experimental environment is built according to the needs of the experimental test. The technology of connecting database in Java is JDBC. Java programs connect with the database through JDBC driver to perform operations such as querying and extracting data. Sun has also developed JDBC-ODBC bridge. Using this technology, Java programs can access databases with ODBC drivers. At present, most database systems have ODBC drivers, so Java programs can access databases such as Oracle, Sybase, Ms SQL server and MS Access. On this basis, the statistical information is shown in Table 2:

Table 2 Data statistics

Data name	Number of tuples(K)	Number of attributes
DBLP-1-2	50	2
DBLP-1-4	50	4
DBLP-2-2	500	3
DBLP-1-4	500	5
DBLP-3-2	5000	4
DBLP-3-4	5000	6

Based on the two-tier structure (C / S) data access logic and application logic (data processing), the three-tier structure separates the user interface from the application logic as a separate part, and divides the client into two parts. One part is the Internet user interface based on browser, and the

other part is the application server independent of data storage logic and end-user interface, It can also be called "middle tier" server. These "middle tier" application servers need both Web-oriented interfaces and database service-oriented interfaces. In this way, when the web server receives that the web client needs to connect with the database to access the dynamic data content, the connection between the database server and the web server can be established through the two interfaces of the application server. In the above experimental environment, experimental test is carried out.

2.2 Experimental result

This paper selects the English teaching ability evaluation algorithm based on heterogeneous network and the English teaching ability evaluation algorithm based on FLFM for experimental comparison with the designed English teaching ability evaluation algorithm. Test the data integrity of the three evaluation algorithms under different data scales. The higher the value, the better the performance of the algorithm. The experimental results are shown in table 3-4:

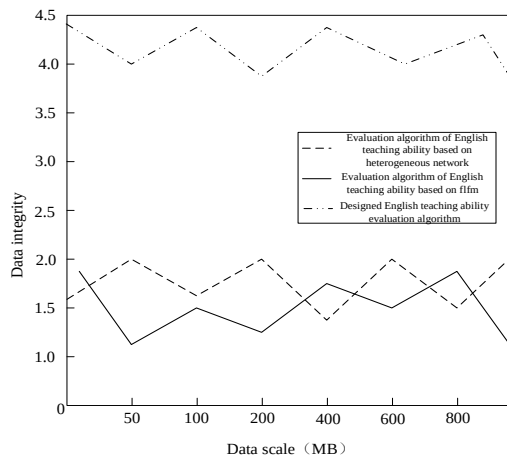
Table 3 Data size 200MB estimation algorithm data integrity

Number of experiments	Evaluation algorithm of English teaching ability based on a heterogeneous network	Evaluation algorithm of English teaching ability based on FLFM	Designed English teaching ability evaluation algorithm
1	0.505	0.633	0.824
2	0.614	0.574	0.793
3	0.587	0.625	0.816
4	0.602	0.577	0.855
5	0.596	0.644	0.781
6	0.611	0.651	0.811

Table 4 Data size 800MB estimation algorithm data integrity

Number of experiments	Evaluation algorithm of English teaching ability based on heterogeneous network	Evaluation algorithm of English teaching ability based on FLM	Designed English teaching ability evaluation algorithm
1	3.224	3.332	8.455
2	2.946	2.678	7.541
3	3.655	3.224	7.220
4	2.997	2.784	7.348
5	3.551	3.346	8.341
6	3.164	3.557	8.255

From table 3 and table 4, we can get the average data integrity of the three evaluation algorithms when the data scale is 200MB and 800MB, as shown in Figure 4:

**Fig. 4** Data integrity mean of three evaluation algorithms

According to figure 4, the average data integrity of the designed English teaching ability evaluation algorithm is 4.33, and the average data integrity of the other two evaluation algorithms is 1.921 and 1.885, indicating that the designed English teaching ability evaluation algorithm has better performance.

Conclusions

In conclusion, we examine that from recent many

years with the development of science and technology the importance of education also has been increase. The most important development has been occurred in the field of English teaching. With the rapid industrialization, English has become a major course of study. Many developing countries has been focusing on learning English as their major course in order to increase the progress of their country. In this research paper, we studied the importance of English language teaching in the development of the country economy and the English teaching ability evaluation model is used which was based on the teaching management, leadership abilities, entrepreneurship including education. Furthermore, data fusion and notch filtering techniques has been used to investigate the English teaching abilities in various school and colleges of China. Moreover, we examined that the previously used techniques of English teaching ability evaluation examined the abilities of English teaching based on only teachers' and experts' subjective perception, whereas neglecting students' perspectives, which was extremely different from actual teaching results. Simultaneously, the applicability of teaching ability analysis techniques was low, due to which the accuracy of the collected results was also low. That is why, in this research article, we investigate the optimized evaluation methods for evaluating abilities of English teaching. Apart from this, in order to enhance the performance of the English teaching ability evaluation method, in this research, we utilized English teaching ability evaluation algorithm which is based on notch filtering / frequency effect and data fusion. This algorithm presents the evaluation index

model based on the perspectives of experts, students, and teachers.

According to the design process of English teaching ability evaluation algorithm, students' ability evaluation factors of teachers are adopted. By studying the relationship between completely subjective indicators and total achievement, it is found that students' teaching evaluation achievement has little impact on teachers' English teaching ability. It enriches the academic literature on English teaching ability evaluation algorithms and promotes the development process of data fusion and notch filtering.

Apart from this, this study seeks effective approaches from a variety of perspectives, including teaching management, leadership abilities, teaching quality of English teachers, as well as students' performance. Furthermore, various strategies that can improve students' practical abilities are also presented in the research.

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