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Positive Role of AI Model in the Sustainable Development of College English Education from the Perspective of Educational Ecology

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Abstract: With the rise of the concept of ecological education, the sustainable development of English education has steadily become more important to many institutions and universities and have carried out reforms to address the shortcomings of traditional English teaching. Under the influence of computer technology, AI (artificial intelligence) has also made breakthrough progress and has certain applications in all walks of life. However, the computer communication network is also facing serious security risks, and it needs to be combined with relevant technologies to maintain the security of the communication network. In this paper, the concept of ecological education was integrated into college English education, and AI technology was applied to English teaching. By combining support vector machine and principal component analysis, the paper constructed an evaluation index system of English teaching quality, and made an experimental analysis of English teaching quality evaluation. The experimental results showed that the average evaluation accuracy of the five evaluation indexes was 94.06%, and the average evaluation time was 5.06s. It can be seen from the above data that the algorithm in this paper can effectively improve the evaluation accuracy of the system and shorten the evaluation time. This paper also tested the communication network security encryption system, and the results showed that the proportion of decrypted data in the system was less than 4%, which showed that the encryption effect of the system was good.

1. Introduction

At this stage, the concept of ecological education is prevailing, but there are many problems in the traditional English education methods, which are difficult to adapt to the needs of the current education development. In order to promote the sustainable development of English education, ecological education needs to be applied to English education and teaching. With the help of science and technology, AI technology is becoming more and more mature and has good applications in many industries. AI can therefore be used in English instruction to support its newfound

development.

The academic world has recently become very concerned with English, and researchers have done studies on it. Macaro Ernesto provided an overview of English teaching research in higher education. By studying the questionnaire about the beliefs of college teachers and students, he explored the impact of English as a second language teaching on students' English proficiency and content learning [1]. Lee Given conducted an experimental study on 79 students of a Korean university in the same English course by adopting the flipped learning method and communicative language teaching method respectively. The study found that the flipped learning method would have a positive impact on students' English learning [2]. Agung Antonius Setyawan Nur investigated and analyzed 66 students in order to explore their views on online English learning. It was found that there were some obstacles to online learning in English education and learning projects, the most important of which ws the accessibility of teaching media [3]. Anderson Jason investigated 116 English learners' future language use and found that most English learners believed that cross language practice was needed in the future, and made some discussions on this finding [4]. Alfahadi Abdulrahman M Abdulrahman pointed out that students can use social media websites, smartphones, tablets, etc. for extracurricular English learning, and they can also use social media to establish a learning community. English learners can learn English skills in online communities [5]. Di Bitetti Mario S analyzed their influence on the citation rate from the aspects of English and non English languages, paper length and publication time. The research found that the citation rate of articles published in English would be higher, so universities and scientific institutions should pay attention to English teaching [6]. However, these scholars' researches on English were not comprehensive enough, and the research on English based on AI can play a better role.

Some scholars have also made corresponding research on the combination of AI and English. Zhang Yonggang proposed an AI based English teaching resource integration model, which can be used to solve the problem of poor accuracy and high complexity in the process of teaching resource integration, and can integrate the web crawler recognition technology to collect English teaching resource information [7]. Considering the information technology and curricula are combined, Bin Yi made some explorations on the application of AI in English teaching in middle schools, and proposed an AI-based approach for teaching supplementary English in college [8]. In general, there are not many researches on AI and English. In order to improve the relevant research on college English education, it is necessary to study the positive role of AI models in the sustainable development of college English education from the perspective of educational ecology.

In this paper, AI was applied to English education and teaching, and combined with support vector machine and principal component analysis, a teaching quality evaluation index system was constructed. The experimental results showed that the average evaluation accuracy of the algorithm in this paper was 94.06%, and the average evaluation accuracy of the traditional algorithm was 87.12%. In terms of evaluation time, the average evaluation time of this algorithm was 5.06s, and the average evaluation time of traditional algorithm was 10.16s. It can be seen from the above data that the algorithm in this paper can optimize the evaluation accuracy and evaluation time of the system. In the test experiment of communication network security encryption system, the proportion of decrypted data in this system was less than 4% as a whole, while the proportion of decrypted data in traditional systems was more than 7%, which showed that the proportion of decrypted data in this system was lower.

2. College English Education Based on Education Ecology and AI

2.1 Computer Communication Network Security Maintenance Measures

Access control security technology is the key way of communication network security maintenance at this stage. Its key task is to ensure the security of computer communication network, so as to ensure that communication network resources would not be illegally used, browsed and infringed by network information.

In the computer communication network, the first important thing to ensure the security of data transmission is to protect the data information passively transmitted on the communication network, so as to avoid causing tort liability during the operation of the computer communication network. At present, the technical measures for data transmission security are usually firewall technology, data encryption and digital signature technology, virtual private network technology, etc. Firewall is a defense system used to block bad information in communication network. There are two types of firewalls: inbound and outbound. In the current computer communication network, transitive firewalls are often used to maintain network security. The technical rule structure of transitive firewalls is shown in Figure 1.

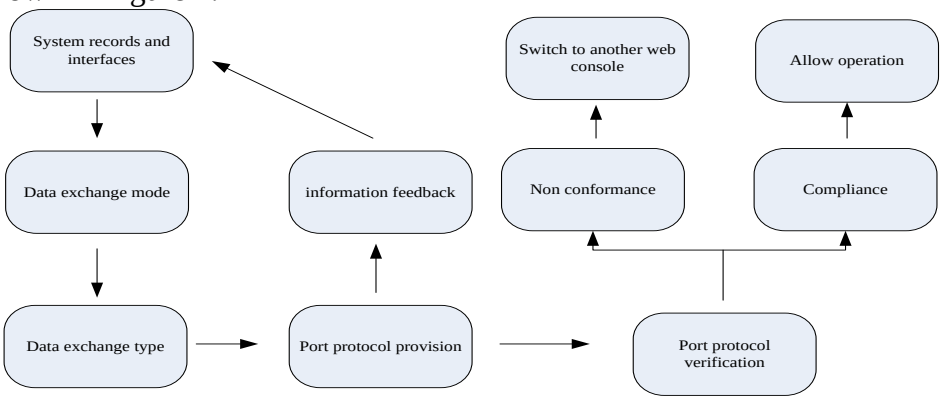

Figure 1 Structure of technical rules for transitive firewall

2.2 Sustainable Development of English Education under Ecological Education

2.2.1 Significance of Ecological Education on College English Teaching

Ecological education applies ecological principles and methods to study the impact of education on nature and social development, and the relationship among people, education and environment in the educational ecosystem.

First, it is important to follow a virtuous circle development model to implement a comprehensive and dynamic English education. Teachers can integrate socio-economic development and professional needs to observe students' learning, and constantly improve teaching methods and methods by virtue of various factors, so as to increase the interest and richness of classroom teaching and promote the dynamic change of language learning [9]. Secondly, ecological education is to spread ecological knowledge and culture on the basis of ecology, so that students' ecological concepts and quality can be improved, thus creating an ecological civilization education.

2.2.2 Effective Ways to Achieve Sustainable Development of College English Education

(1) Cultivate students' comprehensive ability

Teachers should consider the long-term development of students as the main objective of

instruction during the classroom teaching process, and comprehensively cultivate students' comprehensive ability. Although students' cultural achievements are very important, they are not the only criteria for judging. Teachers should let students participate in the classroom more and be good at guiding students to use English professional knowledge to deal with specific problems in life.

(2) Improve students' ability of autonomous learning

When students learn English in class, the teacher serves as a mentor and aids in knowledge transfer. When knowledge is taught to students, students need to consolidate and improve their knowledge spontaneously. Therefore, whether in class or out of class, teachers should give students full opportunities to learn independently, so that students can play their talents and exchange learning. In the classroom, teachers should be good at mobilizing the enthusiasm of students and let them participate in the classroom independently. At the same time, teachers should also be good at throwing out questions for students to think, so that students can find the joy of learning English in the process of thinking. In addition, teachers should also allocate more practical activities after class to help students improve their practical ability.

(3) Integrate English education with other disciplines

In the process of English education, it is required to be good at adding some other subjects. This is because English is widely used and there are many problems that can be solved with the help of English knowledge [10]. For example, in translation, the knowledge in English books is very theoretical, and the knowledge content is also very single. However, some knowledge content in other disciplines can play a complementary role to it. Many new problems would be encountered in this session, which would also enable students to practice their problem-solving skills.

2.3 Influence of AI on the Role of Teachers and Students in English Teaching

In the process of English teaching, teachers and students play a key role. AI technology plays a huge role in English teaching, so the teaching subjects have also changed from the original two to the current three, and the added subject is AI. The main body structure between AI and teachers and students is shown in Figure 2.

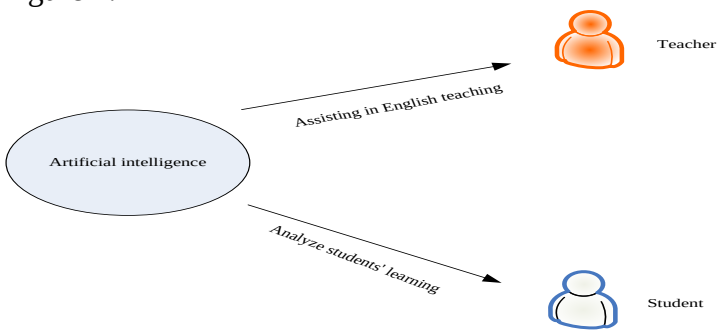

Figure 2 The main body structure between AI and teachers and students

The use of AI technology in English teaching demonstrates how AI would affect English teachers and students. By applying AI teaching assistant to teaching links, the assistant would assign different teaching contents according to different types of teaching objects. The assistant would also analyze the learning situation according to the students' assessment answers, and analyze the overall English learning situation of the class. According to the situation of different students, the assistant would also give feedback to the teacher one by one and give corresponding solutions.

AI technology can play the role of students in the process of English teaching, and record the learning situation of each student. With the help of the questionnaire report, students' English level

and their absorption of English professional knowledge in each class can be mastered, and the characteristics of students' English learning can be analyzed. After that, it can push targeted English learning suggestions according to different students' English learning conditions, and make learning plans to help students improve their English level.

2.4 College English Teaching Mode Based on AI

AI technology has rich applications in English teaching, which are shown in Figure 3. Through the combination of AI technology, the college English teaching mode is discussed from four aspects.

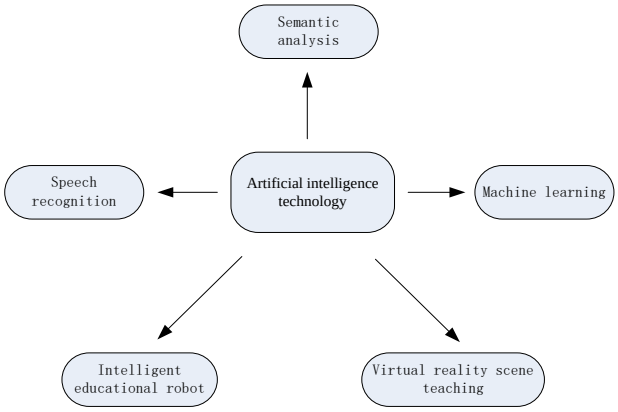

Figure 3 Application of AI technology in English teaching

2.4.1 Corpus based College English Listening Teaching

(1) Automatic matching of learning resources

There are a large number of learning resources in the English learning corpus, and students would have some difficulties in choosing learning resources, which is easy to consume a lot of time. AI technology can select the matching learning resources according to the needs of different students, which saves a lot of time for students to select teaching resources. Moreover, AI has a high degree of mastery of students' learning ability.

(2) Creation of a contextual learning model

With the support of AI technology, corpus can complete the interaction between scenes and learning. For example, if students use the mobile phone scanning function to identify an object, AI would retrieve and identify the object to search for the English word of the object, and automatically read it aloud. It is also possible to make adjustments to the speed of English reading aloud, and whether or not to translate sentences and repeat after them. Integrating English listening into students' daily lives would allow them to learn English while perceiving life.

2.4.2 College Oral English Teaching Based on Educational Robot

(1) Companion practice

The educational robot can accompany students like friends and communicate with learners in standard English, thus creating a natural English communication environment for students. The educational robot can also create a variety of dialogue scenes for students and have friendly conversations with students.

(2) Group learning

After the new semester starts, the students' oral ability would decline obviously, because there is no lack of environment for oral practice during the holidays. The educational robot can not only

solve this problem well, but also extend the scope of oral English teaching. With the help of educational robots, students can have oral conversations with teachers outside class, and can conduct group training with other online students by means of video conference. At this time, the educational robot would be converted into a learning assistant to give the interlocutor some basic sentence patterns and phrase collocation on a certain topic, so as to facilitate the students' daily oral application.

2.4.3 Blended English Writing Teaching

This paper combined AI technology to build a mixed English writing teaching model as shown in Figure 4.

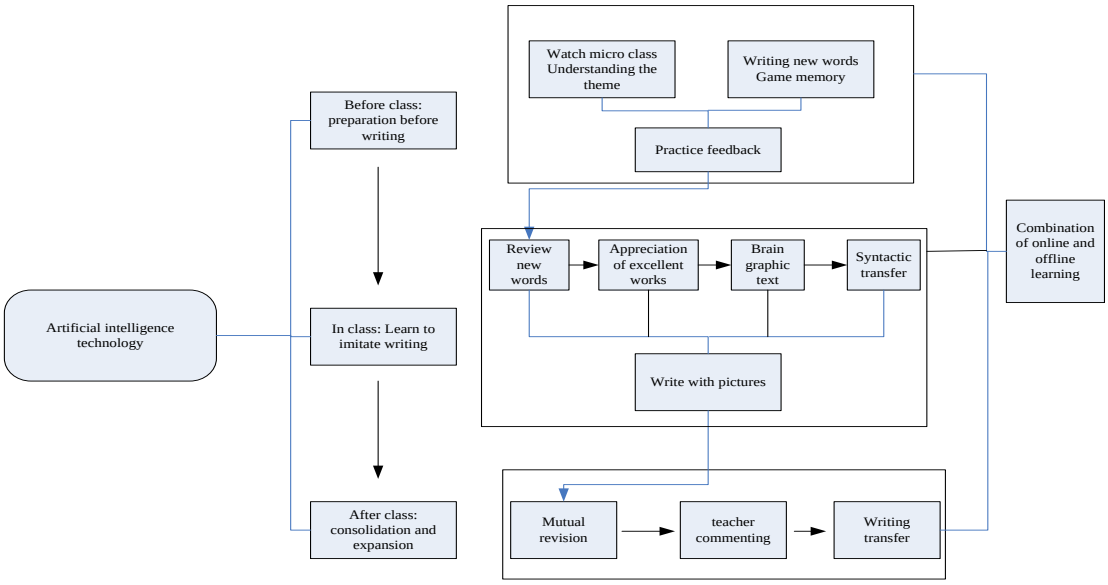

Figure 4 Mixed English writing teaching mode with AI

(1) Before class: preparation before writing

The writing preparation stage is mainly carried out through online active learning activities. The activity includes three aspects: the first is micro learning on the topic of writing. The task of writing is determined by understanding and mastering the theme of writing. The second is to memorize new words by playing games, which can help students learn vocabulary and lay a foundation for writing.

(2) During the lesson: learning to imitate the text

According to the teaching platform's monitoring data, the teacher identifies the students' areas of weakness, and during the subsequent lesson, he guides the students in consolidating and reviewing new vocabulary. In the section of appreciation of excellent works, students read aloud in groups or study excellent works through machine translation. Brain graphic text is instruct students on how to use mind mapping to organize the article's writing style and linguistic elements. Through pertinent copying and rewriting assignments, sentence pattern transfer helps students learn to flexibly apply key language patterns.

(3) After class: consolidation and expansion

The consolidation and expansion stage adopts the combination of online and offline. The first is mutual correction and revision. Students correct each other's homework and revise mistakes. The second is the teacher's comments. The teacher makes comments according to the revision of the students, and selects excellent model articles to share in the class. Finally, there is the transfer of writing. Teachers can add some simple and real foreign trade businesses in teaching, so that students can complete the corresponding tasks and write English accordingly.

2.4.4 Cloud based College English Teaching

With the aid of AI platform, teachers can create tasks in different situations for students and give them help and guidance. In the translation link, students can use cloud service technology to deal with problems encountered in text interpretation, language processing and other aspects, which can effectively reduce the difficulty and stimulate students' exploration of English learning.

3. Evaluation of English Teaching Quality Based on Principal Component Evaluation and Support Vector Machine

3.1 Support Vector Machines and Principal Component Evaluation

In dealing with the quality of English language teaching, a classifier needs to be built with the help of a support vector machine. The data set of this evaluation question is expressed as(r_j, h_j),$r_j \in W^m$, $h_j \in \{-1,1\}$, $\mathrm{j} = 1,2,\cdots,\mathrm{m}$. Among them, 1 represents the evaluation index of teaching quality, and 2 represents the level of teaching quality. To minimize the risk, a hyperplane is created with Formula (1):

$$h_j = \delta^{\mathrm{P}}\Psi(r_j) + \mathrm{c} \tag{1}$$

If the classification problem is not linear and indivisible, the Formula (1) shall be solved. To create the best hyperplane, it is necessary to transform and improve the classification of discrete systems. The formulas are:

$$\min \mathrm{L}(\delta, \mu) = \frac{1}{2}\|\delta\|^2 + \mathrm{A}\sum_{\mathrm{j}=1}^{\mathrm{m}} \mu_{\mathrm{j}}$$

$$\mathrm{S.t.}\ h_j(\delta \cdot \Psi(r_j) + \mathrm{c}) \geq 1 - \mu_{\mathrm{j}}, \mu_{\mathrm{j}} \geq 0, \mathrm{j} == 1,2,\cdots,\mathrm{m} \tag{2}$$

Among them, the penalty parameter of error classification results is represented by A.

When a new sample is introduced, the support vector machine would learn it once. With the continuous expansion of the sample size, the learning time would increase accordingly, and the calculation of time would become more complex. In order to improve the learning rate, Lagrange multipliers can be introduced to deal with it. The classification function formula is:

$$\mathrm{k(r)} = \mathrm{sgn}\left(\sum_{\mathrm{j}=1}^{\mathrm{n}} \theta_j h_j \left(\Psi(\mathrm{r}) \cdot \Psi(r_j)\right) + \mathrm{c}\right) \tag{3}$$

Among them, θ_j represents the Lagrange multiplier.

The point product operation $\Psi(\mathrm{r}) \cdot \Psi(r_j)$ is replaced by the kernel function $Y(r_j, r)$, and the classification process is simplified. The formula is:

$$\mathrm{k(r)} = \mathrm{sgn}\left(\sum_{\mathrm{j}=1}^{\mathrm{n}} r_j h_j Y(r_j, r) + \mathrm{c}\right) \tag{4}$$

The number of English teaching quality evaluation indexes is relatively large, so some techniques must be used to select evaluation indexes and reduce the number of overall evaluation indicators. The choice of evaluation indicators in this paper was implemented using principal component analysis. The units of different evaluation indicators are different, which would lead to large differences in data, thus causing adverse effects on the teaching quality evaluation results. To solve this problem, the index value used to measure teaching quality must be standardized, and the formula is:

$$\bar{r}_{jl} = \left(r_{jl} - \bar{r}_l\right)/f_l \tag{5}$$

Among them, there are:

$$\begin{cases} \bar{r}_l = \frac{1}{y}\sum_{j=1}^{y} r_{jl} \\ f_l = \frac{1}{y-1}\sum_{j=1}^{y}\left(r_{jl} - \bar{r}_l\right)^2 \end{cases} \tag{6}$$

The evaluation index's correlation coefficient matrix is calculated, and the formula is:

$$\mathrm{E} = \left(\mathrm{a_{jl}}\right)_{\mathrm{q\times q}}, \mathrm{a_{jl}} = \sum_{\mathrm{u=1}}^{\mathrm{y}} \bar{r}_{uj}\bar{r}_{ul}/(y-1) \tag{7}$$

Among them, the $j$teaching quality evaluation sample's l index correlation coefficient is expressed as $\mathrm{a_{jl}}$, and the number of evaluation indexes is expressed as q.

3.2 Construction of the Evaluation Index System of English Teaching Quality

To get the best evaluation results for the effectiveness of English education, it is necessary to create an optimal evaluation index system of English teaching quality. At this stage, there are many ways to create evaluation index value system. This paper created a teaching quality evaluation index system as shown in Figure 5 mainly from both teachers and students.

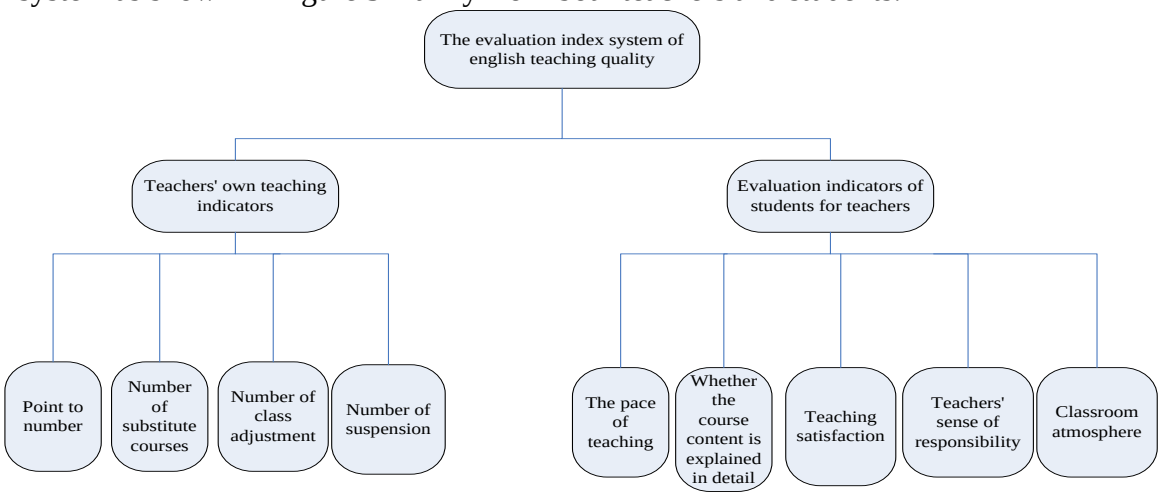

Figure 5 College English teaching quality evaluation index system

3.3 College English Teaching Quality Evaluation Test Experiment

In this paper, the effect of English classroom teaching in a university was selected as the experimental object, and five of them were selected from the evaluation indicators of teaching quality for the experimental test, including five aspects: the number of class suspension, the number of class substitution, the number of class adjustment, the classroom atmosphere, and teachers' sense of responsibility. Relevant data information was collected. By combining principal component analysis and support vector machine, this paper tested the teaching quality evaluation, and used traditional algorithms to carry out comparative experiments.

3.3.1 Evaluation Accuracy

This paper used two different algorithms to test the teaching quality evaluation from the aspect of evaluation accuracy. The test results of five evaluation indicators are shown in Figure 6.

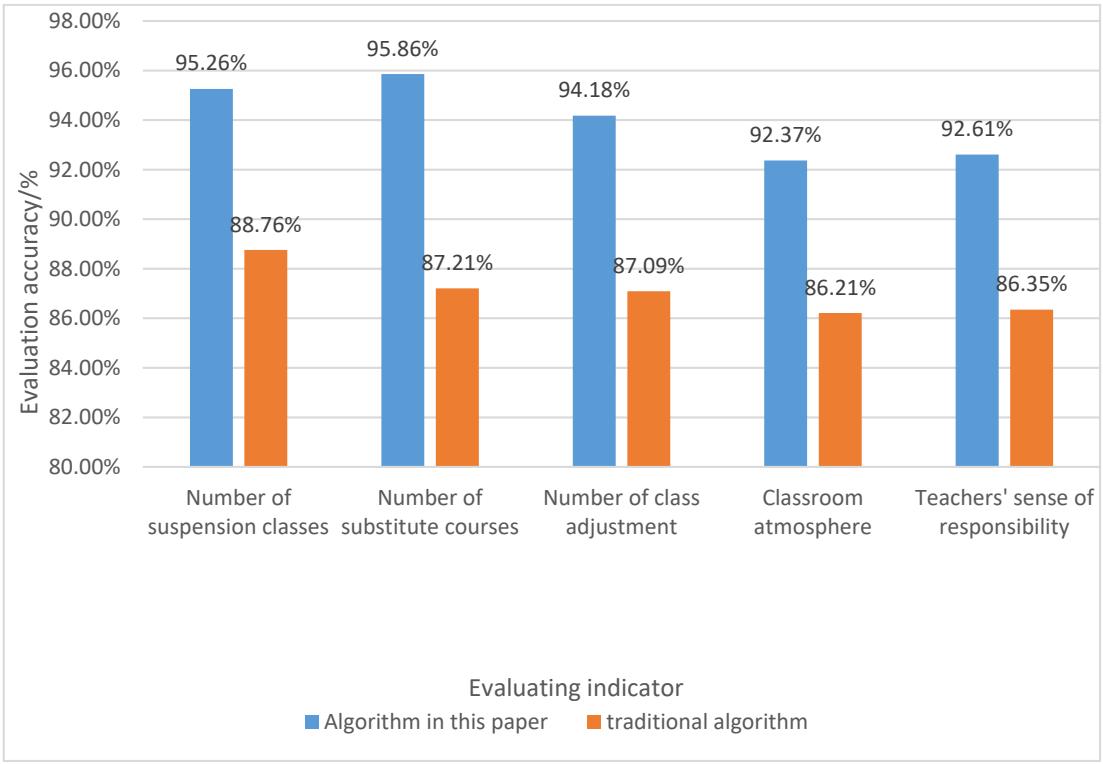

Figure 6 Comparison of evaluation accuracy under different algorithms

It can be seen from Figure 6 that the two algorithms had obvious differences in the evaluation accuracy of teaching quality evaluation. Under this algorithm, the evaluation accuracy of different evaluation indexes exceeded 90%. The evaluation accuracy of classroom atmosphere was the lowest, which was 92.37%; the evaluation accuracy of the number of substitute courses was the highest, which was 95.86%; the average evaluation accuracy of the five evaluation indexes was 94.06%. Under the traditional algorithm, the evaluation accuracy of different evaluation indicators was below 90%. The evaluation accuracy of classroom atmosphere was the lowest, which was 86.21%; the evaluation accuracy of the number of suspension as the highest, which was 88.76%; the average evaluation accuracy of the five evaluation indexes was 87.12%. From the above data, the evaluation accuracy of this algorithm was higher.

3.3.2 Evaluation Time

In order to further highlight the advantages of the algorithm in this paper, this paper also tested the teaching quality evaluation from the aspect of evaluation time. The test results of the two algorithms are shown in Figure 7.

According to Figure 7, the evaluation time of the two algorithms for teaching quality evaluation was different. Under this algorithm, the evaluation time was about 5s. The evaluation time of the number of suspension was the shortest, which was 4.27s; the evaluation time of teachers' sense of responsibility was the longest, which was 5.93s; the average evaluation time of five evaluation indexes can be calculated as 5.06s. Under the traditional algorithm, the evaluation time was longer. Among them, the evaluation time of the number of class transfers was the shortest, which was 9.41s; the evaluation time of teachers' sense of responsibility was the longest, which was 10.99s; the average evaluation time of the five evaluation indicators was 10.16s. It can be seen that the evaluation time of this algorithm was shorter.

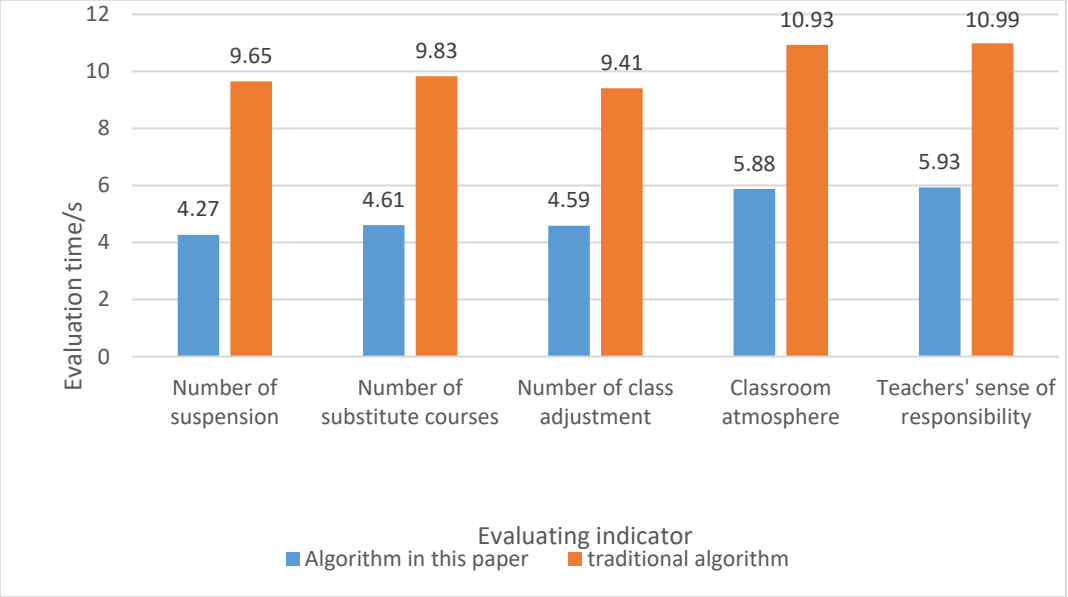

Figure 7 Comparison of evaluation time under different algorithms

3.4 Test Experiment of Communication Network Security Encryption System Based on Public Key Cryptography

In this paper, the system in this paper was tested from the proportion of decrypted data. A comparative experiment was also carried out with the traditional system. The experimental results are shown in Figure 8.

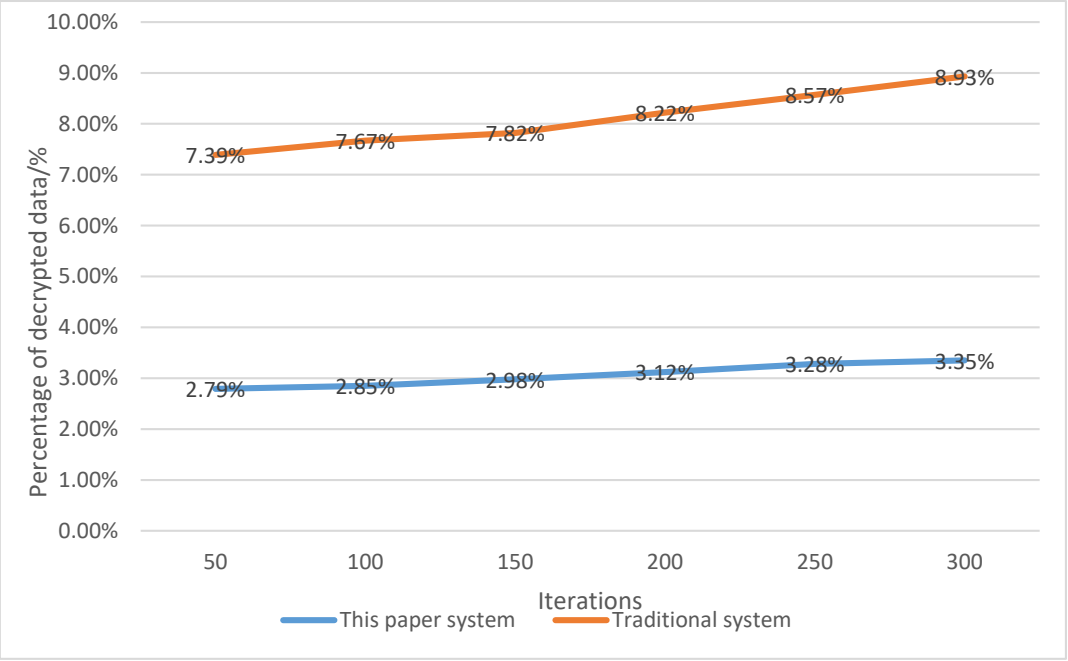

Figure 8 Comparison of the proportion of decrypted data between the two systems

It can be seen from Figure 8 that in terms of the proportion of decrypted data, the test results of this system were different from those of traditional systems. In this system, the proportion of decrypted data increased with the number of iterations, but the overall increase was relatively small, and the proportion was controlled below 4%. In traditional systems, the proportion of decrypted

data also increased with the number of iterations, and the increase was large. On the whole, the proportion of decrypted data was more than 7%, which was slightly higher. To sum up, the proportion of decrypted data in this system was lower, and the encryption effect was better.

4. Conclusions

Under the concept of ecological education, colleges and universities also pay more and more attention to the sustainable development of English education, and have carried out some reforms in English teaching. With the help of science and technology, computer technology has become increasingly mature and has good applications in many industries. However, there are also many hidden dangers in computer communication network security. It is necessary to combine relevant technologies to maintain the security of communication network. This paper applied education ecology and AI to college English education, and combined support vector machine and principal component analysis to build an evaluation index system of English teaching quality. It also tested the evaluation of teaching quality from the aspects of evaluation accuracy and evaluation time. Under this algorithm, the evaluation accuracy of teaching quality evaluation was higher and the evaluation time was shorter, which could play a good optimization effect on teaching quality evaluation. This paper also tested the communication network security encryption system. The test results showed that the system in this paper accounted for a lower proportion of decrypted data and has certain advantages. In the future research work, support vector machine and principal component analysis should continue to adapt to the development needs of English teaching quality evaluation, and improve the performance of the algorithm, so as to provide more accurate information for teaching quality evaluation.

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