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Effect of using 5G and cloud computing environment for independent college english vocabulary learning

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Abstract

An independent university refers to an institution of higher learning that has a bachelor's degree or higher education, and cooperates with social organizations other than state institutions or individuals to use non-state financial funds to establish and implement undergraduate education. While welcoming the arrival of the fifth-generation communication technology (5G) era, China's independent universities are also carrying out educational reforms to adapt to social development. 5G has created new opportunities for the development of students. Cloud computing refers to a system with extremely strong computing power formed through computer networks (mostly the Internet), which can store, collect relevant resources and configure them as needed to provide personalized services to users. Therefore, this paper studied and discussed the application of 5G and cloud computing in English vocabulary learning in independent universities. This paper explores the impact of 5G and cloud computing environments on independent college English vocabulary learning. With the assistance of 5G technology and a cloud computing environment, students' vocabulary mastery and application abilities have achieved certain improvements. Students' vocabulary learning can not only effectively break through the constraints of region and time, but also improve the interaction of learning and promote the communication and exchange between learners. This can not only deepen the understanding of vocabulary but also stimulate students' learning initiative and improve their learning ability and level. Given the current situation of English vocabulary acquisition, this paper used the fuzzy evaluation method to establish an evaluation model. The learning platform built by 5G and cloud computing technology has been utilized to study the effect of applying it to learners' vocabulary learning. In the questionnaire survey, 43.00% of the students are generally satisfied with the current English vocabulary teaching, 33.20% of the students think that their learning effect is average, 43.00% of the students think that the arrangement of teaching content is not reasonable, and 35.40% of the students think that the arrangement of class hours is generally reasonable. Before the experiment, the vocabulary of 68 and 65 students in the experimental group and the control group were between 1500–3500. Through the experiment, 67 students in the experimental group had vocabularies in the range of 3501–6500, while the vast majority of students in the control group still had vocabularies in the range of 1500–3500. In addition, through the experiment, the average total score of English test scores increased from 67 to 87 for the experimental group and from 69 to 72 for the control group. Based on the above data, it can be seen that the learning of English vocabulary through independent learning platforms built on 5G and cloud computing has a significant effect on the learning of English vocabulary of independent university students.

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Keywords Cloud computing, English vocabulary, Fifth generation communication technology, Independent universities, Learning effect, Mobile devices

Introduction

The traditional teaching mode of the independent university is mostly teacher-led, which not only leads to the low learning efficiency of students but also the decline of students' participation, thus affecting the cognition and application of English. To solve the above issues, this article uses 5G technology and cloud computing technology to help students carry out classroom teaching and after-class exercises to improve students' understanding and mastery of English vocabulary. The rich online education resources have also created conditions for the growth of mobile education. Researchers generally believe that the combination of mobile learning and English teaching is very promising. With the advent of "Internet Plus", mobile learning of independent college English has been extensively studied. Vocabulary is an important link in college English teaching, and it is also a concern of many scholars. At present, college English vocabulary learning is generally carried out by students themselves after class. The use of paper-based teaching and rote memorization has also led to the lack of timely review of the memory of newly learned words by college students. The popularity of mobile devices and the Internet has provided a new way of vocabulary teaching. This article focuses on the effectiveness of using mobile devices for teaching English vocabulary to college students.

With the continuous growth of society, the study of English vocabulary has gradually increased. The purpose of Sundqvist Pia's research was to examine the relationship between playing commercial spot games in the field and the vocabulary of second language English and compare it with the vocabulary of non-game players [1]. The purpose of Peters Elke's study was to find out how often learners are exposed to English media outside of the classroom and whether exposure to English media outside of the classroom affects the vocabulary of Flemish learners. The results of this study showed that Flemish English, as a foreign language learner, was often exposed to English media. The research results also showed that learners' vocabulary knowledge had a positive relationship with their exposure to subtitled television programs and films, the Internet, and written prints (books and magazines) [2]. Albiladi Waheeb S reviewed the research on the application of blended learning as a language in English in the second language context [3]. Although these studies have promoted the learning of English vocabulary to a certain extent, they have not been combined with the actual situation.

At the same time, cloud computing has gradually attracted widespread attention from academia. Klimova Blanka explored the use of smartphones and their applications in foreign language teaching on the background of the development of cloud computing and highlighted its advantages and limitations in teaching English [4]. Putri Emiliana discussed how Instagram affected students' vocabulary, what functions were used to improve vocabulary, and whether using Instagram could increase students' vocabulary, which had a profound impact on cloud computing [5]. De Wilde Vanessa investigated the effects of individual differences (out-of-school exposure and gender) and word-related variables (homophily, frequency, and language) based on cloud computing [6]. Although these research methods are highly innovative, a large amount of experimental data is needed to prove the reliability of the methods.

This paper analyzed the problems of autonomous English vocabulary learning in colleges under the 5G network. On this basis, the reform of an autonomous English vocabulary teaching environment under the conditions of 5G and cloud computing was proposed. The innovation of this paper was to combine English vocabulary teaching with a fuzzy comprehensive evaluation and establish an autonomous learning platform for English vocabulary based on 5G and cloud computing. Through the experiment, the influence of English comprehensive vocabulary teaching based on the platform on English vocabulary learning was compared and analyzed.

Comprehensive fuzzy english vocabulary teaching evaluation method

G and cloud computing

With the rapid growth of network technology, the data demand for wireless communication services is also increasing rapidly. In the 4G era, smart homes, virtual reality technology, and augmented reality technology have been experienced. However, the reason why these new and high technologies can not be popularized in life is attributed to network problems, such as high network delay, slow transmission speed, and relatively low security. 5G has developed various wireless network technologies. No matter in terms of speed, delay, density, etc., 5G is far better than the current fourth-generation mobile communication technology (4G). It is possible to obtain applications in cloud computing, the Internet of Things, driverless and other aspects, and

establish an efficient interconnected world. From the development trend of cloud computing, with the continuous improvement and maturity of 5G technology, 4G technology has been further optimized and updated, making its application in the market inevitable. The 5G era is an era of mutual integration of cloud and network. 5G accelerates the convergence of cloud networks. Cloud network convergence gives 5G more meaning. In the face of the wave of digital transformation, a large number of digital applications naturally require cloud networks integrated infrastructure and energy platforms, such as artificial intelligence quality inspection, remote control, and AR/VR in the digital transformation of factories. Not only do they need to invoke cloud resource capabilities and artificial intelligence capabilities through open digital platforms, but also need cloud (edge) network integrated infrastructure to ensure low latency, high reliability, and large bandwidth network capabilities, Realize cloud network and promote factory automation and intelligent upgrading.

Figure 1 illustrates the application fields of 5G technology.

From Figure 1, 5G technology is mainly applied in the fields of industry, Internet of Vehicles and automatic driving, energy, education, medical care, culture

and tourism, smart city, information consumption, and finance.

Cloud computing is to analyze a large amount of data and processors through a server, and finally get a complete result. The cloud service mentioned at this stage is not only a kind of distributed computing, but also the result of the mixed evolution and leap of computer technologies such as distributed computing, utility computing, load balancing, parallel computing, network storage, hot backup redundancy, and virtualization. Figure 2 also illustrates the application of cloud computing.

In Fig. 2, cloud computing is mainly used in the storage cloud, medical cloud, financial cloud, and education cloud.

The education cloud is essentially an educational informatization. Specifically, education cloud computing can transform the required education hardware resources into networks, thus providing a convenient and fast platform for schools and teachers. At present, the most popular MOOC is educational cloud computing. The so-called MOOC is a large-scale open-network teaching. At present, the three best MOOC platforms are Coursera, edX, and Udacity, and MOOC is also a good learning platform in China.

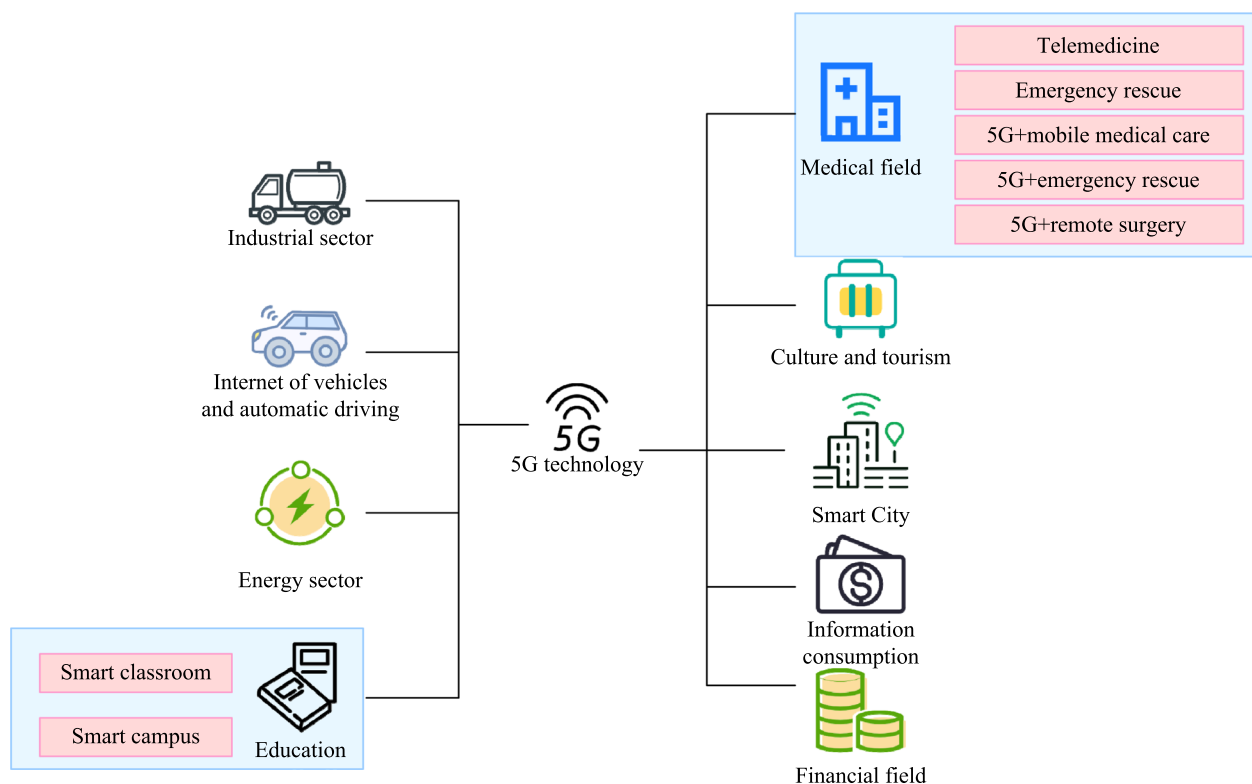


Fig. 1 Application of 5G technology

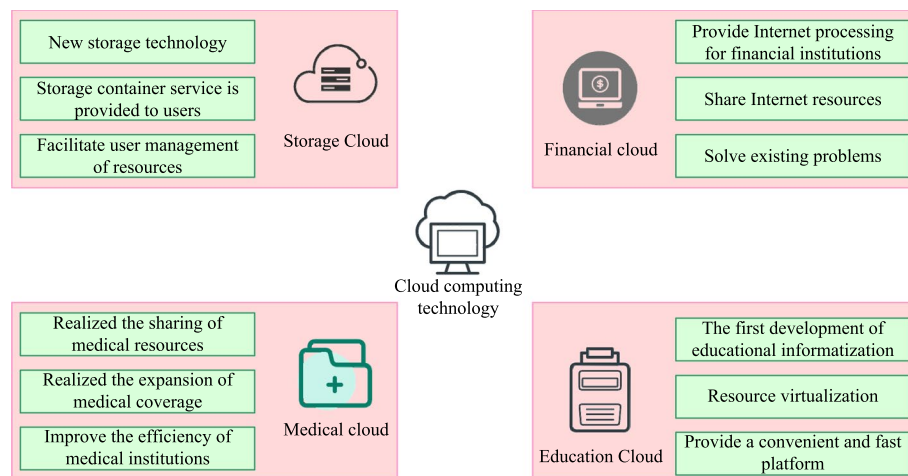


Fig. 2 Application of cloud computing

The traditional teaching methods of English teaching mainly use Microsoft Office presentations and traditional paper textbooks, which can not effectively interact and communicate with students [7, 8]. In the context of Internet Plus, 5G and cloud computing have become the foundation of education in the new century and the important cornerstone of Internet Plus education.

According to the above, the combination of 5G technology and cloud computing technology has a certain impact on education.

Intelligent mobile learning

The conventional teaching mode of independent college English is carried out in the classroom and is dominated by teachers, as shown in Fig. 3.

It can be seen from Fig. 3 that teachers mainly use chalk, blackboard, and textbooks, and sometimes release some teaching materials. The students' acquisition of knowledge is mainly based on the teacher's explanation and then consolidated in the form of questions. This is a very rigid method, which may play a great role in a specific historical stage, but it has changed over time. Due to its limitations, students' personal needs cannot be fully considered, resulting in their low learning efficiency.

In independent university students' English learning, influenced by CET 4 and CET 6, the main means for students to increase their vocabulary is to recite CET 4 and CET 6 vocabulary books. They rigidly remember words, do not pay attention to the use of words, ignore the context of words, etc., resulting in the lack of internal correlation between words [9, 10]. There are a large number of vocabulary in English, and these vocabularies do not correspond to each other. There may be multiple English phrases in Chinese phrases, and the meanings of these

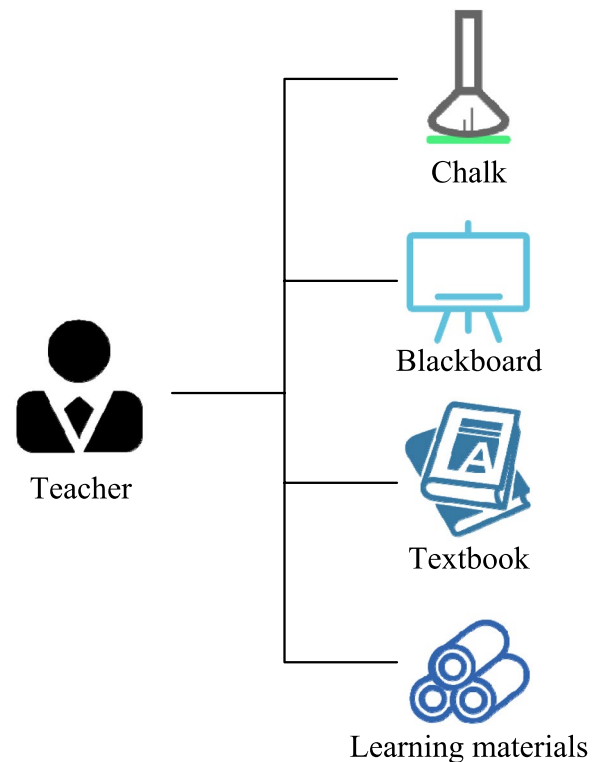


Fig. 3 Traditional English vocabulary teaching

phrases are the same. However, words and phrases in English are not completely the same or different in meaning and use.

As technology and society progress, expectations for 5G technology are increasing. Many college students also choose to learn English in college. At the same time, it can be learned from the learning characteristics of college students that they love English very much, but they

do not have much foundation in English teaching [11]. Therefore, for those students who have a strong interest in English but lack the foundation of English and the language, how to make them have a strong interest has become an important issue in college education.

There are many problems in traditional English teaching, such as lack of multimedia support, lack of online guidance from teachers, and lack of learning environment, which make it difficult to achieve effective and accurate learning objectives. The integration of 5G and cloud computing provides new opportunities and challenges for the growth of education. In the context of educational informatization, it is a very meaningful topic to carry out autonomous English vocabulary teaching.

Vocabulary is the most basic unit of language communication, and it plays an important role in actual language communication. The success or failure of foreign language communication is influenced by good or bad vocabulary acquisition [12, 13]. However, because of the traditional English teaching method of a teacher speaking and student memorizing, the learning efficiency of English vocabulary is not high. Even if students remember, they would soon forget, or remember more words, but do not know how to express them.

In recent years, with the continuous development of 5G and cloud computing technology, as well as the popularity of smartphones, opportunities have been brought to solve this problem. As long as smart mobile devices are available, learners can use multimedia short messages, wireless application protocol browsing, and other ways to learn vocabulary at any time and anywhere. To better understand the new vocabulary learning model, the paper studies the impact of English vocabulary learning under the background of 5G and cloud computing. The purpose is to use modern information technologies such as 5G and cloud computing to enhance the quality of English vocabulary learning among college students [14, 15]. How to evaluate English vocabulary teaching objectively and accurately is also one of the contents of this paper.

Modern information technology is constantly changing learning methods. The combination of cloud computing technology on 5G networks enables mobile learning anywhere, anytime, and in any way. Through smartphones, students can learn words anytime and anywhere. They use words in the actual environment, and interact with teachers and students in real-time, to greatly improve the learning efficiency of students [16, 17].

Under the English autonomous learning platform based on 5G technology and cloud computing technology, students use mobile devices such as smartphones to send short messages to the teaching server. During this process, the mobile phone signal base station will analyze the short messages and send the short messages

to the background of the teaching software through the network in the form of packet requests. The background will carry out corresponding pre-designed business logic for the packet requests, And return the execution results from the operator's signal base station to the students. There are two main modes of a short message, one is a short message, and the other is a multimedia message. The difference between the two is that the form of a short message can only be limited character text, while the form of a multimedia message can be multimedia such as text, picture, or sound. What they have in common is that the data capacity transmitted is very small, and because it is very simple to use and has little dependence on technology, it is easy to be extended to various vocabulary learning platforms. In this model, teachers and students can carry out a series of teaching activities, such as the interaction between teachers and students, notification of the teaching organization, consultation of students' learning status, and simple testing and counseling [18].

Both the native application development mode and the Web application development mode have their limitations. Therefore, developers hope to find a development mode that can combine the advantages of these two aspects, which is the cross-platform hybrid development mode. The design idea of this mode is mainly to use the third-party framework based on javascript for development. At present, the most popular third-party frameworks include Phonegap, Sencha, AppCan, etc. These third-party frameworks are programmed based on the fifth-generation hypertext markup language and jQuery. After that, various modules within the framework, such as camera, geographic information, contact, SMS, etc., are called, To complete the design of relevant logic. HTML5 and jQuery are like a "window" for developers. Relevant parameters are transmitted to the lower level through this window to determine which module to complete. The biggest advantage of this model is that its built-in "window" can realize multiple different applications, saving a lot of time and research and development costs. When the "window" is standardized and opened, it will be a new milestone in the development of mobile applications. Now, Baidu has adopted this method in the design of mobile applications.

Each development model has its characteristics and limitations, and there is no standard to judge the quality of the development model. In the process of designing mobile applications, technicians can reduce the development cost to the minimum, improve the user experience, minimize the maintenance time, and design excellent software as long as they flexibly choose a development mode suitable for themselves based on their own project needs and design schemes.

Evaluation model of english vocabulary teaching

A fuzzy comprehensive evaluation is a method that uses fuzzy mathematics to evaluate a thing. However, the current research on the index system of English vocabulary teaching in independent universities mostly lacks pertinence, and it is difficult to correctly evaluate the English vocabulary teaching in other universities. This paper has established a set of evaluation indicators suitable for English vocabulary teaching based on practice and the suggestions of English teachers and experts, providing a basis for future evaluation.

This article examines the assessment of English vocabulary teaching in independent universities from both theoretical and practical aspects to ensure its rationality, scientificity, effectiveness, and credibility. Indicators are selected according to the principles shown in Fig. 4. The evaluation of English vocabulary teaching in independent universities starts with students' satisfaction with teaching methods, learning effects, teaching contents, and class hours.

Integrity: Many factors affect English vocabulary teaching in independent universities. Therefore, the corresponding indicators should be selected from multiple aspects and levels, and the evaluation results of English vocabulary should be included in the evaluation scope as far as possible, providing a basis for the future assessment of vocabulary teaching.

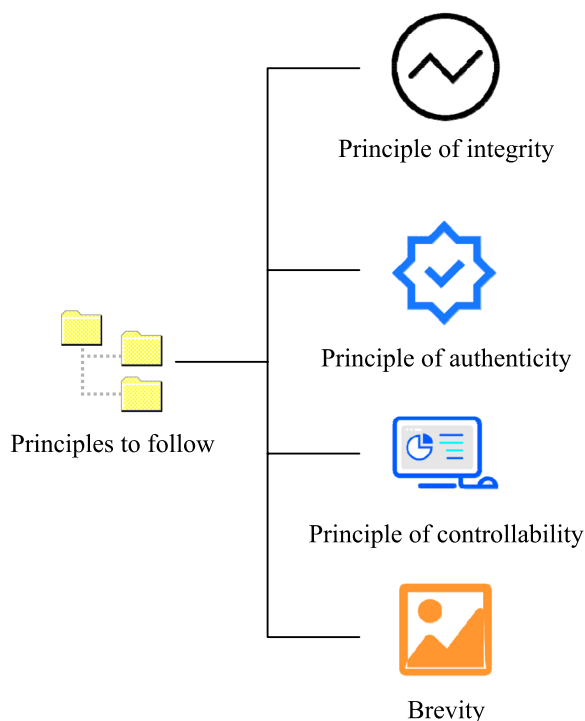


Fig. 4 Principles to be followed

Authenticity: When selecting the evaluation indicators of English vocabulary teaching, it is necessary to avoid personal tendencies about certain indicators according to the actual situation and the comprehensive performance of teachers in the classroom, to select appropriate and fair indicators.

Controllability: When selecting indicators, whether the data of some indicators are easy to obtain and whether the indicator factors are clear should be fully considered. Therefore, if the indicators are reasonable, the evaluation data collected are meaningless.

Simplicity: When selecting English vocabulary teaching indicators, the selection of indicators should be simplified as much as possible. If all the indexes are included in the index system, then it leads to the missing role of the indexes chosen at the beginning.

(1) Weight calculation

Among them, experts are composed of m first-level indicators, and the corresponding weights of these classroom evaluation indicators are V_1, V_2, \dots, V_m .

For each level of indicators in the evaluation of English vocabulary instruction, there exist a varying number of sub-indicators. In the overall indicators, the sum of the weights of teachers and students is 1, which conforms to Formula (1).

$$V_1 + V_2 + \dots + V_m = 1 \quad (1)$$

In independent college English vocabulary teaching, the weight of the first-level indicators such as experts, students, and teachers is the sum of the second-level indicators. Therefore, the requirements of experts, students, teachers, and other indicators have been met, as shown in Formula (2) and Formula (3):

$$V_o = V_{o1} + V_{o2} + \dots + V_{ol_o} \quad (o = 1, 2, \dots, m) \quad (2)$$

$$\begin{cases} V_1 = V_{11} + V_{12} + \dots + V_{1l_1} \\ V_2 = V_{21} + V_{22} + \dots + V_{2l_2} \\ \dots \\ V_m = V_{m1} + V_{m2} + \dots + V_{ml_1} \end{cases} \quad (3)$$

(2) Calculation of membership matrix

The set of independent college English vocabulary classroom evaluation results is denoted as $B = \{B_1, B_2, \dots, B_n\}$. The evaluation grade of English vocabulary teaching is $B_k (k = 1, 2, \dots, n)$. Therefore, the values of each element r_{ok} in the relationship matrix R of experts, students, and teachers are obtained. Each indicator is evaluated and a comment B_1, B_2, \dots, B_n is given.

Through the survey of n questionnaires, the evaluation quantity vector $M_o = (M_{o1}, M_{o2}, \dots, M_{ok})$ ($o = 1, 2, 3$) of each index is obtained, that is, M_{ok} is the value of the evaluation term k of the o first-level evaluation index.

Each row is the result of the evaluation of various indicators, and the matrix also contains a group of evaluation results B . All information obtained by the evaluation index group is shown in Formula (4).

$$r_{okc} = \frac{M_{okc}}{n} \quad (4)$$

M_{okc} is the number of evaluations at the c evaluation level of the k second level indicator under the o -the first level indicator. n represents the number of questionnaires. r_{okc} is the degree of membership of V_{okc} the index to B_c the fuzzy subset.

When the evaluation level is a , there are w secondary evaluation indicators. The fuzzy relation matrix R_o of first-level indicators is presented in Formula (5).

$$R_o = \begin{bmatrix} r_{o11} & r_{o12} & \dots & r_{o1a} \\ r_{o21} & r_{o22} & \dots & r_{o2a} \\ \dots & \dots & \dots & \dots \\ r_{ow1} & r_{ow2} & \dots & r_{owa} \end{bmatrix} \quad (5)$$

From the weight V_o of the three indicators of experts, students, and teachers and the correlation matrix R_o , the row vector Q_o is calculated, as shown in Formula (6).

$$Q_o = V_o \circ R_o = (v_{o1}, v_{o2}, \dots, v_{owo}) \circ \begin{bmatrix} r_{o11} & r_{o12} & \dots & r_{o1a} \\ r_{o21} & r_{o22} & \dots & r_{o2a} \\ r_{o31} & r_{o32} & \dots & r_{o3a} \\ \dots & \dots & \dots & \dots \\ r_{ow1} & r_{ow2} & \dots & r_{owa} \end{bmatrix} = (q_{o1}, q_{o2}, \dots, q_{oa}) \quad (6)$$

The fuzzy relation matrix R of the overall objective can be determined by combining V_o m first-level indicators, as shown in Formula (7).

$$R = \begin{bmatrix} Q_1 \\ Q_2 \\ Q_3 \\ \dots \\ Q_m \end{bmatrix} \quad (7)$$

(3) Comprehensive evaluation results

On this basis, the expert-level indicator weights and the fuzzy relationship matrix R are derived, leading to a set of intermediate variables Q . Similarly, a group of intermediate variables Q of teachers and students can also be obtained, as shown in Formula (8).

$$Q = V \circ R = V \circ \begin{bmatrix} V_1 \circ R_1 \\ V_2 \circ R_2 \\ \dots \\ V_l \circ R_l \end{bmatrix} = (q_1, q_2, \dots, q_a) \quad (8)$$

q_l ($l = 1, 2, \dots, a$) refers to the comprehensive evaluation value of experts, students, and teachers in independent English vocabulary teaching. q_l is normalized to obtain q'_l , as shown in Formula (9).

$$q'_l = \frac{q_l}{\sum_{l=1}^a q_l} \quad (9)$$

Through Formula (9), an evaluation value can be obtained, that is, the u value, and then an independent evaluation level of English vocabulary teaching can be obtained, as presented by Formula (10).

$$u = q'_l \times b^T \quad (10)$$

The evaluation grade u of independent college English vocabulary teaching effectiveness evaluation is obtained.

Independent college english vocabulary learning effect experiment

Current status of english teaching in independent universities

It is understood that English teaching in independent universities is mainly based on English textbooks (teach-

er's books) and English materials (classroom teaching materials).

The study of independent college English focuses on the ability to use language and use English expressions correctly, fluently, accurately, and completely by mastering some pragmatic rules. It is difficult for students in independent universities to master the basic vocabulary of the English language under the condition of a weak learning environment and foundation, which has little effect on improving their English level. The English words that independent college students come into contact with are translated by teachers, so it is easy to cause difficulties in vocabulary memory.

Therefore, students with poor English vocabulary learning ability lack both systematic and complete mastery of foreign language knowledge and standard corpus in the process of vocabulary memory.

This paper randomly selects five independent universities to investigate college students. A total of 500 questionnaires are distributed, of which 500 are recovered and valid. The following is an analysis of the questionnaire.

Survey of the current situation of english vocabulary teaching

Figure 5 is a survey of students' satisfaction with the current English vocabulary teaching and their learning effects.

According to Fig. 5 (a), 40 students are very satisfied with the current English vocabulary teaching, accounting for 8.00%. 76 students are relatively satisfied, accounting for 15.20%. 215 students are generally satisfied, accounting for 43.00%. 124 students feel dissatisfied, accounting for 24.80%. 45 students are very dissatisfied, accounting for 9.00%. According to the above data, most students are not satisfied with English vocabulary teaching. English vocabulary teaching needs further optimization.

It can be learned from Fig. 5 (b) that 36 students think their learning effect is very good, accounting for 7.20%. 72 students think it is better, accounting for 14.40%. 187 students think it is average, accounting for 37.40%. 165 students think it is not good, accounting for 33.00%. 40 students think it is very bad, accounting for 8.00%. According to the above data, in the current context of English vocabulary teaching, only a few students think that their learning effect is very good, indicating that the improvement of English vocabulary teaching is urgent.

Figure 6 shows the relevant investigation on the rationality of teaching content and class hour arrangement.

It can be seen from Fig. 6 (a) that 58 students think the arrangement of teaching content is very reasonable, accounting for 11.60%. 70 students think it is reasonable,

accounting for 14.00%. 122 students think it is generally reasonable, accounting for 24.40%. 166 students think it is unreasonable, accounting for 33.20%. 84 students think it is very unreasonable, accounting for 16.80%.

It can be learned from Fig. 6 (b) that 35 students think the class schedule is very reasonable, accounting for 7.00%. 59 students think it is reasonable, accounting for 11.80%. 177 students think it is generally reasonable, accounting for 35.40%. 159 students think it is unreasonable, accounting for 31.80%. 70 students think it is very unreasonable, accounting for 14.00%. It can be seen that the teaching effect is not ideal due to the unreasonable teaching content and class hour arrangement.

Table 1 is a survey of students' classroom activity.

According to Table 1, 43 students believe they are very active in class, accounting for 8.60%. 61 students believe they are active in class, accounting for 12.20%. 124 students believe they are generally active in class, accounting for 24.80%. 178 students believe they are not very active in class, accounting for 35.60%. 94 students believe they are very inactive in class, accounting for 18.80%. It can be seen that the current English vocabulary teaching cannot fully mobilize students' activity in the classroom.

Table 2 is the relevant investigation of the reasons for the poor learning effect on students.

It can be learned from Table 2 that among the reasons for students' poor learning effect, the number of teachers who do not fully consider the individual difference is the largest, accounting for 33.00%. Secondly, there is a lack of effective design of interaction between teachers and students, accounting for 30.80% of the total, resulting in poor learning effects for students. Few of them are due to their lack of interest, which indicates that students have some interest in learning English vocabulary.



Fig. 5 Satisfaction and learning effect survey. **a** Satisfaction **(b)** Learning effect

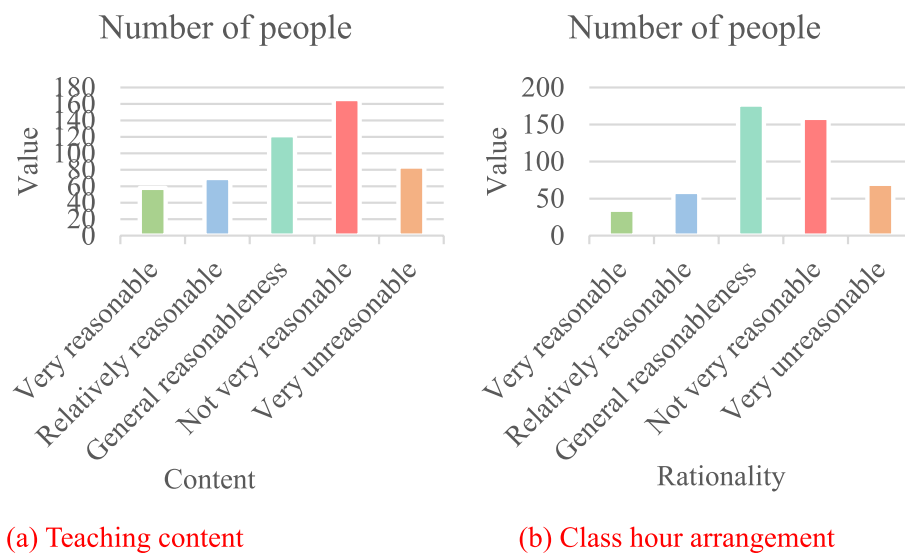


Fig. 6 The rationality of teaching content and class hour arrangement. **a** Teaching content **(b)** Class hour arrangement

Table 1 Students' classroom activity

Activity	Number of people	Percentage
Very active	43	8.60%
Relatively active	61	12.20%
Generally active	124	24.80%
Not very active	178	35.60%
Very inactive	94	18.80%

Table 2 Reasons for poor learning effect

Reason	Number of people	Percentage
Lack of interest	30	6.00%
Class is boring	82	16.40%
The course is very difficult	69	13.80%
Teachers don't take individual differences into account enough	165	33.00%
Lack of effective design of teacher-student interaction	154	30.80%

In addition, it is also found that in the teaching of English vocabulary in independent universities, teachers' lack of attention to students' learning process and low interest in learning English vocabulary seriously affect teacher-student interaction in the classroom.

Given the above problems, this paper can help students enhance their learning efficiency and expand their knowledge by using 5G and cloud computing, to improve their understanding of words and sentences and deepen their mastery of words.

Vocabulary ability test results

In this paper, 200 students from independent universities are selected for comparative analysis. They are divided into two groups, with 100 students in each group, for their six-month English vocabulary learning experiment. The difference between the two groups is that the experimental group uses an English vocabulary-independent learning platform built on 5G and cloud computing technology. Learners can use smart mobile devices to learn vocabulary at any time, anywhere and anywhere, and use vocabulary flexibly in the real natural context. The control group uses traditional English vocabulary learning.

Through three different English vocabulary software tests, the student's vocabulary is tested. Figure 7 shows two groups of related surveys on English vocabulary.

It can be seen from Fig. 7 (a) that before the experiment, the number of students in the experimental group with a vocabulary of less than 4000, 4000–4500, 4501–5500, and 5501–6000 was 65, 26, 8, and 1, respectively, while the number of students in the control group with a vocabulary of less than 4000, 4000–4500, and 4501–5500 was 61, 29, and 10, respectively. It can be seen that the difference in vocabulary size between the two groups of students is not very large.

It can be seen from Fig. 7 (b) that after the experiment, the number of students in the experimental group with a vocabulary of less than 4000, 4000–4500, 4501–5500, 5501–6000, and 6001–8000 is 22, 42, 31, 3 and 2 respectively, while the number of students in the control group with a vocabulary of less than 4000, 4000–4500 and 4501–5500 is 63, 26 and 11 respectively. It can be seen that the students in the experimental group

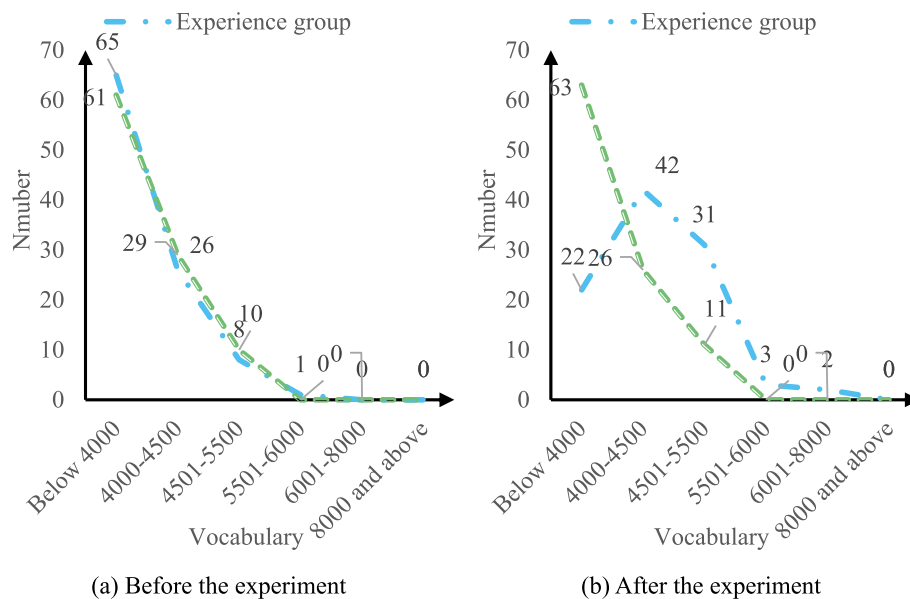


Fig. 7 Comparison of vocabulary before and after the experiment. **a** Before the experiment **(b)** After the experiment

have significantly improved their vocabulary through the autonomous learning platform of English vocabulary based on 5G and cloud computing technology. The change in the control group is far less than that in the experimental group.

According to the data risk in Fig. 7, the difference in vocabulary size between the experimental group and the control group is not significant before the experiment, but the vocabulary size of the experimental group

significantly improved after the experiment. The changes in the control group were much smaller than those in the experimental group.

Students are tested on English vocabulary through a unified English test paper. Figure 8 shows two groups of related surveys on the score of each question type.

It can be learned from Fig. 8 (a) that before the experiment, the average scores of listening, reading comprehension, translation, composition, and total scores of

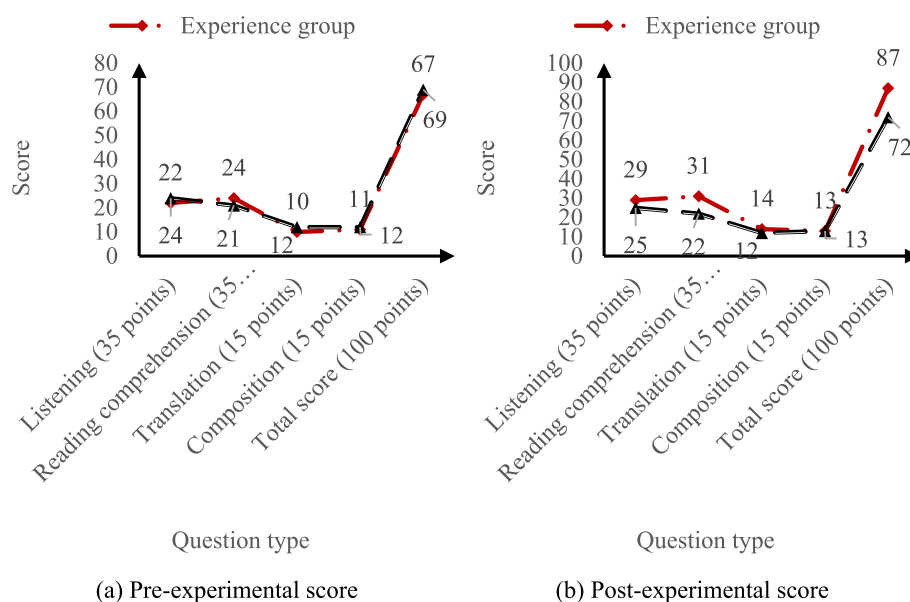


Fig. 8 Comparison of results before and after the experiment. **a** Pre-experimental score **(b)** Post-experimental score

the students in the experimental group are 22, 24, 10, 11, and 67, respectively. The average scores of the students in the control group are 24, 21, 12, 12, and 69 respectively. It can be seen that before the experiment, the English scores of the two groups of students are not very different, and are not particularly ideal.

It can be learned from Fig. 8 (b) that after the experiment, the average scores of listening, reading comprehension, translation, composition, and total scores of the students in the experimental group are 29, 31, 14, 13, and 87, respectively. The average scores of the students in the control group are 25, 22, 12, 13, and 72 respectively. It can be learned that the students in the experimental group have significantly enhanced their English test scores by learning English vocabulary through autonomous learning platforms based on 5G and cloud computing technology. The changes in the control group are much smaller than those in the experimental group.

According to the above experimental analysis, it is concluded that the application of 5G and cloud computing in independent college English vocabulary learning can effectively help students enhance the efficiency and quality of word memory.

According to the experiment, the factors that affect learners' performance include the use of 5G technology and cloud computing technology, the speed of teachers uploading textbooks and answering questions, and the stability of the system [19].

Conclusions

Modern information technology is constantly changing the way we learn. "With the advent of the 3G era and the widespread use of intelligent mobile devices, combined with the emerging" cloud computing "technology of the Internet, it will truly achieve mobile learning anywhere, anytime, and in any manner". Therefore, we envisage building an autonomous learning platform for English vocabulary based on 3C and cloud computing technology. Learners can use intelligent mobile devices to learn vocabulary at any time, anywhere, and in real natural contexts. In addition, their autonomous learning ability and vocabulary learning effect will be greatly improved through real-time interaction and collaboration with teachers and other learners during the learning process. 5G technology is a new communication technology, which has been widely used in the world today and has made an important contribution to China's scientific and technological progress. The application of 5G and cloud computing technology in English vocabulary learning in independent universities can effectively promote English vocabulary learning. It can also promote students' ability to learn independently,

think independently, and solve problems, and provide a useful reference for future employment. Therefore, the introduction of 5G and cloud computing technology in autonomous English teaching can effectively solve students' learning problems, improve their autonomous learning ability and cultivate their comprehensive quality, which is also a challenge for teachers.

Authors' contributions

Tiantian Wang completed the whole process of designing experiments, collecting data, analyzing data, and writing the first draft of the article. The author(s) read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate

Not applicable.

Competing interests

There is no potential conflict of interest in our paper and all authors have seen the manuscript and approved to submit it to your journal. We confirm that the content of the manuscript has not been published or submitted for publication elsewhere..

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