English Teaching Ability Evaluation Based on Fuzzy K-means Clustering Algorithm

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Abstract. With the continuous progress of my country's social economy and the continuous improvement of people's material living standards, people's demand for teaching standards is increasing. In recent years, many higher vocational colleges in our country have hired many foreign teachers when opening English classes. Higher vocational colleges are different from traditional schools. They pay particular attention to cultivating students' skills. Using foreign teachers in English classrooms can enable students to understand English knowledge and improve their later use ability. However, in English classroom teaching, too many foreign teachers have brought a lot of problems to the teaching ability evaluation system of English foreign teachers and caused difficulties to the teaching management of higher vocational colleges. Based on the fuzzy K-means clustering algorithm, this paper has launched a series of research and discussion on the evaluation of English teaching ability. In the context of the modern big data era, in order to improve the teaching ability of English teachers, improve the quality of college teachers, and provide students with better teaching services, teachers can start with the main factors that influence and influence the improvement of college English teaching ability. In this paper, by designing a college English teaching ability evaluation system, based on the establishment of the constraint parameter index analysis model, the ability evaluation of the big data information model is carried out, and the ability constraint function information is extracted. A combination of K-means clustering algorithms, clustering and integrating proficiency index parameters, completing the preparation of an educational resource allocation plan, and achieving scientific evaluation of the English language ability. The experimental results show that the use of the K-means fuzzy clustering algorithm to evaluate the English language proficiency has an excellent information fusion analysis capability. This improves the accuracy of educational ability evaluation and the efficiency of educational resources.

Keywords: Fuzzy K-means clustering algorithm, English teaching ability, Ability effect evaluation, Big data era

1. Introduction
As an international language, English has become the second language of most people in the world and is widely used internationally. With the continued development of globalization in the economy,
learning English well has become the consensus of many people. In this context, improving the English language proficiency of university English teachers is very important to improve the English learning efficiency of modern college students and to achieve fluency in English [1]. Whether in the application level, in the actual situation of students, or in order to meet the requirements of professional evaluation, teachers must continuously improve their teaching ability [2].

Teaching evaluation refers to the use of all effective technical means to measure, evaluate, and evaluate the process and results of teaching activities based on teaching goals, and to establish scientific standards and norms. This evaluation system can effectively avoid the situation of blindly introducing foreign teachers in higher vocational colleges, and it also has a very significant improvement in the teaching management of foreign teachers. The evaluation of the teaching ability and effect of English foreign teachers in higher vocational colleges has many functions [3].

First, the assessment of teaching ability has a diagnostic function. Evaluation of the educational competence and effectiveness of English teachers, they can judge their valuable activities based on actual effects and basic records. In this process, colleges and English teachers can understand all aspects of teaching and be clear Recognize the effectiveness and problems in actual teaching [4]. At the same time, in a reasonable evaluation system, it can also reflect the problem, whether it is the problem of teaching methods, or the lack of teaching resources. Through these effective evaluations, the deficiencies of foreign teachers’ teaching ability and effectiveness can be diagnosed [5]. Second, the teaching ability assessment has a guiding role [6]. College education is paying more attention to the training of students' professional skills. This also requires that students have higher independence and initiative [7]. In view of this feature, when teaching English teachers are evaluated, teachers and students will be allowed to understand the evaluation standards and requirements in advance. In order to meet this requirement, English teachers will have more teaching goals when teaching [8]. Third, teaching evaluation determines the value of foreign teachers to a certain extent. In order to achieve better results in the evaluation, English teachers are more active in daily teaching work [9]. In addition, he can also improve his knowledge and teaching level through continuous learning, It is possible to improve the quality of English education at a university by allowing university English teachers to focus on English education. [10].

2. Method

2.1 K-means algorithm
For category U, the calculation formula for the j-th dimension of the center point is:

\[ U_j = \frac{1}{N} \sum_{i=1}^{n} X_{ij} \]  

(1)

N is the number of data of class U, and X_{ij} is the j-th dimension data of X_i. The calculation formula of Euclidean distance is:

\[ \text{Dist}(X_i, X_j) = \sqrt{(\sum_{k=1}^{m} (X_{ik} - X_{jk})^2)} \]  

(2)

Among them, \( X_i, X_j \) represent the m-dimensional data object in the data set, and k represents the dimension.

For the value of i, the calculation formula of the scatter matrix \( S_i \) is:

\[ S_i = \sum_{x \in C_i} (X - U_i)(X - U_i)^T \]  

(3)

For the overall data, the calculation formula of the scatter matrix \( S_S \) is:

\[ S_S = \sum_{x \in S} (X - U_S)(X - U_S)^T \]  

(4)

In the conventional k-means algorithm, the loss function is an error square sum function and the calculation method is as follows.

\[ J_c = \sum_{i=1}^{k} \sum_{x \in C_i} ||X - U_i||^2 \]  

(5)

2.2 Big data evaluation algorithm
Construct a differential equation to express the information flow model of English teaching ability constraint parameters as:
\[ x_n = x(t_0 + n \triangle t) = h[z(t_0 + n \triangle t)] + \omega_n \quad (6) \]

In the high dimensional feature distribution space, the correlation vector method is used to calculate the solution vector of the English language ability evaluation, and feature training subset teaching ability evaluation should meet the following conditions:

\[ \Sigma = \text{diag}(\delta_1, \delta_2, \cdots, \delta_r), \delta_i + \sqrt{\lambda_i} \forall i \neq j; \quad (7) \]

For the distribution sequence of the statistical characteristics \( x(n) \) of the multivariate The English language proficiency evaluation data information flow model constructed based on the previous statistical measurement values is set as follows.

\[
\begin{align*}
    c_{1x}(T) &= E\{x(n)\} = 0 \\
    c_{kx}(T_1, T_2, \cdots, T_{k-1}) &\equiv 0, k < 3
\end{align*}
\]

When \( q=2 \), the teacher's strength level of the English language proficiency evaluation and the allocation level of educational resources satisfy the (2 + 1) continuous function conditions. In other words, the evaluation of English language education has convergence and convergence. Condition:

\[ \Psi_x(\omega) = \ln \Phi_x(\omega) = -\frac{1}{2} \omega^2 \sigma^2 \quad (10) \]

2.3 Scientifically and reasonably formulate evaluation items

To establish the educational ability and effectiveness evaluation system of foreign teachers in the technical college select evaluation items rigorously so that the selected evaluation items fully reflect the teaching ability and effect of foreign teachers. The teaching evaluation of foreign teachers should take the teaching purpose as the guiding direction, and transform it into a measurable student behavior goal, fully based on their goals, formulate reasonable courses, teaching materials and teaching plans, and organize related teaching activities, fully based on the behavior The goal is to carry out a reasonable evaluation of the actual effect of teaching activities, and fully determine whether the implementation effect can meet the original goal. Using this method, we can fully and effectively formulate the teaching goals of foreign teachers of English, and compare the teaching effect with the expected goals, in order to strengthen the judgment of the teaching ability of foreign teachers. When evaluating, we need to consider various factors. It is not only necessary to select evaluation items according to the students' test scores, but also to evaluate the students' English ability and overall quality in listening, dialogue, reading, writing, translation and other learning. This is the first time that foreign teachers can pay attention to the overall training of students in the education process, and the high school will enable them to determine the educational ability of foreign teachers from many aspects, and can take out relevant training for the shortcomings of foreign teachers, and urge foreign English teachers to correct them. Shortcomings, so as to be able to target foreign teachers in teaching. The corresponding training is insufficient to fully promote the efficiency of foreign teachers' classroom teaching.

2.4 Strictly follow the system in the evaluation system

You must follow the basic principles of the evaluation system strictly. One is the principle of authenticity and reliability. Establishing an evaluation system is to make reasonable judgments about the level of education of a foreign English teacher by a university, and to find out the deficiencies in their teaching to improve and improve. Therefore, the final result of the evaluation must be true and effective in order to better complete the teaching goals. The second is the principle of difference. Because the main body of students in foreign teachers' English classrooms is different, and the classes of professors are also different, coupled with the difference in the ability of students to accept night tours, foreign teachers of English teachers pay more attention to the existence of this difference when conducting teaching assessments. It should also focus on studying the differences between students and classes, and strictly ensure that foreign teachers are evaluated according to different standards. The
main purpose is to enhance the comprehensive ability of students in English. The third is the principle of diversity. Its principles are reflected in teaching management. Vocational colleges focus on analyzing the teacher-student relationship between English foreign teachers and students and the actual situation in daily classroom teaching, scientifically and rationally formulating diversified assessments, and strengthening students' interest in learning and overall quality. The promotion.

3. Modeling method

3.1 Fuzzy K-means clustering model

The entropy feature extraction value of the English education ability feature information is as follows.

\[ P_{\text{loss}} = 1 - \frac{1 - p_0}{\rho} = \frac{p_0 + \rho - 1}{\rho} = \sum_{n=1}^{N} p_{k,n} \]  

(11)

Since D is the perturbation feature vector of the education capability evaluation, the English educational ability evaluation formula is converted to the least square solution, as follows:

\[ z(t) = x(t) + iy(t) = a(t)e^{i\theta(t)} + n(t) \]  

(12)

The perturbation function is executed for the empirical distribution data of K-type educational capability evaluation, and the subcategory set of the K-type education ability evaluation is acquired. Therefore, the use rate of English education resource allocation can be expressed as follows.

\[ U_{\text{util}} = \zeta \bar{X} \]  

(13)

Build a hierarchical tree and solve the similarity of the distribution of educational resources using fuzzy proximity filling method.

\[ \text{Sim}_1 (d_i, d_j) = \frac{\sum_{k=1}^{M} w_{ik} \cdot w_{jk}}{\sqrt{\sum_{k=1}^{M} w_{ik}^2} \cdot \sqrt{\sum_{k=1}^{M} w_{jk}^2}} \]  

(14)

\[ P(w|x) = P(x|w)/P(x) \]  

(15)

4. Results

Through a series of studies, some classroom competence is found to be very important to the teaching ability of a college English teacher. Figure 1 shows the importance of curriculum development skills for the teaching ability of English teachers.

![Fig. 1. The importance of curriculum development capabilities](image_url)
average 17.0%; only 2.7% of people think that curriculum development ability is not important for English teachers in foreign language colleges. It can be seen that English teachers in foreign language colleges generally believe that the ability of English curriculum development is relatively important for them.

Through the survey, it is found that college English teachers have several methods for cultivating the ability of curriculum development, as shown in Table 1.

Table 1. Main methods of cultivating curriculum development ability

| Options | Find auxiliary materials other than textbooks to enrich teaching resources | Reintegrate the knowledge in the textbook | Pay attention to the frontier dynamics of the curriculum and cultivate students' innovative consciousness and thinking ability | Other methods |
|---------|----------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------|---------------|
| Number of people | 68                                      | 45                                        | 57                                                               | 1             |

From the data in Table 1, it can be seen that there are three main methods commonly used by college English teachers in curriculum development: 60.7% of those who enrich teaching resources by searching for auxiliary materials other than textbooks; and by focusing on the frontier dynamics of the course The most valuable part of the most cutting-edge knowledge is shown to students, inspiring students to think, and cultivating students' innovative consciousness and thinking ability accounted for 50.9%; by re-integrating the knowledge in the textbook, the knowledge is more conducive to student acceptance. Those who taught to students accounted for 40.2%. It can be seen that, in the course development process of foreign language colleges and universities English teachers attach great importance to collecting teaching resources from books other than textbooks to enrich the classroom content.

![Fig. 2. The frequency of teacher access to materials when preparing lessons](image)

It can be seen from Figure 2 that most English teachers in colleges and universities can reflect on whether the teaching methods used in the course are appropriate and can often make self-assessment on the effectiveness of classroom teaching. However, combined with the above research results, we can conclude that although most English teachers in colleges and universities often consult materials when preparing lessons, the coverage of the materials they consult is relatively narrow, and to a certain extent, they ignore the inquiries and materials related to the development of English courses. Collecting results in a lack of ability in the development of English courses.

5. Conclusion
By summarizing the full text, this article allows you to find out the path to improve your English
teacher's educational ability from the viewpoint of the fuzzy k-means clustering algorithm. It will not only allow university English teachers to consciously improve their teaching skills, but also conforms to the current education system in my country. As our country people become more and more interested in English education, the number of university English teachers in Japan is gradually increasing. We need to develop a scientific and rational evaluation system for the teaching effectiveness and ability of English teachers. Therefore, in the selection of English teachers, we should focus on strengthening the rational selection of evaluation items, the reasonable and clear evaluation subject, and the basic principles that must be strictly based on the formulation of the evaluation system, in order to better serve the English teachers of Chinese universities and colleges. Develop a reasonable system for the evaluation of teaching effect and teaching ability. Therefore, it is necessary to scientifically select evaluation items and scientifically establish the main body of the evaluation. At the same time, three basic principles must be followed in the evaluation. Only in this way can a good evaluation system of college English teachers' teaching ability and effectiveness be constructed.

References
[1] Syafrizal S, Pahamzah J. A Comparative Study between the Use of Role Play and Discussion Method in Teaching Speaking Ability[J]. IJET (Indonesian Journal of English Teaching), 2020, 9(2):227-241.
[2] Linlin Y, Song Z. English teaching model and cultivation of students' speculative ability based on internet of things and typical case analysis[J]. Journal of Intelligent and Fuzzy Systems, 2019, 37(5):1-9.
[3] Gao F. Establishment of college English teachers' teaching ability evaluation based on Clementine data mining[J]. Journal of Intelligent and Fuzzy Systems, 2020, 38(6):1-9.
[4] Rachmawati d l, fadhilawatid. Teachers' self-efficacy, English ability, and teaching ability in EFL settings: a case study at higher education level. Journal of exposure education in English and Literature, 2020, 9(1):40-58.
[5] Sitorusn. Application of communicative language teaching to improve students' ability to speak. Julus Dan Pembelajaran 2019, 2(3):252-255.
[6] Haviz m, Maris I m, herlinae. The relationship between educational experience and educational competence by TPACK: the recognition of mathematics and science lecturers at the Islamic University. Journal of Science 2020, 4(1):1-7.
[7] Mauliandari R, Sumarwati M, Upoyo A S. Peer Learning: An Effective Teaching-Learning Method for Improving Ability in Arterial Blood Gases Interpretation[J]. Nurse Media Journal of Nursing, 2020, 10(3):329-338.
[8] Zotrius LITA Z, nofriyandi n, itiskomahe. Increased self-efficacy and self-regulation by geogebra based education reviewed from early mathematical ability (IMA) level [J].International Journal of Instruction, 2021, 14(1):587-598.
[9] Wang Y, Ma X. Research on Blended Teaching Ability of College English Teachers[J]. Open Journal of Social Sciences, 2020, 08(12):308-319.
[10] Molla N L. Communicative Language Teaching (CLT) Approach Towards Speaking Ability[J]. English Focus Journal of English Language Education, 2019, 2(1):10-24.