Intelligent Evaluation Algorithm of Undergraduate College English Mobile Learning Efficiency Based on Big Data

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Abstract. In order to better improve the quality of undergraduate English learning and understand the problems of students in the process of English learning, an intelligent evaluation algorithm of undergraduate college English mobile learning efficiency based on big a data is proposed. Combined with big data technology, a college English mobile learning information management platform is constructed, the hierarchical structure of College English mobile learning efficiency is optimized, and the intelligent evaluation index of College English mobile learning efficiency is constructed, The evaluation algorithm is optimized. Finally, experiments show that the intelligent evaluation algorithm of undergraduate college English mobile learning efficiency based on big data has high practicability in the process of practical application and fully meets the research requirements.

Keywords: Big data · College English · Mobile learning · Learning efficiency

1 Introduction

There are many literatures on the evaluation of undergraduate college English mobile learning education. These literatures emphasize the individual developmental evaluation under the concept of quality education [1]. Through the correlation between the college entrance examination results and the comprehensive results of the University, it is found that after entering the University, the learning efficiency of college students is not only affected by intellectual factors, but also the influence of non intellectual factors is far greater than intellectual factors. However, these evaluation factors are single, which is analyzed through the correlation between the total score and the college entrance examination score. There is no discussion on the impact of the College English curriculum system, which can not reflect the relative effectiveness of its learning. Based on this, using the big data network analysis method, a big data English model is established, and the relative effectiveness of College Students' final academic performance is evaluated on the basis of considering their starting point of admission [2].

The big data network method is to "evaluate" through effective and ineffective, which is especially suitable for the evaluation of "relative advantages and disadvantages" of

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decision-making among multiple similar sample units. Therefore, the big data network analysis model is used to evaluate the academic performance of different students in the same environment. However, these assessments are based on the overall curriculum as a decision-making unit, and do not distinguish the impact of different curriculum systems on College Students' learning efficiency. Because different curriculum systems have different effects on College Students' learning efficiency, the evaluation results obtained can not fully reflect the problems existing in college students' English learning process. In order to improve the practicability of the evaluation results of College Students' English mobile learning efficiency, this paper first divides the accessible data of the curriculum system, and combines big data technology to optimize the hierarchical structure of College English mobile learning efficiency; The intelligent evaluation index of College English mobile learning efficiency is constructed, and the learning efficiency of college students is studied through optimized evaluation algorithm and generalized big data network analysis. Through different curriculum systems, we can better analyze the impact of different curriculum systems on College Students' learning efficiency, which is very different from the big data network analysis method used to analyze college students' learning efficiency.

2 Intelligent Evaluation of Undergraduate College English Mobile Learning Efficiency

2.1 Undergraduate College English Mobile Learning System

The existing research has hindered the internal dynamic analysis of organizational learning, which is not conducive to people's understanding of the relationship between the overall and local transformation of organizational learning. However, studying the knowledge transformation mechanism between different organizational levels from the perspective of hierarchy has unique advantages to solve this problem [3, 4]. From the perspective of hierarchy, organizational learning includes four levels. Because Inter Organizational learning mainly promotes organizational learning, team learning and individual learning through the external environment, this paper only makes an auxiliary analysis. From individual learning to team learning and then to organizational learning is a knowledge sharing process of continuous inclusion and high-order transition between levels. From organizational learning to team learning and then to individual learning is a knowledge sharing process of continuous inclusion and low-order transformation between levels [5]. Therefore, organizational learning is not limited to a certain level of organizational learning, but includes a dynamic circular learning process in which the three levels of individual, team and organization overlap, promote and transform each other. The occurrence and cycle of learning is like tai chi operation. It can start from any learning level of the organization and induce the operation of other learning levels at the same time. This learning process that starts at one level and leads to or transitions to other levels is essentially the sharing, transition, transmission, attenuation and renewal of knowledge resources and skills and experience among different learning subjects. The cross level transformation of English learning is shown in Fig. 1:

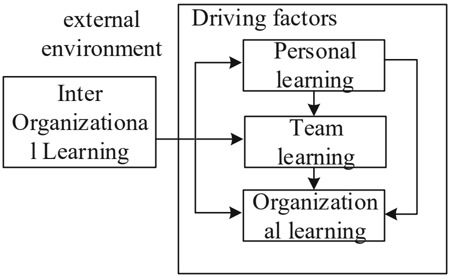

Fig. 1. Cross-level transformation of english learning

For college students English learning efficiency, from intelligence differences, personality differences, teaching methods, learning motivation to stimulate and maintain, teacher characteristics and teachers 'learning efficiency, which summarizes the eight most important factors affecting English learning efficiency: interest, focus, can keep up with the teacher's thinking, logical thinking ability, computing ability, independent homework, confidence, learning attitude "English teaching efficiency theory", specific learning system as shown in Fig. 2:

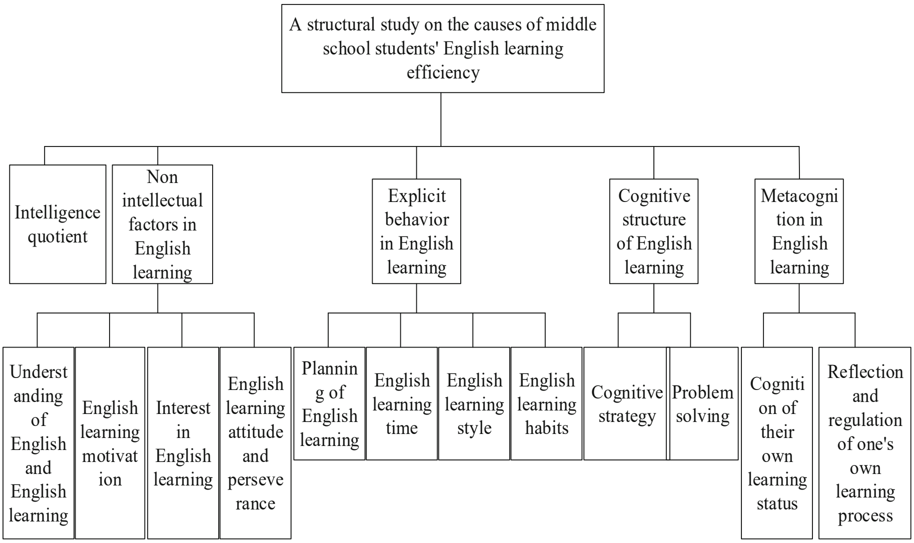

Fig. 2. Teaching system structure of college english learning

According to the structure of Fig. 2, the methods of observation, recording and interview, and the non-intellectual factors of English learning, planning, timing, attitude and habit, English cognitive structure, [6]. The English learning efficiency of middle school students is mainly attributed to the understanding and attitude towards English and English learning; the advantages of English learning methods and habits; whether the English cognitive structure is good: the strength of reflective consciousness and regulation ability in English learning.

2.2 Evaluation Index of College English Learning Efficiency

According to the definition of English learning efficiency, establish the evaluation index of English learning efficiency. The quantity that directly affects and reflects students' English learning efficiency includes three [7]: English learning time, English learning performance and English learning experience. It is also used as a first-level index to measure students' English learning efficiency. On this basis, seven second-level indicators are determined: students 'time use of learning English in class, students' time use of extracurricular learning English, English usual scores, English test scores, feelings before English learning, English learning and English learning. The structure is as shown in Fig. 3:

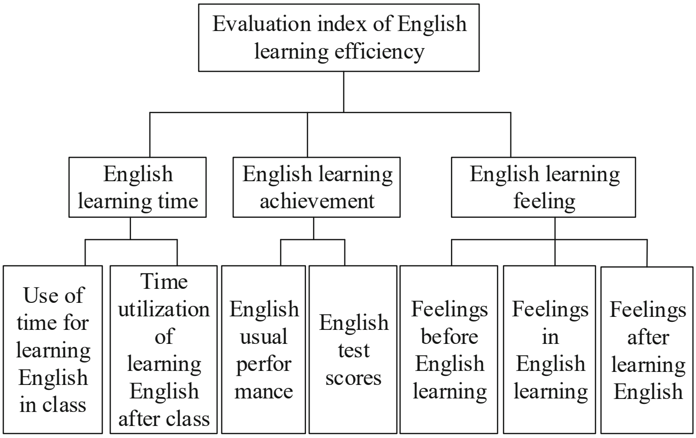

Fig. 3. Evaluation index of english learning efficiency

Considering that the traditional big data method is not feasible in the micro efficiency evaluation, in order to scientifically evaluate the action relationship and strength of different influencing factors and explore the overall evaluation mechanism of organizational cross-level learning transformation efficiency, this paper introduces the DEMATEL method which can effectively analyze factors and identify complex network action associations, which can fully reflect The system quantifies and effectively refines the advantages of subjective decision-making information of different experts, discriminates the influence relationship between organizational cross-level learning transformation efficiency indicators, preprocesses the influencing factor set of organizational cross-level learning transformation efficiency, deletes unimportant or redundant influencing factors, effectively distinguishes and ranks the key influencing factors of organizational cross-level learning transformation efficiency. The specific steps are as follows:

Suppose there are now x_p decision-making unit to be evaluated and y_p sample elements selected. Both the decision-making unit and the sample unit have m input and p output indicators, which are expressed as follows:

$x_p = \left(x_{1p}, x_{2p}, \ldots, x_{mp}\right)^T > 0$ represents the input index value, the value of the p-th decision-making unit;

$y_p = \left(y_{1p}, y_{2p}, \ldots, y_{mp}\right)^T > 0$ represents the output index value, the value of the p-th decision unit.

$\overline{x}_j = \left(\overline{x}_{1j}, \overline{x}_{2j}, \ldots, \overline{x}_{mj}\right)^T > 0$ represents the input index value, the value of the j-th sample unit;

$\overline{y}_j = \left(\overline{y}_{1j}, \overline{y}_{2j}, \ldots, \overline{y}_{mj}\right)^T > 0$ represents the input index value, the generalized CCR model constructed by the m-th sample unit against the decision unit p is as follows:

$$\left(G - C^2R\right) = \begin{cases} \text{Mowize } \mu^{\mathrm{T}} y_p - \overline{x}_j V(d), & \\ st : y_p - \overline{y}_j / x_p - \overline{x}_j & \omega \overline{x}_j - \mu^{\mathrm{T}} d y_j \geq 0, j = 1, \ldots, \overline{n} \\ \omega_{x_p} = 1 & \mu, \omega \geq 0, \quad r = 1, \ldots, s; \quad i = 1_1 \ldots, m \end{cases} \tag{1}$$

With d decision-making unit, the input of $V(d)$ is x = (Xij, XY,... XM) and the input is μ^{T}, ω, d, which are the index numbers of input and output x $\geq$ 0 and y $\geq$ 0 respectively, then the CR model with Archimedean infinitesimal for evaluating the overall effectiveness of the j-th decision-making unit is

$$\begin{cases} \min \theta - \varepsilon \sum_{i=1}^{m} s_i^- - \varepsilon \sum_{r=1}^{l} s_r^+ + \left(G - C^2R\right) \\ s.t. \sum_{j=1}^{n} x_{ij} \lambda_j + s_i^- = \theta x_{ij} \\ \sum_{j=1}^{n} y_{rj} \lambda_j - s_r^+ \\ \lambda_j > 0, s_i > 0, s_r^+ > 0 \end{cases} \tag{2}$$

In the comprehensive influence matrix of organizational cross-level learning transformation efficiency calculated in the previous step, element s_r^+ represents the influence degree of influencing factors on r influencing factor θ. The influence value of influencing factor s_i^- on all other influencing factors is the sum of the elements in row j of the comprehensive influence matrix λ_j, and the influence degree y_{rj} is the influence value of all comprehensive influencing factors on other influencing factors.

Similarly, the comprehensive influence value of influencing factor ε affected by all other influencing factors is the centrality of the comprehensive influence matrix. Centrality reflects the role and importance of influencing factor s_r^+ in the evaluation index system, that is, the centrality of influencing factor is directly proportional to its importance. The greater the influence, the greater the role and importance of the influencing factor in the evaluation index system, and vice versa. The cause degree of influencing factor s_i^- is the difference between the influence degree of influencing factor s_i^- and the affected degree, i.e. If $s_i^- > 0$, it is the cause factor, indicating that the effect of other influencing factors on influencing factor s_r^+ is less than that of this factor on other factors;

If $s_i^- > 0$, it is the result factor, indicating that the effect of other influencing factors on influencing factor s_r^+ is greater than that of this factor on other factors [8].

Through the above calculation steps, we can get the centrality, cause, influence and affected degree of the influencing factors affecting the organizational cross-level learning transformation efficiency, so as to screen the key influencing factors of the organizational cross-level learning transformation efficiency in the next step, and take them as the input or output indicators of the organizational cross-level learning transformation efficiency, so as to reflect the learning efficiency or teaching effect of students through these courses, This requires analysis by categories from these courses in order to achieve more detailed analysis results.

2.3 Realization of Intelligent Evaluation of College English Learning Efficiency

The goal of big data analysis is to classify by collecting the similarity of data. The theoretical basis of big data analysis comes from many fields. With the development of science and technology and disciplines, its theoretical basis includes recitation machine science, English, biology, statistics and economics [9]. With the expansion of application fields, big data technology has also been developed. These big data technology methods can be well used to describe data, express the similarity between different data sources, and classify each data source into different clusters. The specific evaluation process of English classroom learning efficiency is shown in Fig. 4 below:

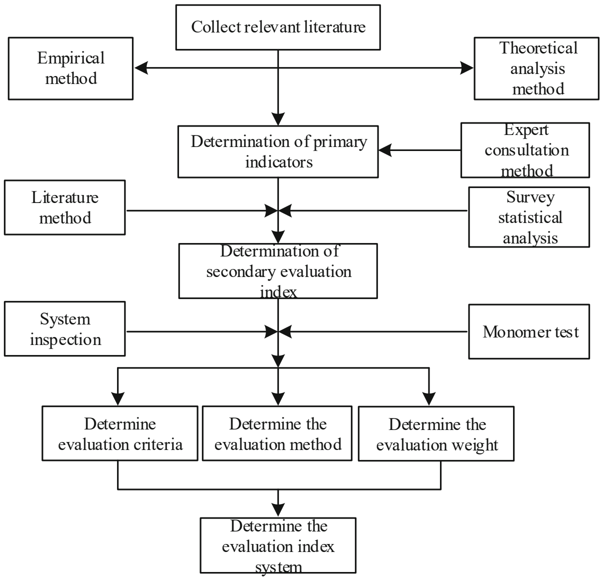

Fig. 4. Evaluation process of english classroom learning efficiency

Big data is a mature and common measurement method in the field of relative efficiency measurement, especially in the efficiency evaluation and improvement closely related to economic input and output. However, the application of big data in the field of education is insufficient, and the research ideas and process specifications lack a unified paradigm [10, 11]. Explain the complex behavior of intelligence with the elements and key stages in the process of information processing, mainly including the perception, selection and acceptance of information, processing, coding, storage, extraction and recovery of information. In particular, it puts forward the concept of "memory" and provides a basic tool for analyzing the thinking process and mechanism. The first mock exam model of learning process is presented based on modern information processing theory (shown in Fig. 5), which shows the information flow in the learning process.

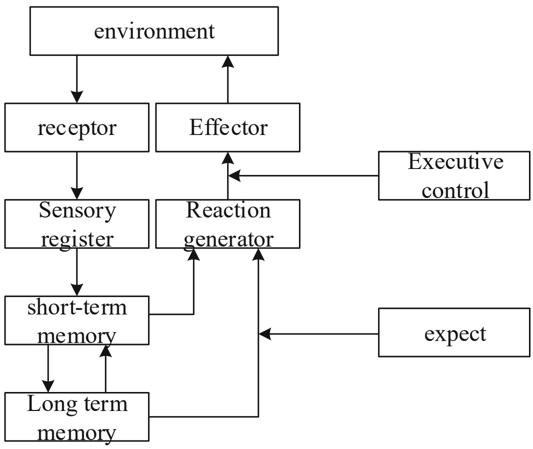

Fig. 5. Basic mode of intelligent management of information processing and learning efficiency

This pattern indicates that stimuli from the learner's environment act on his receptors and enter the nervous system through the sensory register. The information is initially encoded in the sensory register, and the initial stimulus is maintained in the sensory register in the form of image for 0.25–2 s. When the information enters the short-term memory, it is encoded again. Here, the information is stored in the form of semantics. The holding time of the information in the short-term memory is also very short, generally only 2.5–20 s. The learner can copy information for a little longer than a minute. After retelling, surprise processing and organization coding, the information can also be transferred to long-term memory for storage for future recall. Most learning theorists believe that the storage in long-term memory is long-term, and the reason why they can't recall later is due to the difficulty of "extracting" this information. In fact, short-term memory and long-term memory are not different structures, they are just different ways in which the same structure works. It should also be noted that the information from short-term memory to long-term memory may be retrieved back to short-term memory, which is also called "working memory". When the new learning partially depends on the recall of the students' original learning content, the original learning content is retrieved from the long-term memory and re entered into the short-term memory. For English learning, Zheng Junwen and Zhang Enhua believe that the process of English learning is a process in which new learning content interacts with students' original English cognitive structure and forms a new English cognitive structure according to cognitive learning theory (constructivist learning theory). The general process of English learning can be divided into four stages: input stage, interaction stage, operation stage and output stage. First, the so-called input in the input stage is essentially to create a learning situation and provide students with new learning content. In this learning situation, there is a cognitive conflict between the students' original English cognitive structure and the new learning content, which makes the learners have the need to learn new knowledge (i.e. "aspiration"). Second, after the input of the new learning content in the interaction stage, the students' English cognitive structure and the new learning content interact, and English learning is like the interaction stage. This interaction has two basic forms: assimilation and adaptation. Assimilation is the process of incorporating the new learning content into the original English cognitive structure, so as to expand the original cognitive structure. Adaptation is the process that when the original cognitive structure cannot accept new learning content, the original cognitive structure must be transformed to adapt to the new learning content. The result of the interaction stage is the rudiment of a new English cognitive structure. Third, the operation stage is essentially a process of consolidating the newly learned knowledge through exercises and other activities on the basis of the prototype of the new English cognitive structure in the second stage, so as to initially form a new English cognitive structure. Through this stage of learning, students learn certain skills, which makes the new knowledge closely related to the original cognitive institutions. Fourth, the output stage. This stage is based on the third stage. By solving English problems, the newly formed English cognitive structure is improved, and finally a new and good English cognitive structure is formed. Students' ability is developed, so as to achieve the expected goal of English learning. The general cognitive process of English learning is shown in Fig. 6.

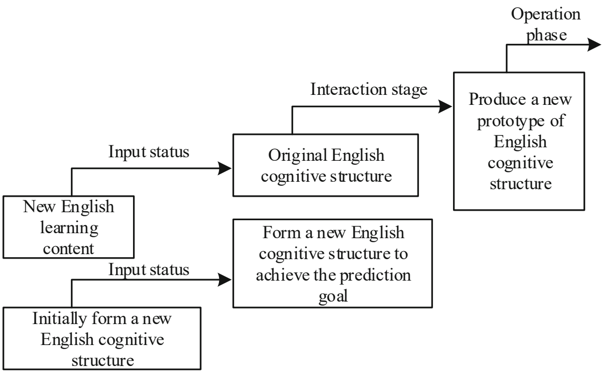

Fig. 6. General cognitive process of english teaching and learning

The above four stages are closely related. Problems in any stage of learning will affect the quality of English learning. Whether new English content is accepted or included depends on the English cognitive structure of students. Therefore, students' existing English cognitive structure is always the basis for learning new English content. On the whole, the principles and methods of big data are applicable to the analysis of learners' learning process. The diversity of big data models meets the analysis requirements of relative learning efficiency at different levels. At the same time, the efficiency analysis among various efficiency models complement each other; Big data realizes the use of learners' learning process data to evaluate relative learning efficiency, avoids the distribution of evaluation index weight in process data, and provides personalized results for the improvement of learning efficiency in terms of input redundancy and insufficient output. However, the big data method also has limitations on the analysis of learners' relative efficiency. On the one hand, the big data model has high requirements for data specification. For example, for the student data with the phenomenon of achievement inheritance, it is impossible to correspond to the relationship between input and output; The number of input and output indicators and the number of students should meet the standard requirements; The guarantee of the correlation between input indicators and output indicators will reduce the integrity of indicators, etc. On the other hand, there is great uncertainty in the interpretation of big data model results. Before efficiency evaluation, introduce big data analysis to determine the sample unit set, and then evaluate the decision-making unit, so as to study the feasibility of this method in teaching evaluation. This method is called the data reaching method of big data analysis, find the sample unit, then calculate the efficiency value of the decision-making unit, and analyze the effectiveness of the decision-making unit from the aspect. The general steps of big data analysis are as follows.

Firstly, the pairwise distance between n sample points is calculated.

The distance matrix D = dam (2) is obtained to construct n classes, each class contains only one sample point, and the platform height of each class is zero at the beginning.

The two nearest classes are merged into a new class, and the distance value of these two classes is taken as the platform height in the new big data graph.

Calculate the distance between the new class and other current classes. If the combined number of new classes is equal to 1, go to step 5); otherwise, go to step 3).

Determine the number of classes and classes through the above process.

Different defined distances are used for classification to obtain different big data results, so as to obtain different sample unit sets. Selection of sample unit set: there should be no great difference in the degree of correlation between samples, so that there will be no great difference in the quantitative analysis of decision-making unit by sample unit set. In this way, there will be no great difference between quantitative analysis and qualitative analysis of decision-making unit. The following is an analysis and calculation through specific examples.

3 Analysis of Experimental Results

3.1 Experimental Preparation

There have 19 freshmen in the same major to analyze and study the learning situation of a basic course. Students' learning is affected by many factors. After analysis and screening, seven inputs are selected. A is the college entrance examination score of this course, which reflects the enrollment basis of students; B is the pre class preview time. Pre class preview can improve the efficiency of listening and cultivate students' ability of self-study and independent thinking; C is the class time. Classroom teaching is a direct way for students to acquire knowledge and cultivate their ability to analyze and solve problems. It is an important link in learning; The percentage of students' understanding of classroom teaching is D; E is the review time after class, which is an important link to consolidate the knowledge learned in class; F is the homework score, which reflects the students' further digestion and absorption of the knowledge learned in class; G is the time to read the extracurricular guidance books of relevant courses Select an output h as the final grade. 8 items of data of 14 students are shown in Table 1. The college entrance examination score is converted into the score of the hundred mark system.

Table 1. Statistics of Students' English learning

Student number	a	b	c	d	e	f	g	h
1	87	30	100	0.91	10	90	60	62
2	55	60	90	0.91	30	85	60	35
3	56	60	100	0.61	120	70	60	35
4	59	30	100	0.81	120	95	30	63
5	55	0	100	0.81	120	85	30	35
6	61	30	100	0.86	30	80	90	92
7	58	10	100	0.81	30	90	60	75
8	69	30	100	0.76	30	85	60	60
9	89	0	100	0.81	0	95	30	67
10	72	30	50	0.91	60	90	10	76
11	80	30	100	0.71	60	85	0	97
12	69	60	100	0.86	90	90	180	82
13	71	0	100	0.91	60	90	60	82
14	77	30	100	1.00	10	90	60	98

The distribution of students' comprehensive efficiency in the semester course is shown in Table 2.

Table 2. Initial evaluation information of the index of the expert group

Enterprise	I1 English learning time					I2English learning performance				
	C1Use of learning time in class	C2Use of extracurricular learning time	C3Usual performance	C4Examination performance	C5Preview situation	C6Learn attention	C7Logic thinking ability	C8Independent homework	C9Attitude to learning	C10Learning experience
L1	7	3	9	8	8	2	2	8	9	6
L2	6	2	8	5	5	8	1	3	2	8
L3	3	5	5	6	2	6	6	8	1	2
L4	8	7	9	1	3	2	3	7	5	8
L5	4	9	5	2	6	8	8	5	3	6
L6	2	3	9	8	5	2	6	3	8	5
L7	2	4	5	6	8	8	7	6	7	4
L8	5	5	8	5	2	4	2	4	5	7
L9	9	2	2	9	6	8	8	1	3	6
L10	8	4	9	4	8	6	5	2	8	8
L11	3	8	2	8	4	2	6	8	6	5
L12	6	2	8	9	1	8	9	9	8	9

Table 3. Directly affects the matrix

Index matrix		Classroom learning efficiency									
		C1 Learning interest	C2 Use of learning time	C3 Usual performance	C4 Examination performance	C5 Preview situation	C6Learn attention	C7Logic thinking ability	C8 Independent homework	C9 Attitude to learning	C10 Learning experience
Extracurricular learning efficiency	C1 Learning interest	0	4	5	4	5	4	4	5	5	5
	C2 Use of learning time	3	1	3	4	2	0	3	4	2	2
	C3 Usual performance	4	3	0	5	6	2	3	2	5	2
	C4 Examination performance	5	2	2	1	3	2	1	3	2	3
	C5 Preview situation	4	5	4	3	0	5	3	4	4	3
	C6Learn attention	4	3	3	1	2	3	0	2	3	5
	C7Logic thinking ability	5	1	2	3	1	3	2	3	0	1
	C8 Independent homework	1	4	2	2	2	4	2	2	1	2
	C9 Attitude to learning	1	3	3	5	3	1	4	1	2	5
	C10 Learning experience	0	1	5	4	4	5	3	0	5	4

Comprehensive efficiency is the product of pure technical efficiency and scale efficiency. Pure technical efficiency includes students' efficiency in learning methods, skills and time management. Scale efficiency only refers to the degree of energy that students invest in learning. Further, on the basis of combining resources and preliminary research, the teaching effect of 12 foreign language universities in a certain province was evaluated and studied, and the above learning efficiency was evaluated and analyzed. The The directly affects the matrix is shown in Table 3.

The above analysis results show that the overall measurement results obtained by applying the two efficiency evaluation schemes are significantly different. This scheme not only has more reference value for the overall efficiency identification results, but also has more interpretation advantages for the specific measurement information obtained for comprehensive efficiency, pure technical efficiency and scale efficiency. For example, although index u has efficiency in both evaluation schemes, this evaluation scheme measures that it still has deficiencies in scale efficiency, and further combined with its scale efficiency, it is in an increasing state. During the research process, the record of the course learning efficiency of most English students is relatively objective, and the learning effect is basically the same. The scores between courses are basically OK, while there are large differences between the scores of other courses, that is, there is a large gap between the scores. Then, this is different from the way of grey correlation, Grey correlation considers the correlation degree between the course and the grade of graduation design to consider the selected course to reflect the efficiency of students' learning. The big data analysis method classifies students by their course scores.

3.2 Experimental Results

In order to analyze and reflect the evaluation results of students' learning efficiency with big data, the traditional method and this method are compared and analyzed, and the comparison results are shown in Fig. 7.

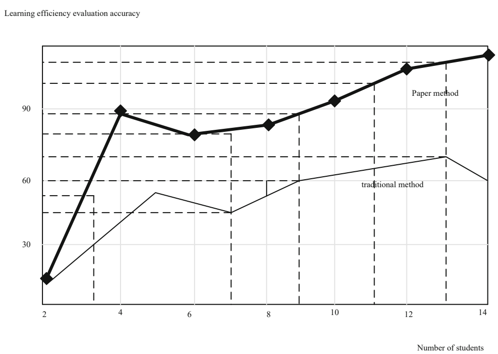

Fig. 7. Comparison and evaluation results of teaching efficiency

The research conclusion of this paper is universal, which is applicable not only to colleges and universities, but also to indicators and scientific research institutes.

3.3 Experimental Analysis

The reason is that organizational cross-level learning is composed of members with different backgrounds, different foundations and different experiences. The starting point of this study is efficiency, which is to realize the horizontal comparability of efficiency at a higher level based on a reasonable perspective, and is the rationality evaluation within a certain range. In this paper, the big data technology is used to optimize the level of college English mobile learning efficiency, construct the intelligent evaluation index of college English mobile learning efficiency, optimize the evaluation algorithm, and obtain the learning efficiency evaluation results are more accurate. The learning efficiency results obtained by using big data can provide a new classification basis for this kind of research. The analysis results of this study can not only enable teachers to understand the overall student learning efficiency and help teachers grasp the overall curriculum, but also enable students to have an intuitive understanding of their learning efficiency and understand the direction they should improve by showing the efficiency data, input redundancy and insufficient output of each student.

4 Conclusion

This paper proposes an intelligent evaluation algorithm for college students' English mobile learning efficiency based on big data. Innovative use of big data technology has built a college English mobile learning information management platform and optimized the hierarchical structure of College English mobile learning efficiency; It constructs an intelligent evaluation index of learning efficiency, optimizes the evaluation algorithm by using big data technology, and realizes intelligent evaluation of learning efficiency. The example shows that the application of generalized DEA model based on big data analysis to evaluate college students' learning efficiency has better theoretical and practical significance. Through the big data analysis method in statistical theory, it is difficult to distinguish the learning efficiency of 28 students, because no matter how many kinds of big data are used, it can be obtained that the vast majority of students are one kind, so it is impossible to distinguish students. However, through the combination of big data and generalized DEA method, we can distinguish the learning efficiency of college students, and obtain the relative efficiency of 23 students of the same class by selecting decision-making unit and reference unit, which can be completely sorted. In this way, we achieve the purpose of investigating the learning efficiency of students.

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