

Wireless Network Based Distance English Education and Teaching Mode in Smart Classroom Mode

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Abstract: At this stage, emerging technologies are developing continuously and are gradually applied to all walks of life. They are also reflected in English teaching, which leads to the emergence of the smart classroom model. Under the influence of network technology, the birth of distance English teaching mode has opened a convenient door for English teaching and learning. Digital education resources provide rich curriculum materials for education and teaching. It is very important for the construction of digital education resources to promote the integration and development of education and information technology. Under the smart classroom mode, this paper integrates wireless network technology (WNT) into remote English teaching mode, and combines K-means clustering algorithm to carry out relevant experiments on the evaluation of English teaching mode. This paper made an experimental analysis on the evaluation of the teaching model from the aspects of clustering accuracy and evaluation time. The results displayed that the average clustering accuracy was 91.53%, and the average evaluation time was 5s. It can be seen from the above data that K-means clustering algorithm can optimize the clustering accuracy and evaluation time of the teaching mode evaluation. This paper also investigated and analyzed the use of digital education resources in teachers' work. The results show that the proportion of digital education resources used in classroom teaching was the largest, accounting for 45.6%. It can be seen that digital education resources play a huge role in teaching.

1. Introduction

In recent years, English teaching has aroused widespread concern in the academic community, and scholars have carried out research on it. Songbatumis Aisyah Mumary conducted a survey on the challenges teachers face in English teaching. The survey shows that these challenges mainly come from students, teachers themselves and school facilities. He gave some solutions to these challenges in English teaching [1]. Xu Ziling aimed to explore the influence of the application of constructivist learning theory in flipped classroom. Taking college English teaching as an example, he interpreted the communication & interaction between teachers and students under the flipped classroom model to improve students' learning quality [2]. Laoli Adieli analyzed the course learning

process of training novice English teachers to improve the quality of English teaching. The results show that novice English teachers have some problems in teaching English writing courses, such as lack of experience, single teaching methods and improper evaluation methods [3]. Liang Liqun pointed out that in college English teaching, it is easy for teachers to ignore the importance of explaining the proper names on websites to students. He believed that teachers should adopt effective methods to guide students to explore proper names online in the process of English teaching [4]. Putri Nina Rosiana conducted a survey on four English teachers' use of E-Learning Madrasah platform in English teaching. The survey found that when English teachers use the platform for English teaching, they would also combine a variety of strategies to reduce online teaching barriers, so as to improve students' English performance [5]. Yao Shuping gave an overview of the application of CAT in English teaching. He proposed to apply this technology to English teaching, and also made relevant explanations for the problems of this technology [6]. However, these scholars' research on English teaching is not comprehensive enough, and based on the network, the research on English can play a better role.

Some scholars have also made corresponding researches on the Internet and English. In order to analyze the impact of multimedia and network hybrid teaching on college students' English learning ability, Sang Peng proposed a model and combined it with the improved extreme learning machine model to integrate multimedia network teaching information and college students' English learning information [7]. In view of the shortcomings of the traditional English reading teaching system, Le Yang proposed an interactive English reading teaching system by integrating the mixed communication network, and established a learning evaluation model to evaluate students' learning status [8]. On the whole, there are not many researches on Internet and English. In order to improve the relevant research of distance English education and teaching mode, it is necessary to study the wireless network based distance English education and teaching mode under the smart classroom mode.

This paper combines WNT to build a long-distance English teaching mode, and combines K-means clustering algorithm to conduct an experimental analysis of the evaluation of English teaching mode. The experimental results show that the average clustering accuracy of this algorithm is 91.53%, and the average clustering accuracy of the traditional algorithm is 85.45%. In contrast, the average clustering accuracy of this algorithm is improved by 6.08%. In terms of evaluation time, the average evaluation time of this algorithm is 5s. The average evaluation time of traditional algorithm is 10.52s. In contrast, the average evaluation time of this algorithm is shortened by 5.52 seconds. It can be seen from the above data that K-means clustering algorithm can effectively improve the clustering accuracy of English teaching mode evaluation and shorten the evaluation time. In the survey and analysis of the use of digital education resources in teachers' work, the largest proportion of digital education resources in classroom teaching is 45.6%. It can be seen that digital education resources play an important role in classroom teaching.

2. Smart Classroom Mode and Remote English Teaching Mode Integrating Wireless Network

2.1 Digital Education Resource Construction

Digital education resources are a kind of digital curriculum materials developed to achieve certain teaching goals, which are used to carry out various teaching activities. From the perspective of ecology, the education ecosystem can be divided into two parts: environment and subject. In the digital education resource ecosystem, various subjects, relationships and environments are closely related and interact with each other, forming a whole. From the perspective of the construction and application of digital education resources, each subject has different priorities, which constitute the basic elements of the construction and application of digital education resources. The relationship

model between them is shown in Figure 1. Among them, the form is the core of the model and plays a decisive role in the other three. The construction is dominant, providing support for services, evaluating auxiliary construction and services, and optimizing the two.

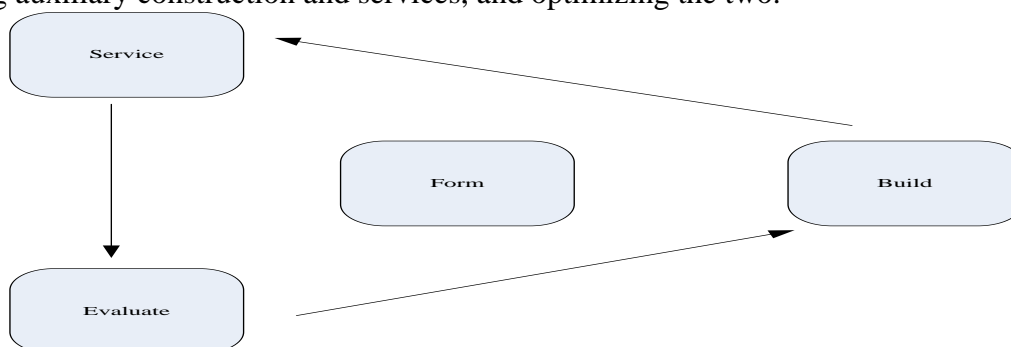


Figure 1: Basic element relationship model of digital education resource construction and application

2.2 Smart Classroom Model

The smart classroom model advocates the development of students' core literacy. Relying on modern technology, the smart classroom model is intended to create an intelligent learning environment suitable for students' physical and mental development. Under the new situation, the construction plan for the smart classroom model is based on the school's training plan. It aims at the development of students' core literacy, uses emerging technologies to build a smart environment, and uses new methods to guide smart teaching. It carries out intelligent learning through practical activities, and generates intelligent evaluation through innovation of logical thinking. The intelligent classroom model is shown in Figure 2.

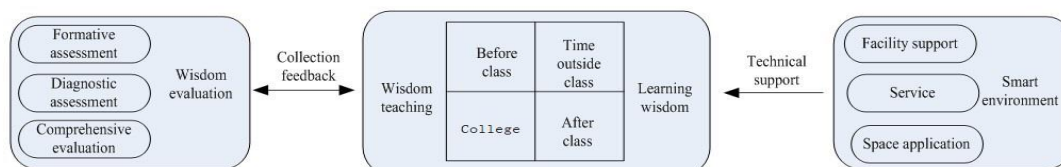


Figure 2: Smart classroom mode

(1) Smart classroom environment model

The smart education environment is the cornerstone to achieve the goal of smart teaching. Nowadays, education tends to be information-based. The school smart education environment needs to meet the requirements of intelligence, situational, collaboration, etc., and establish a smart teaching ecosystem that integrates facility support, space application and resource services.

(2) Smart classroom teaching mode

In the smart education environment, information technology is integrated into education and teaching, and the teaching methods are optimized by combining Internet, big data and other technologies. It can realize the innovation of teaching mode and effectively improve the learning quality of students.

(3) Smart classroom learning mode

Students occupy the main position, and conduct fragmented learning with the help of smart space services in smart classroom, so that students' learning highlights autonomy, individuality and creativity.

(4) Smart classroom evaluation method

Applying intelligent information technology to smart classrooms can make evaluation methods

more diverse. Through the combination of intelligent evaluation, learning analysis, association rule mining and other technologies, it provides effective diagnostic evaluation, performance evaluation, and comprehensive evaluation for teaching and learning, thus forming a smart teaching evaluation index system.

2.3 Application of Wireless Network in Distance Education Mode

Compared with wired network, wireless network is a kind of network extending on its basis, which has more functions and is more convenient. Applying wireless network to distance education can optimize the traditional distance education model.

2.3.1 Transformation of traditional teaching mode

The change of teaching mode can be divided into three stages: at first, it was correspondence education mode, later it became radio and television teaching mode, and now it is distance education mode. However, the distance education mode also has some defects, which must be connected to the network, so the convenience of distance education is very limited. The wireless network solves this problem well. Under the wireless network environment, users can use mobile devices to carry out distance education and teaching, which is very convenient.

2.3.2 Provide cooperative learning platform for trainees

If students encounter difficulties in the learning process, they can upload the questions on the cooperative learning platform through wireless network and mobile terminals, and the cooperative learning platform would automatically transmit the questions to the mobile terminals of teachers and other students. When they receive a question, they can discuss it as soon as possible. In this way, students and teachers can discuss the problems encountered in the learning process and express their personal views without being limited by the location, so as to achieve the timeliness of communication. All of the above are accomplished with the help of WNT.

2.4 Distance English Teaching Mode

2.4.1 Features of distance English teaching mode

As a language and subject, English learners need to pay a certain amount of time and energy to learn English. The distance English teaching mode is composed of multiple modules, so the ways to carry out English teaching are also very diverse, which is conducive to fully mobilizing students' enthusiasm for English learning [9]. The characteristics of distance English teaching mode are as follows:

(1) Learning mode integrating resources

Learning with integrated resources refers to a way to carry out learning activities by collecting a variety of learning resources. In this way, learning resources are an important way for learners to achieve learning objectives, and also the basis for completing meaning construction. Nowadays, in the information age, teaching resources are very rich and easy to obtain. If one wants to select teaching materials suitable for most students, and properly process and sort out the teaching materials, one should also be good at finding and handling problems. This is undoubtedly a great challenge for distance English teachers. At the same time, teachers should update the existing teaching information in a timely manner and constantly optimize the teaching courseware to ensure the timeliness and effectiveness of learning resources.

(2) Learner centered

The remote English teaching mode based on wireless network has adjusted the role of traditional teachers [10]. The traditional role played by teachers is the operator of the classroom and the provider of teaching information, but now it is adjusted to be the participant of teaching activities and the helper of students. The teaching method has also changed from a single classroom teaching to a variety of forms of communication and exchange learning. Students turn passivity into initiative. They can set learning goals and make learning plans according to their own learning situation. At the same time, students should learn to find teaching materials that meet their own needs to assist in English learning.

(3) Teaching and learning benefit each other

Distance English teaching combines computer technology and wireless network to enable students to carry out personalized learning based on their own conditions, thus enhancing their sense of responsibility and consciousness for learning [11]. The learning of multiple modules is integrated, from which students can obtain knowledge and get feedback. Teachers can also obtain students' learning information through wireless networks, and give them feedback and guidance. For learners, this learning mode integrates learning, practice and consolidating knowledge, helping students quickly absorb and master knowledge. Teachers can also discuss students' problems with other teachers through the network resource sharing function, and then make appropriate adjustments to the teaching process and optimize the teaching plan in combination with students' specific conditions.

2.4.2 Teaching links of distance English teaching mode

The distance English teaching mode is mainly divided into the following links:

(1) Face to face coaching

In the distance English teaching mode, the teaching management system is centered on students [12]. Putting students at the center of learning and giving full play to their dominant position is an active learning and student-centered teaching mode, as shown in Figure 3. The teaching mode of face to face tutoring is characterized by discussion type, puzzle solving type, homework review, etc. In classroom teaching, teachers are no longer in the leading position, but play a role of assisting students in classroom teaching. They help and guide students to learn by making diversified learning courseware.

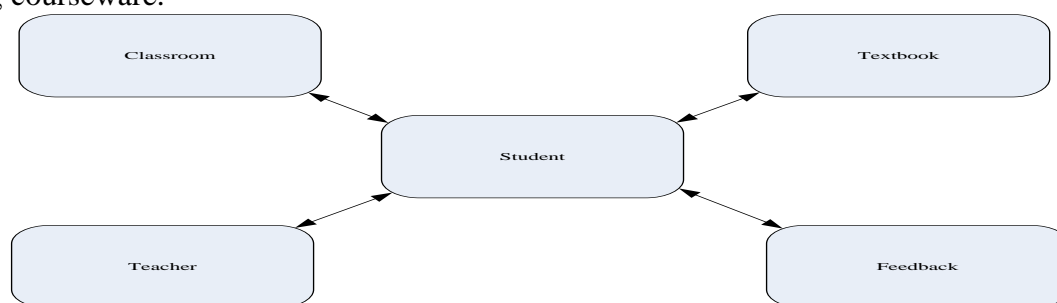


Figure 3: Student centered teaching mode

(2) Electronic Media Assistant

If distance education wants to break the limit of time & space, it needs to be realized by multimedia. In distance education, multimedia resources play an important role. Media learning is a teaching resource that can be used under the communication network technology. In the English teaching mode, it can use a variety of teaching media to conduct face-to-face tutoring, and it can also conduct English teaching through WeChat communication, email, online communication, etc. [13].

(3) Autonomous learning

In traditional classroom teaching, students lack initiative and are in a passive learning state for a long time, while autonomous learning allows students to have learning initiative. Teachers play a guiding role for students. By constantly stimulating their learning motivation, they urge them to improve their learning initiative, and help them formulate learning goals and implement learning plans. People should constantly cultivate students' habit of autonomous learning and let them learn to use media technology skillfully, including print media and electronic technology media.

(4) Course assignment

The course assignment is an effective way to check the effect of students' autonomous learning, and the teaching interaction and teaching feedback between teachers and students are also completed by this way. Teachers can guide students' homework on time, provide help for students in time, and share their excellent homework with other students. It allows them to learn some useful learning skills and methods to improve their learning ability.

2.4.3 Construction of distance English teaching mode

The construction of distance English teaching mode is also the preparation of English teaching syllabus, which integrates multimedia technology to carry out teaching, including three different teaching methods. Under different teaching methods, it is divided into different teaching contents, including written materials, audio-visual materials, and teaching software. Students can choose media teaching materials, learning methods, learning time, etc. according to their own learning conditions, which is the basic mode of distance English teaching, as shown in Figure 4. This teaching mode has few restrictions on learners, and can create a good learning environment for learners, thus improving their autonomous learning ability.

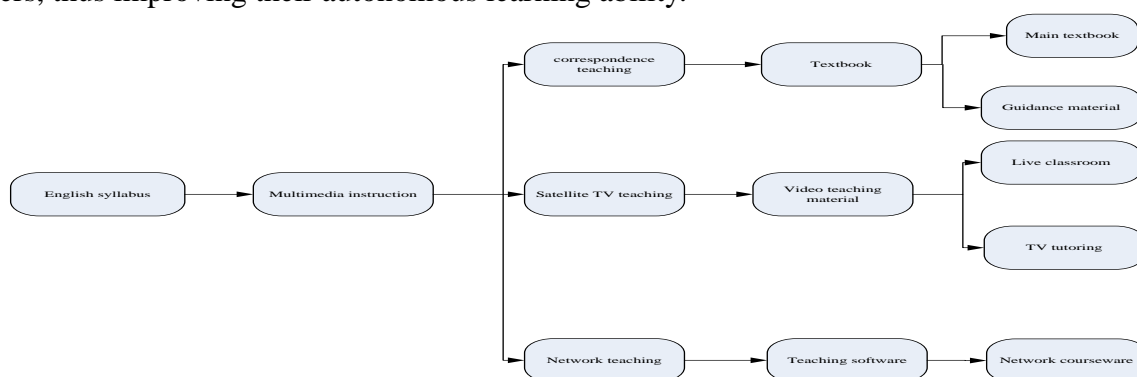


Figure 4: Distance English Teaching Mode

3. Evaluation of English Teaching Mode Based on K-means Clustering Algorithm

3.1 K-means clustering algorithm

K-means clustering algorithm is a partition based clustering algorithm. It is easy to describe, simple, easy to operate, and fast. When processing large datasets with complex structures, the algorithm shows strong flexibility and high implementation efficiency. K-means clustering algorithm has certain applications in various industries, such as industry, science, artificial intelligence, etc. [14]. Nowadays, it is popular to apply to the extraction of headlines, the sorting of customer information in financial institutions, and image processing. The core content of K-means clustering algorithm is to divide multiple data objects to form k clusters and minimize the sum of squares of the distance between the data points in each cluster and the cluster center [15].

Combining k-means clustering algorithm to cluster the data of English teaching mode, the number of object clusters in the teaching mode database should be input, which can be expressed as k . The data sample of English teaching mode is represented as n , and the initial cluster center is represented as $D_r, r = (1, 2, \dots, k)$. D_r is composed of k th objects selected from n . The data points in the dataset are represented by t . The distance between t and k cluster centers could be calculated. It is expressed as g , and the formula is as follows:

$$g(r, h) = \sqrt{(q_{r1} - q_{h1})^2 + (q_{r2} - q_{h2})^2 + \dots + (q_{rn} - q_{hn})^2} \quad (1)$$

$r = (q_{r1}, q_{r2}, \dots, q_{rn}), h = (q_{h1}, q_{h2}, \dots, q_{hn})$ represent two n dimension objects.

Determine the distance of each object, and blend t into the cluster consistent with D_r . In order to obtain a new D_r value as a new cluster center, each object can be searched and recalculated. The formula is:

$$D_k = \sum_{r=1}^T q_r / T \quad (2)$$

D_k is the cluster center of k clusters; T is the number of prime objects in the k th cluster.

Use similar clusters on objects in the dataset, and repeat this operation continuously. When the square error criterion reaches the minimum, stop the operation. The formula is:

$$W = \sum_{r=1}^k \sum_{t \in f_r} |t - D_r|^2 \quad (3)$$

In the formula, the square error of each object is expressed as W , and the average value of cluster f_r is expressed as D_r .

3.2 Evaluation Index System of English Teaching Mode

The construction of the evaluation index system of English teaching mode is displayed in Figure 5.

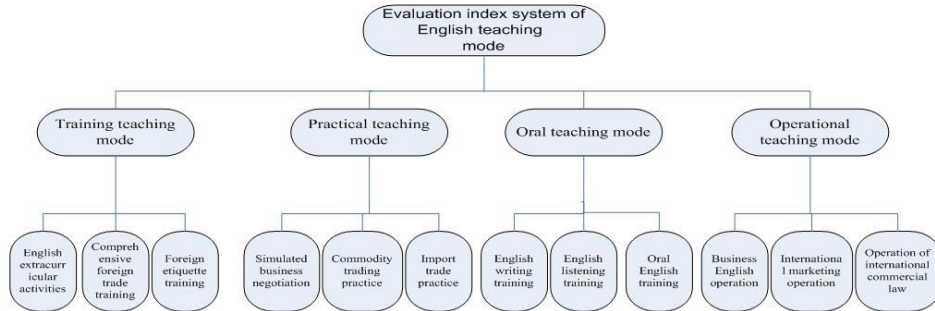


Figure 5: Evaluation index system of English teaching mode

In view of the principle of observability, the primary indicators that cannot be obtained from the data are eliminated, so that the preliminary eliminated indicator system can be quantified. The standardized formulas for positive and negative indicators are:

$$t_{rh} = \frac{M_{rh} - \min_{1 \leq h \leq n}(M_{rh})}{\max_{1 \leq h \leq n}(M_{rh}) - \min_{1 \leq h \leq n}(M_{rh})} \quad (4)$$

$$\hat{t}_{rh} = \frac{\max_{1 \leq h \leq n}(M_{rh}) - M_{rh}}{\max_{1 \leq h \leq n}(M_{rh}) - \min_{1 \leq h \leq n}(M_{rh})} \quad (5)$$

The value of the r th indicator of the h evaluation object after positive standardization is t_{rh} , and the value after negative standardization is \hat{t}_{rh} ; the r th index value of the h evaluation object

is expressed as M_{rh} . The t_{rh} value has a positive relationship with the index of teaching mode; The \hat{t}_{rh} value is inversely related to the indicators of the teaching mode.

It is necessary to combine the grey system theory model, which also integrates the fuzzy comprehensive evaluation method to complete the evaluation of English teaching mode [16].

The factor set is established according to the evaluation index, expressed in B and $B = [b_1, b_2, \dots, b_n]$. The evaluation of the teaching mode can be completed by constructing an evaluation set, which is represented by E, including $E = [e_1, e_2, \dots, e_n]$. In order to obtain the indicator weight matrix, it needs to integrate the analytic hierarchy process. The indicator weight matrix is represented by A, $A = [a_1, a_2, \dots, a_n]$, and the weight value of each indicator is A_r . The reliability of index weight is analyzed, and the formula is:

$$EL = \frac{EO_n}{LO_n} \quad (6)$$

In the formula, the evaluation consistency index of n order judgment matrix can be expressed as EO_n ; the average consistency index of n-order reciprocal matrix can be expressed as LO_n .

The single factor evaluation matrix is constructed, expressed as L, and the formula is:

$$L = \begin{bmatrix} l_{11} & l_{12} & \dots & l_{1n} \\ l_{21} & l_{22} & \dots & l_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ l_{z1} & l_{z2} & \dots & l_{zn} \end{bmatrix} \quad (7)$$

The weighted average comprehensive evaluation model is represented by P, and the comprehensive evaluation matrix is represented by J. The comprehensive evaluation model and the comprehensive evaluation matrix can be expressed as:

$$P = (\cdot, \oplus) = \sum_{i=1}^n (A_i \cdot l_{zn}) \quad (8)$$

$$J = A \cdot L = [a_1, a_2, \dots, a_n] \cdot \begin{bmatrix} l_{11} & l_{12} & \dots & l_{1n} \\ l_{21} & l_{22} & \dots & l_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ l_{z1} & l_{z2} & \dots & l_{zn} \end{bmatrix} \quad (9)$$

The grey correlation degree is calculated to determine the correlation order. The formula is:

$$\begin{aligned} \gamma_{rh}(k) &= \frac{\min_r \min_h \Delta_r(k) + \varphi \max_r \max_k \Delta_r(k)}{\Delta_r(k) + \varphi \max_r \max_k \Delta_r(k)} \\ \varphi &\in (0,1) \\ \Delta_r(k) &= |P'_h(k) - P'_r(k)| \\ \gamma_{rh} &= \frac{1}{k} \sum_1^k \gamma_{rh}(k), k = 1, 2, \dots, n \end{aligned} \quad (10)$$

In the formula, the resolution coefficient is expressed as φ , the initial value image of P is expressed as P'_h and P'_r , and the correlation order is expressed as γ_{rh} . There is a positive relationship between the relational order and the evaluation of the teaching model, that is, the results of the evaluation of the teaching model become better and better with the increase of the relational order.

3.3 Experimental Analysis of English Teaching Model Evaluation

This paper took 8 English schools in a certain area as the research object, and combines K-means clustering algorithm to evaluate four different English teaching models [17]. It mainly conducted

calculation experiments in terms of clustering accuracy and evaluation time, and conducted comparative experiments with traditional algorithms. The specific results are as follows.

3.3.1 Clustering accuracy test

In this experiment, two algorithms are used to test different teaching modes in terms of clustering accuracy, and the test results are shown in Figure 6.

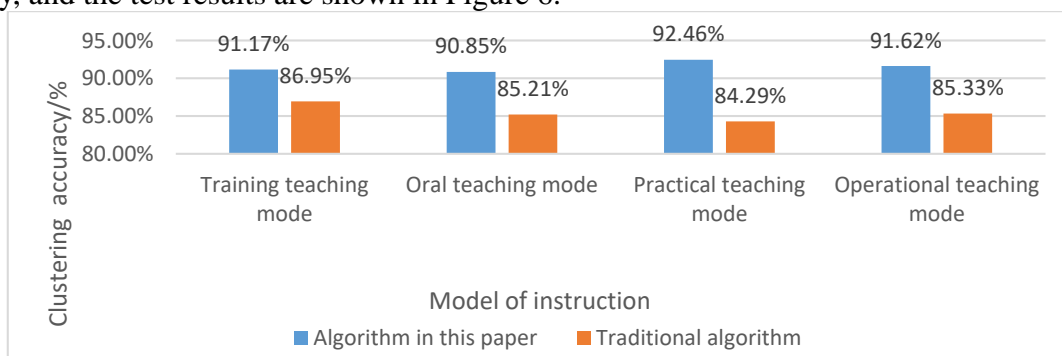


Figure 6: Comparison of clustering accuracy of different algorithms

It can be seen from Figure 6 that under different algorithms, there are certain differences in the clustering accuracy of the teaching mode. Under the algorithm, the clustering accuracy of the four English teaching models is relatively high. The clustering accuracy of oral teaching was the lowest, 90.85%, and that of practical teaching was the highest, 92.46%. The average clustering accuracy of the four teaching modes can be calculated to be 91.53%. Under the traditional algorithm, the clustering accuracy of different teaching modes is relatively low. The clustering accuracy of practical teaching was the lowest, 84.29%, and that of training teaching was the highest, 86.95%. Therefore, the average clustering accuracy of the four teaching models was 85.45%. From the above data, the clustering accuracy under this algorithm is higher, and the accuracy of teaching mode evaluation is directly related to the clustering accuracy, so the accuracy of teaching mode evaluation under this algorithm is also higher.

3.3.2 Evaluation time test

This paper also conducts experimental tests on different English teaching modes from the perspective of evaluation time. The test results of the two algorithms are shown in Figure 7.

It can be seen from Figure 7 that the evaluation time of the two algorithms for different teaching modes is different. Under the algorithm in this paper, the evaluation time of the four teaching modes was about 5s as a whole, among which the evaluation time of training teaching was the shortest, 4.53s. The evaluation time of oral teaching was the longest, 5.32s, and the average evaluation time of the four teaching modes was 5s. Under the traditional algorithm, the overall evaluation time of different teaching modes was about 10s, among which the evaluation time of training teaching was the shortest, 9.96s. The evaluation time of practical teaching was the longest, 11.26s, and the average evaluation time of the four teaching modes was 10.52s. From the above data, the evaluation time under the algorithm in this paper is shorter, which shows that the real-time evaluation of teaching mode is higher.

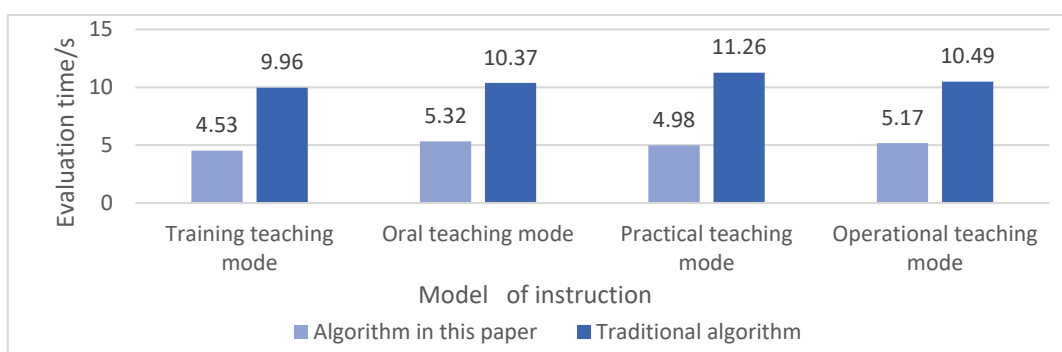


Figure 7: Comparison of evaluation time of different algorithms

3.4 Investigation and Analysis on the Use of Digital Education Resources in Teachers' Work

This paper investigates and analyzes the use of digital educational resources in teachers' work by using online questionnaire among 2,000 university teachers in China. The results are shown in Figure 8.

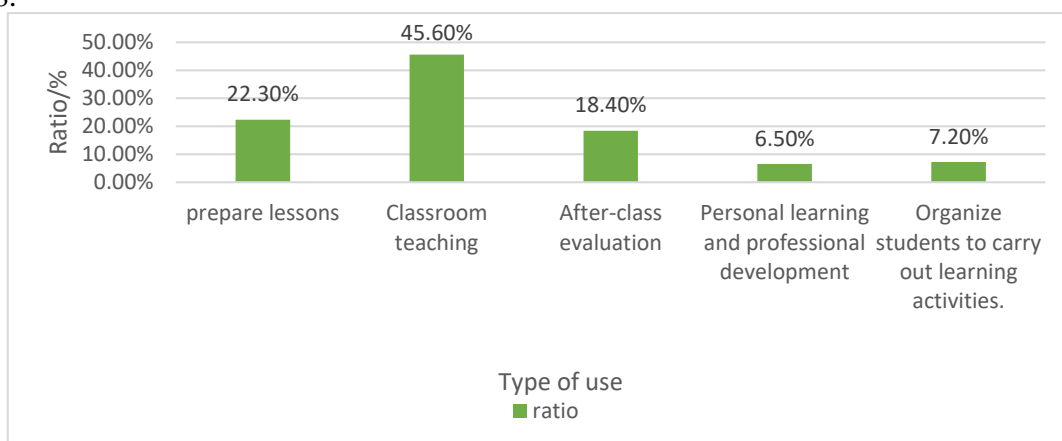


Figure 8: The use of digital education resources in teachers' work

As can be seen from Figure 8, digital educational resources have multiple uses in the work of university teachers. The main use of digital educational resources is still classroom teaching, accounting for 45.6%, followed by lesson preparation, accounting for 22.3%. Digital education resources were the least used for personal learning and professional development at 6.5%. In general, digital educational resources have been widely used in the work of university teachers. It can be seen that digital educational resources have gradually become an important means for university teachers to carry out teaching work.

4. Conclusion

Under the smart classroom model, English classroom teaching is gradually becoming more and more intelligent. With the development of information technology and the Internet, distance education has emerged, so there is a distance English teaching model. Digital education resources provide teachers and students with a large number of curriculum materials. It is very necessary for the construction of digital education resources to promote the organic integration of information technology and education and teaching. In this paper, the WNT was applied to the distance English teaching mode, and combined with the K-means clustering algorithm, the evaluation of English teaching mode is constructed. The experimental analysis of the evaluation of English teaching mode

is also carried out from the clustering accuracy and evaluation time. Under this algorithm, the clustering accuracy of the evaluation of the teaching mode is higher, and the evaluation time is shorter, which can play a good optimization effect on the evaluation of the teaching mode. This paper also conducts an investigation and analysis on the use of digital education resources in teachers' work. The investigation shows that digital education resources are widely used in teachers' work, and the proportion of digital education resources used in classroom teaching is the largest. Due to the limitation of experimental conditions, this experiment only carried out experimental analysis on clustering accuracy and evaluation time, and did not carry out research on other aspects. In the future research work, K-means clustering algorithm still needs to constantly adapt to the development needs of the evaluation of English teaching mode, and improve the performance of the algorithm. It can provide more accurate information for teaching mode evaluation.

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