

Cross-Cultural Awareness of College Students Based on Cross-Cultural Communication

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Objectives: Cross-cultural communication lays the foundation for sustainable development education. In order to further improve the level of cross-cultural awareness of college students in China, a recommendation algorithm based on cross-cultural communication comparison model is proposed. **Methods:** The algorithm uses the keywords with high weight in the recommended items as the attribute characteristics of the recommendation items, and then recommends the items with the closest vectors (the highest score of the vector calculation with user characteristics) to the users. **Results:** TF-IDF method is used to calculate and calculate the keywords with high weight in intercultural communication mode as describing user characteristics, and these keywords are used as describing vector of user characteristics, so as to construct the intercultural awareness model of College students. Finally, APRIORI ALL algorithm is used to train and test the model. **Conclusion:** The test results show that the error is less than 5%. The experimental results show that the proposed algorithm is effective. The intercultural awareness model can improve the intercultural communicative competence of college students and provide a reference for English intercultural teaching in basic education stage.

Keywords: cross-cultural, College students, communication, consciousness

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The formation of economic globalization and economic integration has promoted the development of cross-language English education in Colleges and universities. With the deepening of cross-cultural exchanges, how to improve the cross-cultural awareness of college students in China is imminent¹. Therefore, in order to meet the needs of China's economic development and international exchanges, it is urgent to build a cross-cultural awareness training model for college students based on cross-cultural exchanges². Language and culture are closely related. Language is the reflection of

all social life experiences and cultural characteristics of a nation. Culture is what a society does and thinks. Language and culture complement each other. There is no culture without language and no language divorced from culture. Therefore, it is especially important to infiltrate the cross-cultural communication awareness of college students in language teaching³. However, at present, most of the relevant studies on cross-cultural awareness approaches at home and abroad focus on a whole level, and more in-depth studies are scarce. Therefore, it is of great significance to study the cross-cultural awareness of college students on the

basis of cross-cultural communication.

With the deepening of cross-cultural exchanges around the world, colleges and universities pay more and more attention to the cultivation and improvement of College Students' cross-cultural awareness, and there are various ways to cultivate cross-cultural awareness⁴. How to choose effective ways to cultivate college students' cross-cultural awareness is very important. Therefore, a recommendation algorithm based on the comparison of intercultural communication modes is proposed to study the construction of intercultural awareness model for college students. The method of this algorithm for model is to use previous data as data set, and then learn a model from this data set. When calculating the similarity between user's eigenvector and the recommended item's eigenvector, cosine method is generally used to calculate the cosine value of the angle between two vectors⁵. The algorithm can effectively screen the ways of cultivating cross-cultural awareness.

The APRIORI ALL algorithm based on the cross-cultural awareness model of college students is proposed innovatively. By establishing feature vectors of user's target set, the frequent data sets in data values are found, and the patterns of these sets are helpful for colleges and universities to choose the best way to cultivate students' cross-cultural awareness under the background of cross-cultural communication, thus solving the singularity of the target of traditional algorithm screening. Therefore, the proposed algorithm is innovative⁶.

The recommendation algorithm is used to study the cross-cultural awareness of college students based on cross-cultural communication. A model of College Students' cross-cultural awareness based on APRIORI ALL algorithm is constructed. Based on the comparison of cross-cultural communication modes, a recommendation algorithm is proposed. The main principles and implementation process of the algorithm and model are analyzed concretely. Finally, the validity of the proposed algorithm and model is verified by experiments, and the experimental results are analyzed and summarized.

In recent years, more and more scholars have done a lot of research on College Students' cross-cultural awareness under the background of increasingly frequent cross-cultural exchanges, and have achieved some achievements. Based on Byram's theory of cross-cultural competence assessment model, Wang Z constructed a cross-cultural competence assessment scale for Chinese college students with good reliability and validity. The results show that the localized ICC scale for Chinese college students has been proved to be reliable and effective in practical measurement. Cui S investigated and analyzed the development of cross-cultural competence of Chinese college students through empirical data. The study finds that the cross-cultural competence of Chinese university students is generally at a weak to general level, which provides a data support for the training plan design and teaching mode and method improvement of international talents under the background of "one belt and one road" strategy⁷. Alt tested participants' cross-cultural awareness before and after training through questionnaires. The results show that the experiential approach is generally effective in improving participants' cross-cultural awareness⁸. Lokkesmoe K J used Robert G. Hanwei's four-level theory of cross-cultural awareness to study the cross-cultural awareness of post-90s Chinese College students. It is found that only 47.2% of the students' cross-cultural awareness is in the third level, and there is no students' cross-cultural awareness in the fourth level⁹. Angelova M took English teachers' cross-cultural awareness as the research object, and constructs a development model of English teachers' cross-cultural awareness. The study finds that the model can improve students' cross-cultural communicative competence and is feasible¹⁰. Savva M used quantitative and qualitative data analysis methods to analyze the subjects' cross-cultural awareness, cross-cultural sensitivity and cross-cultural effectiveness. The results show that the circular model of intercultural communicative competence teaching practice can improve the intercultural communicative competence of College students¹¹. Howard B. S. constructed a model of influencing factors of English teachers' cross-cultural awareness, and conducts a case

study on the classroom teaching of two English teachers in two middle schools in Chongqing. It is found that many factors affecting the development of English teachers' cross-cultural awareness are related to the importance attached by colleges and universities¹². Lwin S M established a "diamond structure" model of cross-cultural management, and applies it to business management activities. The results show that the model is effective and can comprehensively analyze the practice of cross-cultural management of nuclear power in Daya Bay¹³. Alexis F proposed a two-way expansion model, which is considered to be an effective way to construct cross-cultural identity¹⁴. Budden M C constructed a cross-cultural adaptation model based on psychological capital. The study finds that psychological capital is the most dynamic and interventional element of cross-cultural adaptation¹⁵.

Through the research of scholars, it can be seen that with the globalization of economy, science and technology and culture, more and more people around the world need intercultural communication, and intercultural communicative competence is becoming more and more important. Many scholars have constructed different research models, and have done a lot of related research on the influence of the cultivation and improvement of College Students' intercultural competence. However, most scholars' research perspectives are in the macro aspect. With the deepening of cross-cultural communication, it is of great significance to study college students' cross-cultural awareness on the basis of previous studies from the perspective of cross-cultural communication.

METHODS

Recommendation Algorithm Based on Cross-Cultural Communication Mode Comparison

With the increasing frequency of international exchanges, College English teaching in recent years attaches great importance to cultivating students' awareness of cross-cultural communication. Why should we cultivate cross-cultural awareness of college students? The

necessity of cultivating cross-cultural awareness of college students will be discussed from the perspective of intercultural communication, and the specific methods of cultivating cross-cultural awareness of college students will be discussed. At present, English teachers in colleges and universities are not aware of which countries may go to study or work in the future, they are not aware of the tasks related to the professional and cultural transmission of college students. Therefore, it is difficult for college English teachers to carry out the implementation of cross-cultural knowledge education. Therefore, the recommendation algorithm is used to study how to choose an effective intercultural communication mode to cultivate college students' intercultural awareness. Users need more diversified projects. Some scholars have proposed a method to measure the degree of diversification. Among them, L represents the length of recommendation list, and H (L) represents the same number of items recommended by recommendation system for user u and t.

$$H_{ut}(L) = 1 - \frac{Q_{ut}(L)}{L} \quad (1)$$

The system recommends the most popular educational methods to users recently. Although the accuracy of the recommendation will be high, the performance of novelty is not always satisfactory. Users may not recognize the value of the recommendation. Specific formulas for novelty are as follows. Among them, H denotes the confidence information of the project, Q denotes the total number of projects, a represents the total number of acts of the project a by users, and the novelty of the whole algorithm is measured by the mean of confidence information of all projects.

$$U_a = \log^2 \frac{M}{ka} \quad (2)$$

Coverage refers to the ratio of the recommended algorithm to the user's recommended items in the total project. From this index, the ability of the algorithm to mine long tail projects can be seen. The coverage calculation formula is as follows, where L represents the recommended project list length for each user. N indicates the total number of items, and Nd (L) indicates the total number of

different items recommended by the recommendation system.

$$COV(L) = \frac{N_d(L)}{N} \quad (3)$$

Accuracy, the accuracy measurement methods of recommendation system mainly include the accuracy of TopN recommendation list and the accuracy of score prediction. Because different educational methods are recommended to users, the former measurement method is mainly introduced. This method is measured by P@N, which represents the N items recommended by users. The proportion of favorite items is the most widely used in recommendation system. The calculation formula is as follows. Among them, $Items_{rel}@N$ refers to the collection of favorite items in the first N items recommended to users.

$$P@N = \frac{|Items_{rel}@N|}{N} \quad (4)$$

Through the evaluation of accuracy, the accuracy of the algorithm can be known, and the superiority of the FP-growth algorithm is compared. There are many factors to consider when evaluating a recommendation algorithm, and each algorithm has different advantages. The current academic research mainly evaluates one or several factors at the same time, and the comparative cases are evaluated by the above evaluation criteria for three different algorithms.

APORI ALL Algorithm Based on College Students' Cross-Cultural Awareness Model

With the globalization of the economy, technology and culture, more and more people around the world need cross-cultural communication. Intercultural communication skills are becoming more and more important. Intercultural communication competence refers to the ability to communicate effectively and appropriately in a cross-cultural environment based on cross-cultural knowledge, skills and attitudes. As the Ministry of Education puts cultural awareness as an aspect of the core literacy of English subjects, cultural education has become more important in the practice of college English teaching. Intercultural communication

skills have also become the basic ability of college students in the new century. Based on the above analysis, the APRIORI ALL algorithm is used to construct the cross-cultural awareness model of college students. The course of cross-cultural learning for college students is expressed by I; the thing is in the transaction database, which refers to the collection of all the items purchased by the customer in one transaction. It refers to the collection of courses learned by a college student in a continuous learning process, and each thing has a unique identifier; item set is a collection of all kinds of items; the dimension of item set is the number of items contained in an item set, which is called the dimension of item set, and the number of items contained in a item set is called the K-dimensional item set; The support degree is the percentage of the number of college students supporting sequence S and the total number of College students. Among them, D is the number of College students, $\{t \in D | I_1 \subseteq t\}$ is the number of college students supporting sequence S:

$$Support(I1) = \frac{|\{t \in D | I_1 \subseteq t\}|}{|D|} \quad (5)$$

Confidence for association rules $A \rightarrow B$, Confidence refers to the probability that project set B will also appear after item A is present, which is:

$$Confidence(R) = \frac{Support(A \cup B)}{|SupportA|} \quad (6)$$

The minimum support is used to measure the support value, which is user-defined. The infrequent item set is the set of items in the project set I and the transaction database D, I are less than the minimum support, called the infrequent item set or small item set; the maximum frequent item set refers to picking out frequent item sets that are not included by other elements in a frequent item set, called the maximum frequent item set or the largest large item set; the sequence is an ordered arrangement of different item sets; the k-sequence means that a sequence S is set, the number of items included in the sequence S is called the length of the sequence, the sequence of length k is the k-sequence, and the subsequence is

$X = \langle x_1, x_2, \dots, x_n \rangle, Y = \langle y_1, y_2, \dots, y_m \rangle$, If there is an integer $1 \leq j_1 < j_2 \dots j_n < m$, make $x_1 \subseteq y_{j_1}, x_2 \subseteq y_{j_2} \dots x_n \subseteq y_{j_n}$, then the sequence X is called a subsequence of sequence Y. If a sequence S is not included by any sequence, the sequence S is said to be the largest; The sequence mode refers to the sequence a if the support degree is not less than minisupport, then the sequence a is a sequence mode, and the sequence pattern of length k is recorded as a k-mode; The sequence association rule means that for a given item set $I = \{i_1, i_2, \dots, I_m\}$ and the sequence S, T, an expression like $S \Rightarrow T$ is called a sequence association rule. The seed set L_{k-1} is set up, and the candidate sequence set C_k is set by 16 kinds of subsets L_{k-1} ; Connecting with L_{k-1} , let S1 and S2 be sequences of seed set L_{k-1} , and S1 and S2 can be connected to get a candidate k-sequence if and only if S1 takes the first sub-sequence equal to S2 takes the last sub-sequence. The rule of generating candidate k-sequence is to connect the sequence S1 with the last of sequence S2. If the last element of S2 is the last element of S1, the item becomes the last element of S1; otherwise, the item becomes the last element of S2.

Experimental Subjects

In order to meet the needs of the development of globalization and enhance the cultural soft power of our country, we should integrate the concept of cross-cultural communication into the cultivation of College Students' cross-cultural awareness, get rid of the limitations of the current cross-cultural communication mode, so as to realize college students' cross-cultural communication ability. Therefore, based on the previous analysis, the algorithm was verified. To this end, the selected experimental subjects are a collection of three test populations, namely M1, M2, and M3. During the experiment, M1 adopts the traditional method of reading teaching, while the students of M2 and M3 conduct English reading and learning under the guidance of the cross-cultural awareness model. The experiment lasted about 5 months. After the experiment, the recommendation algorithm is used to compare the three aspects of the cross-cultural communication ability of the experimental objects before and after. They are cross-cultural awareness, cross-cultural sensitivity and cross-cultural effectiveness. The tools for measuring students' intercultural communication skills are cross-cultural awareness test papers, cross-cultural sensitivity scales and cross-cultural effectiveness scales, as shown in Tables 1 and 2.

RESULTS

Table1
MAP/MLLR Adaptive Performance

Recognition error rate(%)	SI	ML	MAP	MLLR	SD
Test set A	16.32	52.35	12.07	10.88	8.65
M1	27.45	43.84	17.85	16.71	9.91
M2	36.24	66.60	22.87	26.85	13.85
M3	12.09	59.24	9.48	5.76	10.38

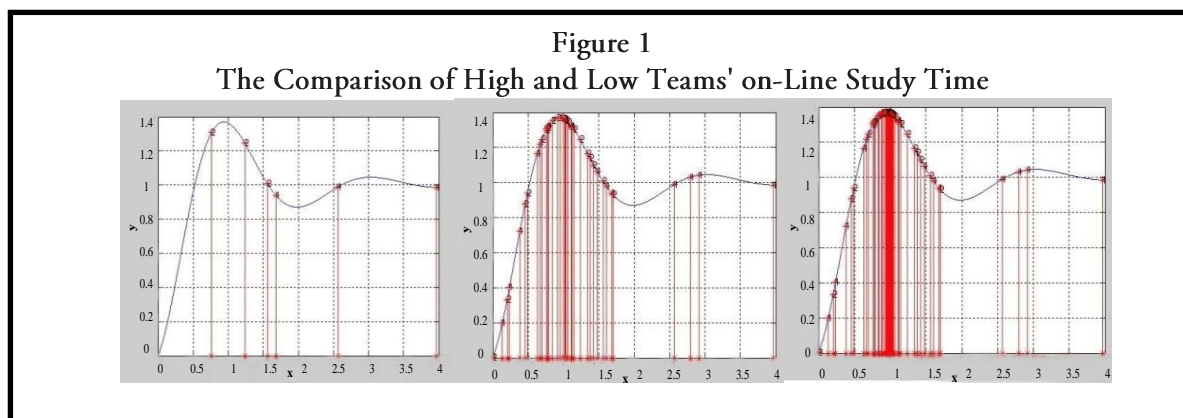
Table2
Changes of MAP White Adaptation Performance With White Adaptation Data Volume

Recognition error rate(%)	SI	2	4	6	8
Test set A	16.38	26.26	19.54	16.93	13.50
M1	21.42	19.52	16.42	16.71	16.24
M2	33.14	36.00	35.42	26.85	24.00
M3	12.00	11.42	10.85	10.00	8.00

Algorithm Verification Experiment and Result Analysis

It can be clearly seen from the results in Table 1 and Table 2 that the model adaptive by the recommendation algorithm has a much lower error rate than the original non-specific person model word, which is reduced by 27.20% and 33.52%, respectively (Calculating method of adaptive effect: $(SA-SI)/SI$). However, if the same

data is used to do ML on the initial system, the error rate is significantly increased, indicating that such a small amount of data is not enough for ML training. Of course, the effect of self-adaptation has not reached the level of SD, but in the next experiment, we can see that with the increase of self-adaptive data, the effect of self-adaptation will approach SD. In this experiment, the adaptive data is continuously added to see the adaptive effect of MAP and MLR, as shown in Figure 1.



Then the actual data are collected for experiments. According to the information data acquisition module, the behavior information data of college students are collected, as shown in

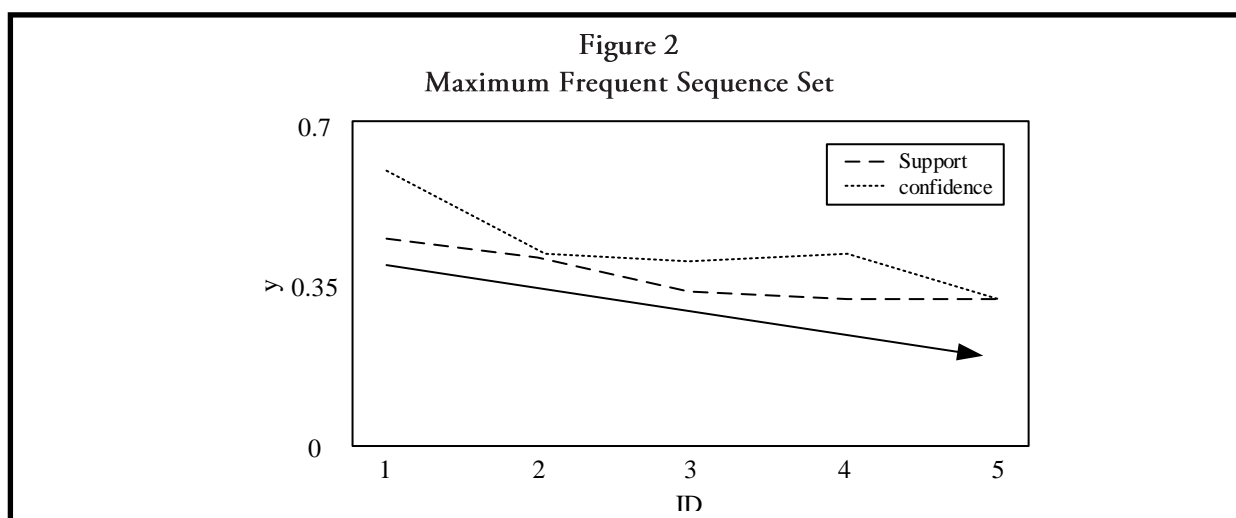
the table below:

Table3
Learner's Behavior Information Data

ID	User_id	Site_id	Event_date
1	3	13	2010-10-02
2	2	124	2010-11-02
3	11	15	2010-11-02
4	5	136	2010-11-02
5	4	12	2010-11-02
6	17	13	2010-11-02
7	6	11	2010-11-02
8	3	12	2010-11-03
9	7	146	2010-11-03
10	6	12	2010-11-03
11	2	13	2010-11-03
12	1	14	2010-11-03
13	10	13	2010-11-03
14	2	15	2010-11-04
15	7	13	2010-11-06
16	13	16	2010-11-06

Then, according to the consultation with experts, 30% of the support and 30% of the

confidence are selected, and the learning sequence pattern is obtained as shown in Figure 2 below:

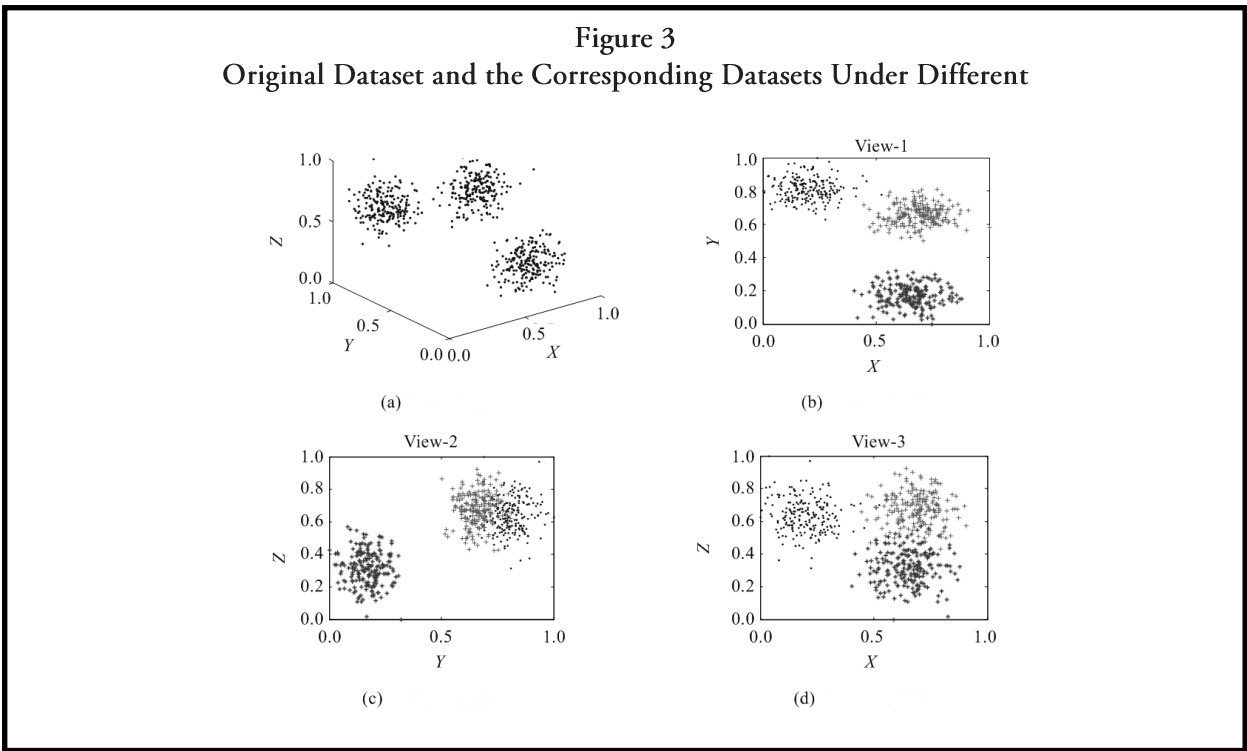


In the Sequences field, 1 represents the course and acts as a delimiter. The following number represents the course number. 1116 represents the maximum frequent sequence (Course 1) → (Course 6). By communicating with the memb

ers of the expert group, in view of the increasing trend of the number of courses, the system support is set at 30% and the confidence is set at 30%. The minimum support of each sequence is 44.6%, 40.4%, 33.1%, 31.2%, and the minimum confidence is 60.2%, 41.9%, 39.6% and 41.3%,

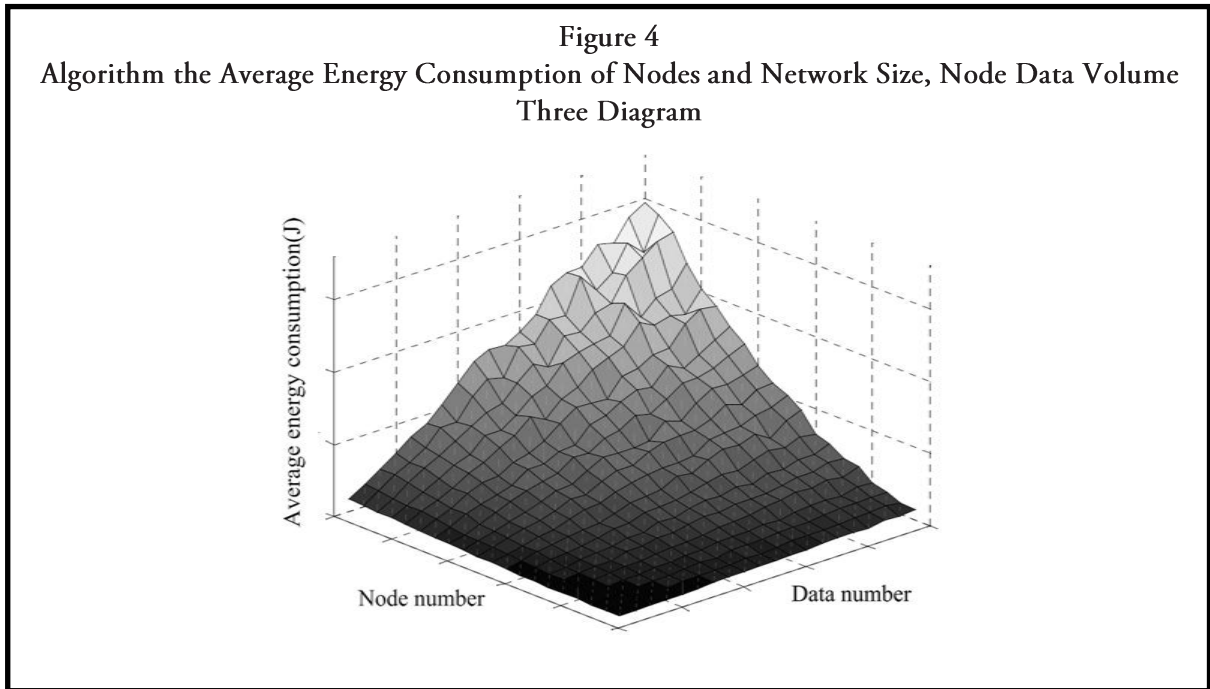
respectively. In the evaluation of sequence usage, 80 students in two classes of the College of Literature selected four of them to evaluate the sequence usage. Assessment score = $\frac{p_1 + p_2 + \dots + p_n}{n}$. Among them, Pn represents the probability of students using learning

sequence n; n represents the number of sequences participating in the evaluation, and the higher the evaluation score, the higher the probability of students using recommendation sequence. Clustering different data sets, the results are as follows:



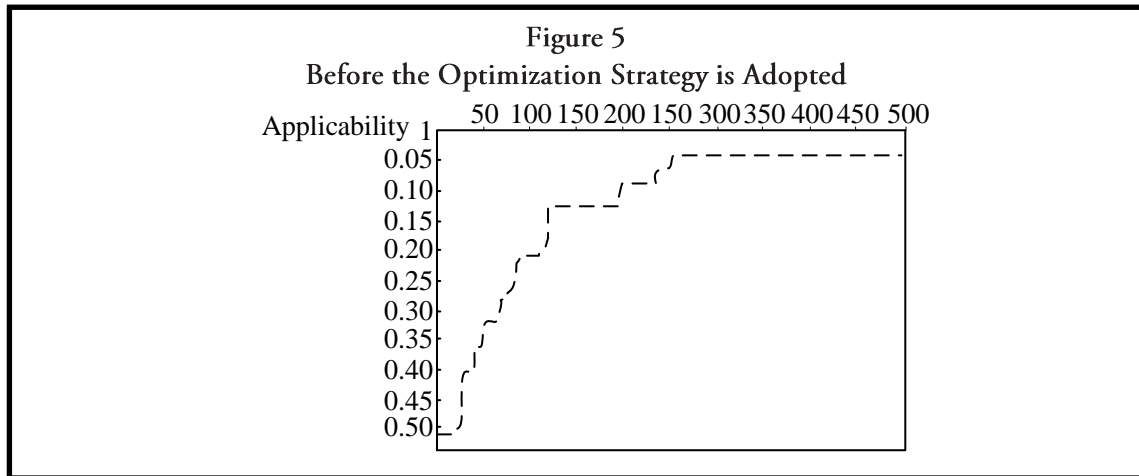
According to the AprioriAll candidate set generation algorithm, the candidate sequence set C2 is generated from L1 sequence. By calculating the support degree of the ordered sequence in

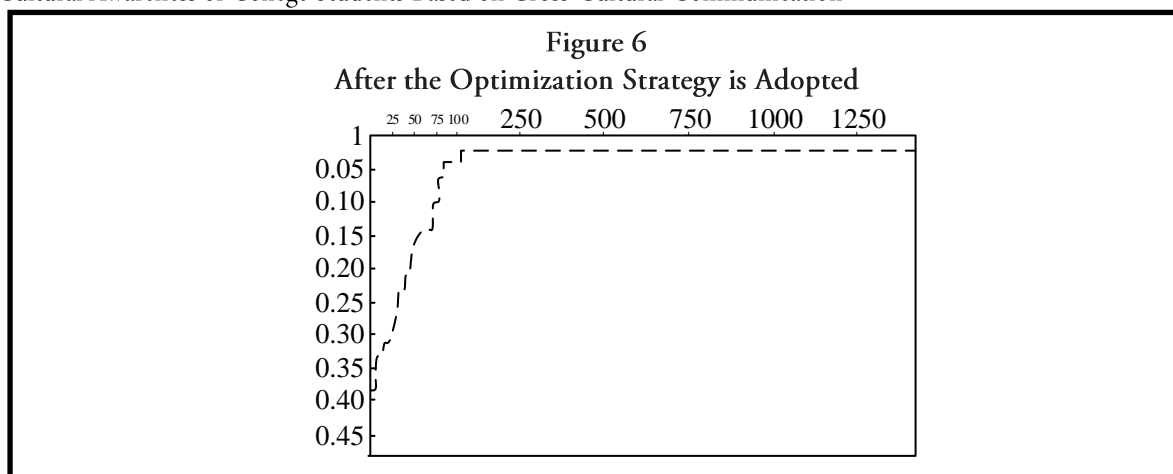
C2, the sequence L2 is generated when the support degree is greater than the minimum support degree.



Then the rate test is carried out. For the same number of nodes test, the speed of the algorithm will increase correspondingly when the data scale continues to increase, which means that the algorithm has obvious advantages for large-scale data processing. When the data size is 52.3M, the segmentation time will not decrease with the

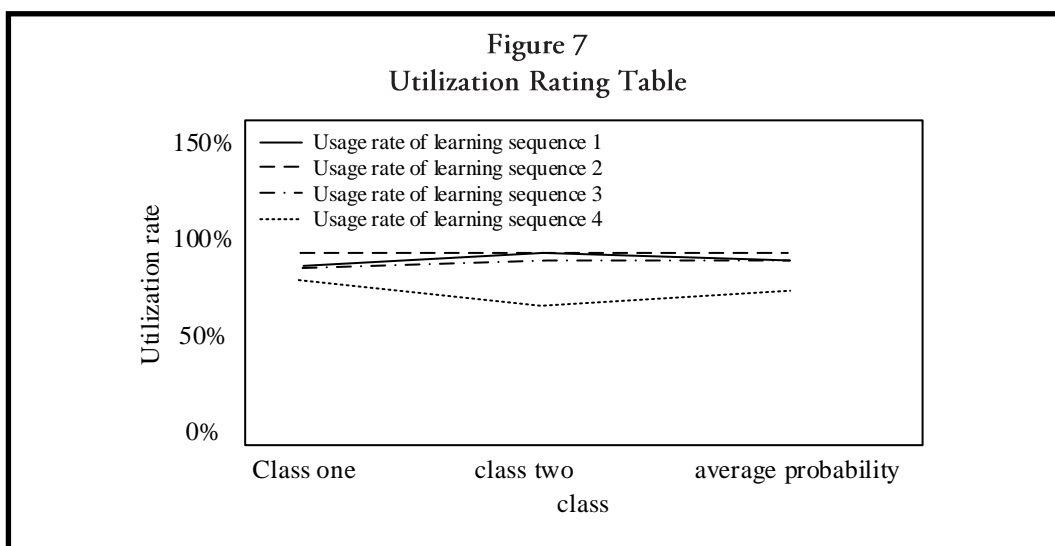
increase of data nodes, but will not change as a whole. And in terms of delay, the decisive factor affecting network delay is the operation delay of data compression. With the increase of the amount of data collected by nodes and the scale of network, the effect is ideal (Figure 4).





From the comparison of Fig. 5 and Fig. 6, it can be seen that the convergence speed of the algorithm is accelerated and the convergence is enhanced after the optimization strategy is adopted, and the optimal solution can be easily obtained. Because cloud computing platform stores large data in each node, Map Reduce algorithm is selected to carry out distributed computing in the word segmentation process, which brings about that each node only deals with local data. This improves the parallelism of processing and the speed of word segmentation. It also shows that mobile computing is cheaper than mobile data, that is, it can achieve higher efficiency if it is executed around the data. The

effect is more significant when the data is very large, which can reduce network congestion and increase system throughput. And the time of word segmentation does not follow the increase of the number of nodes, but decreases. The reason is that there are some cooperative links between nodes. The main node assigns tasks to the corresponding data nodes. In the actual process, it also needs to report its own running status regularly, and eventually inform the main node of the results. At this stage, there will be specific time consumption. According to the clustering results, the accuracy of students' choosing recommended courses is shown in Figure 7.



The average evaluation score of the algorithm is 79.375. College students selected as the

experimental subjects have a positive attitude towards the recommended learning sequence, which reaches a satisfactory level, and proves that

the results of the algorithm are acceptable. The system has only been tested internally, and the amount of data and the number of people tested are not many. The result can only be used as a temporary reference, and a large amount of data is needed for verification in the future. To sum up, College English education should be combined with human all-round education, which is also the inherent requirement of quality education. Cross-cultural communication is to enable college students not only to master certain language skills, but also to understand the transformation of a way of thinking. College English education with strong ability of talent cultivation has trained students with solid theoretical foundation, strong application technology and high comprehensive quality, which is manifested by high employment rate and high social satisfaction.

DISCUSSION

In the context of globalization, Chinese culture has more opportunities to collide and develop with the world's multiculturalism. Through two-way intercultural exchanges, college students are encouraged to form a cross-cultural awareness and mentality of respect, openness and tolerance, which lays the foundation for their participation in international exchanges. Based on Intercultural communication, the intercultural awareness of College Students is studied. Firstly, a recommendation algorithm based on the comparison of intercultural communication modes is proposed. On this basis, the APRIORI ALL algorithm based on the intercultural awareness model of college students is analyzed. Finally, the model is trained and tested by the survey data. The test results show that the error is less than 5%. The experimental results show that this method can improve the accuracy of teaching quality evaluation and the efficiency of the teaching quality evaluation system, and the intercultural communication mode is penetrated into the cultivation of College Students' intercultural awareness. It not only improves the intercultural competence of College students, but also promotes the development of China's economy and society, and makes Chinese culture better

go to the world. However, there are still many shortcomings, and the experimental time is short, which affects the comprehensive accuracy of the experimental results to some extent. The next step should be further improved in the experimental verification process, and the selected subjects should be more representative and diverse.

Human Subjects Approval Statement

This paper did not include human subjects.

Conflict of Interest Disclosure Statement

None declared.

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