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Analysis of the impact of VR technology based on big data edge computing and deep learning on English short video teaching



Abstract: - VR (Virtual Reality) technology applied to English short video teaching, compared with traditional English short video teaching can change the teacher-student interaction mode, providing students with a new English learning environment, making the classroom teaching content more realistic presentation. This paper focuses on VR scenario teaching and short video teaching, taking the English course of a school in Shanghai as an example. The students of VR situational teaching group have made great progress in vocabulary judgment, complementary dialogue and Chinese-English translation, with the passing rates of 43% and 100% respectively. The real scene created by virtual reality technology has greatly improved students' interest in learning and the effectiveness of classroom teaching. The development trend of educational informatization is virtualization and intellectualization. The application of virtual reality technology in the process of education and teaching is of great significance to the modernization of secondary education in China.

Keywords: VR technology, short video teaching, English teaching, interactive learning

I. INTRODUCTION

Since the 1990s, the international education community has paid large-scale attention to the application of information technology in this field[1]. The use of modern information technology to promote teaching reform and the application of information technology in education has been regarded as an important way to reform education in the 21st century[2]. The widespread application of information technology in education has added a diversified atmosphere to our traditional teaching, with personalized teaching methods, virtualized teaching environment, and independent learning atmosphere all leading to a certain degree of improvement in teaching effectiveness[3].

In 2009, the Ministry of Education promulgated the Syllabus for Teaching English in Schools, which states that the English course is a compulsory public foundation course for school students[4]. The teaching process should not only focus on the teaching of knowledge points, but also try to create a vivid and interesting learning situation for students, so that they can master the knowledge points in an interesting way, stimulate their interest in using the language, and then improve their language skills, so as to provide effective services for their future employment and further study[5].

How can we teach basic knowledge and develop language skills. How to create a realistic language environment and how to carry out meaningful language practice so that every student can participate in the language environment[6]. These are long-standing and common problems in English teaching in China that cannot be ignored and need to be solved through new information technology. In addition, we must acknowledge the fact that students return to their native language environment immediately after class, without the "inculcation" of the English language environment, and how to conduct language training in real time[7].

The application of short videos in the classroom is one of the means of education modernization. Short videos can quickly arouse students' interest in learning and make the learning process interesting because of their "short" nature; they also facilitate teachers and students to record and share their teaching and learning experiences and form a like-minded learning community because of their low access threshold and social functions; and with economic development, teaching facilities in primary and secondary schools have been greatly improved, which provides a hardware basis for the application of short videos[8]. With the economic development, the teaching facilities in primary and secondary schools have been greatly improved, which provides the hardware foundation for the application of short videos[9]. Using short videos in the classroom can, on the one hand, change the too

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single and passive teaching mode, and help students master the knowledge points through an intuitive and easy-to-understand form, and build their own knowledge system in the process of actively acquiring knowledge; on the other hand, it can change the role of teachers in the classroom, so that teachers can change from the traditional classroom "full of irrigation" to On the other hand, it can change the teacher's role in the classroom, so that the teacher can change from being the organizer and guide of learning activities to leaving more time for students to think and explore[10]. The application of "short video + education" mode in teaching is worth trying. As an emerging thing that has become popular in recent years, ShakeYin short video, with its low entry threshold and strong interactivity, has extended the boundaries and values of knowledge and culture, and everyone can participate in the process of creating and sharing knowledge, so the "short video + education" mode is gradually becoming a new method of youth education. The use of short videos is not simply a matter of recording teachers' lessons or downloading biology-related videos on the Internet, but requires teachers to combine the characteristics of subjects, fully analyze the learning situation, dig deeper into the knowledge points suitable for presentation in short videos, carefully collect materials, and then edit and reorganize them to make short teaching videos[11]. All this poses new challenges to teachers: teachers need to have good information awareness, actively pay attention to the ever-changing information, and actively look for its integration with daily teaching; teachers need to learn information knowledge, and update information-based teaching theory and information-based teaching design theory; teachers need to improve their ability to handle information, learn to identify and screen the messy and complicated information, and be able to use computer technology to Teachers need to improve their ability to handle information, learn to identify and filter the information, use computer technology to process and share information, and effectively integrate the organized information into teaching[12].

II. RELATED WORK

The United States was the first country to introduce VR technology into the education industry. [14] The first to establish a VR education laboratory, formally combining VR technology with the field of education. The British government gives strong support to VR technology, for students in the VR industry to provide a lot of learning and employment, to facilitate the University of Nottingham, the development of desktop-level VR equipment. At present, the application of foreign VR in education, mainly in the following areas: (1) simulation teaching VR technology with its own virtual characteristics of the real environment, reducing the limitations of the traditional short video classroom teaching environment. For example, General Electric's VR laboratory, which allows users to enter the sea floor to observe the full range of submarine oil and gas extraction. (2) [15] VR devices have been successfully used to explore problems related to neurological disorders, and VR pediatric treatments have been pioneered. [16] The researchers designed and developed a desktop 3D English learning game "Haunted", which is a two-player game. During the game, the two players communicate with each other in English, so that they can practice their speaking skills while playing the game.

At present, the domestic research on VR technology is still dominated by major universities and technology companies (Ali, Baidu, Tencent, etc.). Physical simulation. Experimental middle school physics and chemistry experiments some of the class has a certain degree of danger, students in the experimental process, due to lack of experience, it is likely to make the wrong operation, at this time, if the teacher can not take into account all students, a little carelessness, may produce dangerous situations. The use of VR technology can simulate the process of physics teaching experiments, which is a good solution to the above-mentioned dangerous problems. [19] We designed an English learning website called VEC3D. The website uses 3D declarative technology and real-time voice technology to build a virtual campus system, in which students can control the characters through basic input devices, such as the movement of objects in 3D scenes, and can also conduct Bunmu or voice chat. The system sets different scenarios and tasks, students can be divided into different groups, and the teacher acts as a guide or a participant in the system, assisting students to complete tasks in the 3D scenes.

From the above analysis of the current situation of domestic and foreign research, it can be seen that VR represents no longer a simple game experience, but a range of applications even in various industries, and the birth of more and more VR products (such as VR all-in-one machine, VR experience hall, etc.), making the development prospects of the VR industry more and more bright. With the development of the new generation of 5G technology, VR can be applied to the entire Internet, VR in the field of education and application of the real popularity is just around the corner. At present, there are few domestic examples, [20] applied VR technology to English short story

teaching, taking Early Autumn as a prototype, restoring the scenes in the novel, and through near and far lens switching, lighting effects, etc., to emphasize the emotional expression of the characters in the novel. [19] The VR English learning system was designed and developed to effectively alleviate students' speaking anxiety through VR scenario-based teaching experiments, which provides a useful reference for future applications of this technology in English teaching.

III. ARCHITECTURE

VR technology is a combination of a variety of disciplines and with the corresponding voice recognition equipment and haptic devices, so that the user almost real feel the virtual world of a new technology in the computer field. VR technology can virtualize a realistic scene, in this virtual scene, through interactive devices to make virtual objects become physical, so that the user feels like being brought into the real environment, the experience is more intuitive, the feeling of immersion is born. The user is unaware of the interaction between the computer and the user, compared to the traditional human-computer interaction, VR technology to a large extent to stimulate the interest of the majority of users. This kind of interactive environment generated by VR technology on the computer, which makes the user feel real, is called virtual environment.

Virtual reality systems have three important characteristics: Interaction, Immersion, and Imagination. Any virtual reality system can be characterized by the 3I's. The 3I's of VR technology are shown in Figure 1:

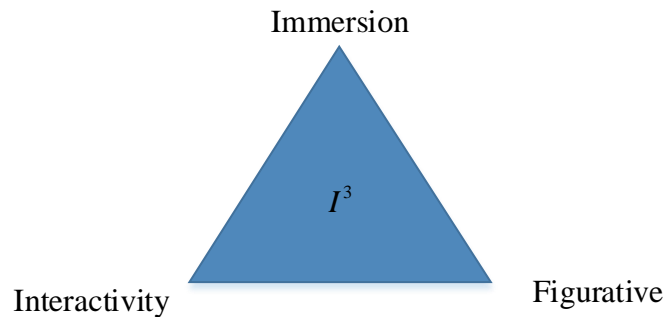


Figure 1 I^3 characteristics of VR

(1) VR technology: operating the objects, the objects make real-time responses according to the user's specific operations, and the user and the object interact and influence each other. This feature needs to be generated with special equipment, so that users can operate objects in the virtual environment from various senses in a natural way (such as language, somatosensory, hearing, etc.) like in the real world.

(2) Immersion of VR technology: It is the most important feature of VR technology, which refers to the real degree that the experiencer regards himself as a part of the virtual environment and performs specified activities as the main object in the virtual environment. Because it is a virtual environment, the experiencer is not really in the environment, so the experience process will inevitably have a sense of unreality. The main factors affecting the immersion include the angle and scope of the presented picture, and the time or space response when carrying out behavioral activities. , the degree of constraint of interactive devices, and depth information in 3D images[21,22].

(3) Imaginativeness of VR technology: It is a necessary feature for the experiencer to fully integrate into the virtual environment. In the virtual environment, the experiencer imagines his real existence through the information obtained in the virtual environment, including actions, instructions, environment switching, etc. In this environment, through the operation of the object, the thinking, judgment, and imagination made by oneself also make associations with the changes of the entire virtual situation.

The implementation process of VR scene teaching mainly includes course design, scene design and classroom application. Among them, the course design is mainly to determine the learning content, the scene design starts from the learning content, designs the corresponding virtual scene, and finally, conducts classroom teaching under the virtual reality scene. The teaching experiment in this paper is combined with the teaching mode implemented by the teaching school: "363" classroom teaching mode, as shown in Figure 2:

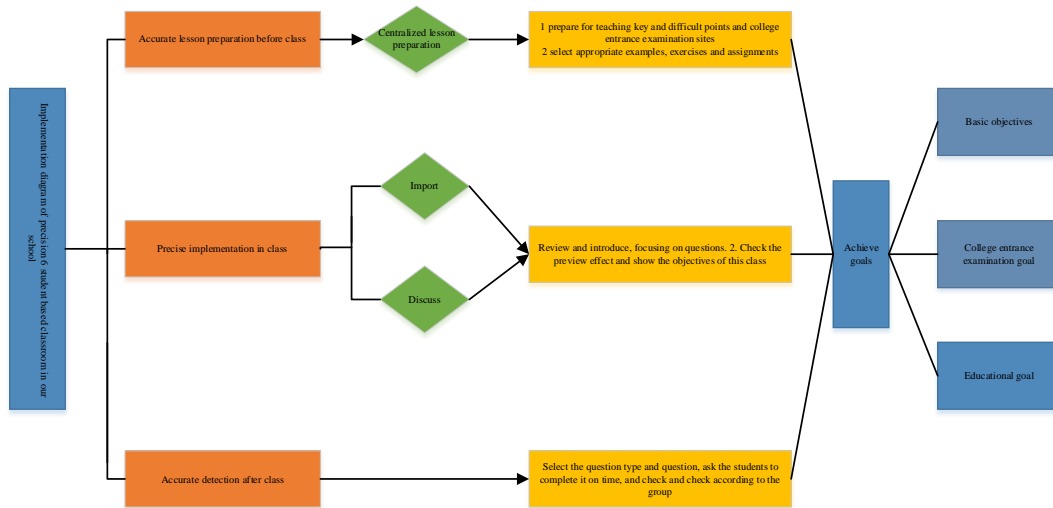


Figure 2 "Precision 363" student-based classroom teaching model

IV. METHOD

The coding theory of distributed video coding is based on the information-theoretic related coding theory established in the 1970s, i.e., the distributed lossless coding theory established by Slepian and Wolf¹³ and the distributed lossy coding theory established by Wyner and Ziv.

As shown in Figure 3, X and Y are assumed to be two statistically correlated discrete memoryless sources. According to Shannon's information theory, when X and Y are jointly coded and jointly decoded, the coding code rate must satisfy $R_X + R_Y \geq H(X, Y)$, which can be losslessly reconstructed at the decoding end for X and Y to be separately coded and jointly decoded for two statistically correlated discrete memoryless sources X and Y. As shown in Fig. 3, the Slepian-Wolf theory gives the code rate bound for X and Y losslessly compressed coding as:

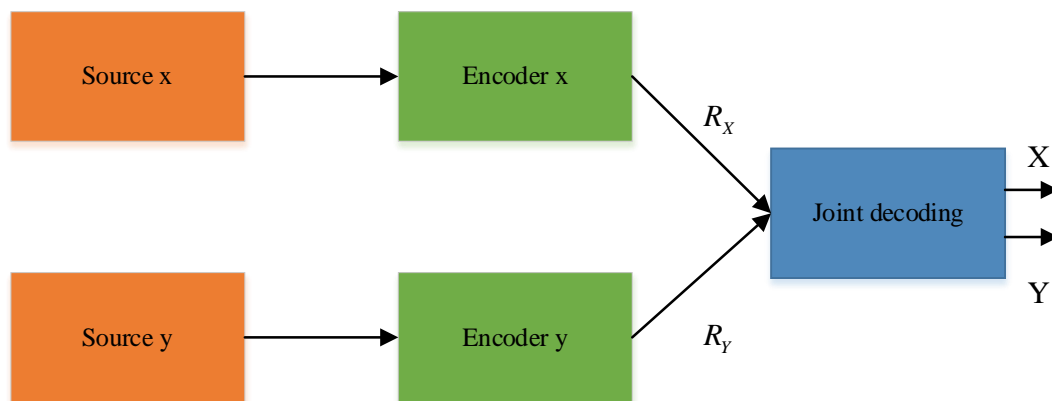


Figure 3 Independent coding-joint decoding of two sources

$$R_X + R_Y \geq H(X, Y) \quad (14)$$

$$R_X \geq H(X|Y) \quad (15)$$

$$R_Y \geq H(Y|X) \quad (16)$$

Where, R_X 、 R_Y and $H(X)$ 、 $H(Y)$ are the code rate and information entropy of X and Y, respectively, and the boundary range is shown as the shaded area in Figure 4. Slepian wof theory proves that although the source X and γ Separately coded, but the total code rate can reach the joint entropy $H(x, y)$, which is the same as that in the case of joint coding and joint decoding X and y, which shows that the minimum code rate of lossless compression

of the system is the same as that of the traditional joint coding joint decoding method only when the correlation between X and Y is used on the decoding side[23,24].

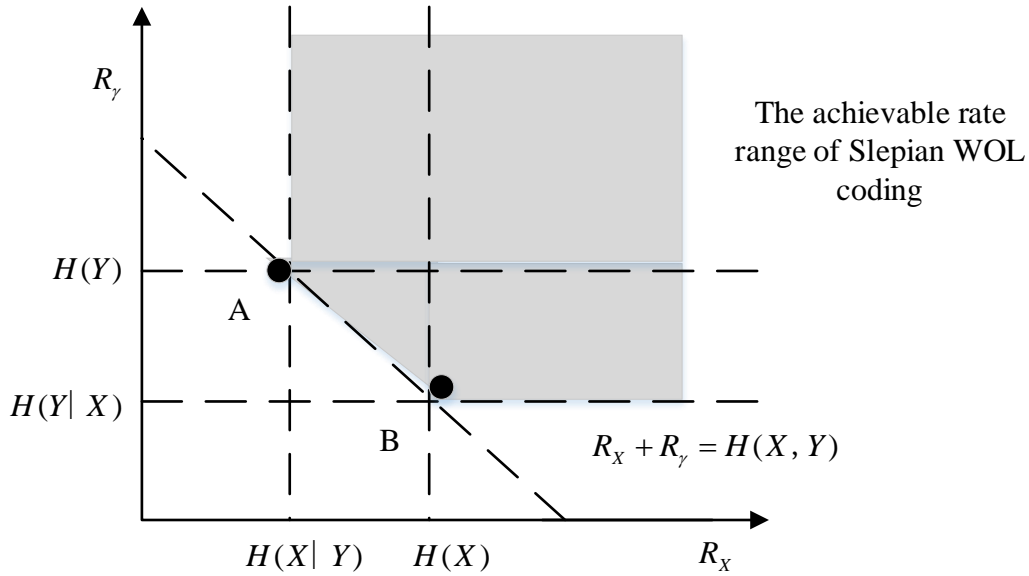


Figure 4 Example diagram

Let the original Wyner-Ziv frame at the coding end be WZ , the decoded recovered Wyner-Ziv frame at the decoding end be WZ' . The edge information at the decoding end be SI , and the edge information generated by simple motion compensation at the coding end be SI' . The corresponding DC coefficient quantization values for each frame are $Q_i^{FZ}, Q_i^{FZ'}, Q_i^{SI}, Q_i^{SI'}$ where; is 1 to the DC coefficient band length K .

For example, for QCIF (176×144) format image with $K=1584$, if we can classify the DC coefficients $Q_k^{WZ'}$ output after LDPC decoding failure, if we can tell that the error of the k th component $Q_k^{WZ'}$ of frame WZ' is much larger than that of frame Q_k^{SI} , it means that the k th component of DC quantization value of frame WZ' is inaccurate, while the DC quantization value corresponding to frame SI' of side information is relatively accurate. For the rest, it is impossible to determine which is more accurate, the DC quantization value of the side information S frames or the decoded WZ' frames, and it is necessary to estimate the trade-off between them according to the relevant noise model distribution parameter[25].

To perform the above reconstruction classification, a judgment threshold is set, and the specific calculation of this threshold is given below. The following inequality holds:

$$\left| Q_k^{WZ'} - Q_k^{SI} \right| \leq \left| Q_k^{WZ'} - Q_k^{NZ} \right| + \left| Q_k^{WZ} - Q_k^{SI} \right| \quad (17)$$

However, the original WZ frame is not available at the decoding side, and the side information SI frame is not available at the coding side, so the $\left| Q_k^{WZ} - Q_k^{SI} \right|$ in equation (4-4) cannot be calculated in real time, and the side information S' frame generated by simple motion compensation at the coding side can be used instead of the SI frame to calculate, and we can get:

$$\begin{aligned} |Q_k^{WZ} - Q_k^{SI}| &\leq |Q_k^{WZ} - Q_k^{WZ'}| + \text{Max}_{i \in [1, K]} (|Q_i^{WZ} - Q_i^{SI}|) \\ \Rightarrow |Q_k^{WZ} - Q_k^{WZ'}| &\geq |Q_k^{WZ} - Q_k^{SI}| - \text{Max}_{i \in [1, K]} (|Q_i^{WZ} - Q_i^{SI}|) \end{aligned} \quad (18)$$

If $|Q_k^{WZ} - Q_k^{WZ'}| \geq \text{Max}_{i \in [1, K]} (|Q_i^{WZ} - Q_i^{SI}|)$ shows that the decoding of the kth component of the quantized value of the DC system of WZ' frames is not as accurate as the corresponding quantized value of the edge information. According to equation (19) should satisfy

$$|Q_k^{WZ'} - Q_k^{SI}| \geq 2 * \text{Max}_{i \in [1, K]} (|Q_i^{WZ} - Q_i^{SI}|) = G \quad (19)$$

In which G is the threshold value, when $|Q_k^{WZ'} - Q_k^{SI}| \geq G$, the decoded Wz quantization value is replaced by the quantization value of the edge information S, and then the conditional expectation reconstruction is used to calculate: when $|Q_k^{WZ'} - Q_k^{SI}| \geq G$, it is impossible to determine which quantization value of the edge information SI' or the decoded Wz is more accurate, therefore, the distribution parameter α of the correlation noise model calculated at the decoding end is used to estimate the trade-off between the two. The larger α is, the smaller the deviation of the generated edge information from the original WZ, and thus the SI frame quantization value of the reconstructed biased edge information will be more accurate; conversely, the smaller α is, the larger the deviation of the generated edge information from the original WZ, and thus the WZ quantization value of the reconstructed biased decoding recovery will be more accurate. In the feedback-free DVC system, this algorithm can effectively improve the recovery of quantization value after LDPC decoding failure, and thus improve the reconstruction quality of Wyner-ziv frame decoding.

V. RESULTS

The subjects of the teaching experiment were students from a school in Shanghai (24 boys, 22 girls, 46 in total), and the experimental groups were arranged in descending order according to the students' pre-experimental test scores in the "1221" way. All subjects were tested after two years. All subjects, after two years of study, had completed the study of "English (high-quality textbook)" and were familiar with the content of the textbook to a certain extent.

Before the experiment, the subjects were grouped according to "1221" according to the "grouping number" column of the test results, and the final grouping results are shown in Tables 2 and 3:

Table 2.VR scene group students' basic situation statistics

Serial number	Full name	Lexical judgment	Single choice	Dialogue completion	Reading comprehension	Cloze Test	Chinese English translation	Total score
1	Wang	5	12	15	14	4	10	60
2	Zhang	6	12	16	13	4	10	61
3	Li	5	12	14	10	3	7	51
4	Ma	7	10	12	9	4	8	50
5	Zhao	7	5	11	12	5	10	50
6	Li	6	10	13	14	5	9	57
7	Yuan	6	11	12	13	4	8	54

Table 3 Statistics of students' foundation in traditional teaching group

Serial number	Full name	Lexical judgment	Single choice	Dialogue completion	Reading comprehension	Cloze Test	Chinese English translation	Total score
1	Wang	5	14	12	16	5	5	57
2	Zhang	6	6	16	12	3	11	54
3	Li	3	6	12	14	6	11	54
4	Ma	4	12	10	14	6	12	53
5	Zhao	3	6	16	10	4	12	51
6	Li	8	12	8	10	3	8	50
7	Yuan	5	4	14	10	3	12	48

The statistics of the test results are shown in Table 4:

Table 4 Comparison statistics of pre-test results

Topic type	VR scene group	Traditional teaching group	Score difference
Lexical judgment	4.38	4.47	-0.09
Single choice	5.51	7.52	0.6
Dialogue completion	12.01	11.23	0.78
Reading comprehension	11.82	11.40	0.42
Cloze Test	2.31	3.52	1.21
Chinese English translation	6.67	7.68	1.01
Total score	42.7	45.82	2.73

Now the test results are analyzed as follows: I will VR scene group and the traditional short video teaching group of students before the experiment test results, according to the question type for each score entry, and calculate the average score of each question type, the average score of the two groups of students for comparison, resulting in Table 4, the above table of the two groups of average score data for bar graph analysis, can be obtained from Figure 5, from the figure can be seen, the two groups of students in the experiment before each question type and The average difference between the two groups is very small (all within 1 point), which means that the two groups of students have the same basic level and meet the requirements of the experiment.

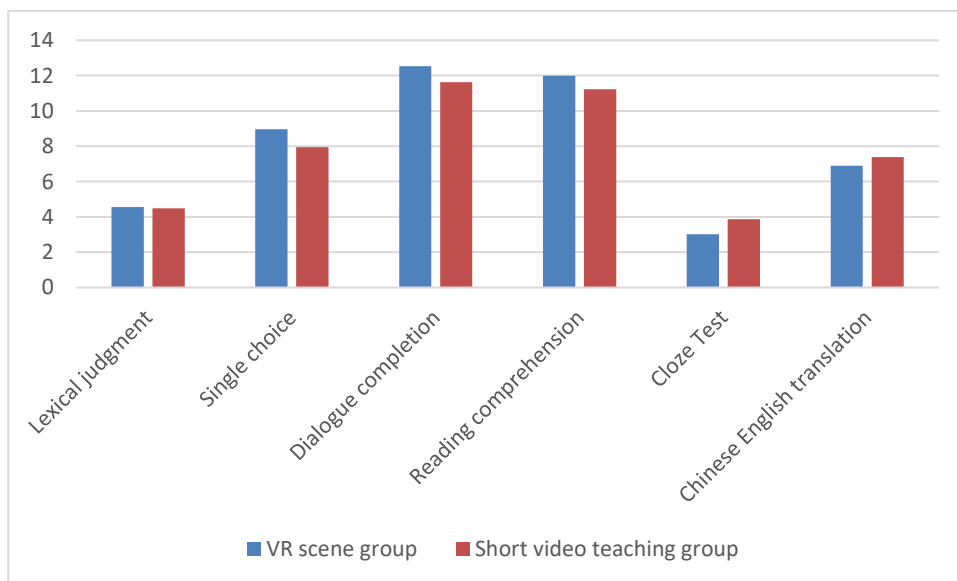


Figure 5 Comparison of test results before the experiment

After 3 months of comparative experimental teaching, a total of 6 tests were conducted, 3 of which were classroom self-tests, the results of which were not analyzed, and the remaining 3, i.e., the 3 major exercises before the college entrance examination, the results of which were the results of the regular level test and could be used as reference data for data analysis. By comparing and analyzing the scores of the three big exercises, we got the analysis chart of each question type 6-12, and now we show the analysis chart of each question type as follows, and make the corresponding data analysis.

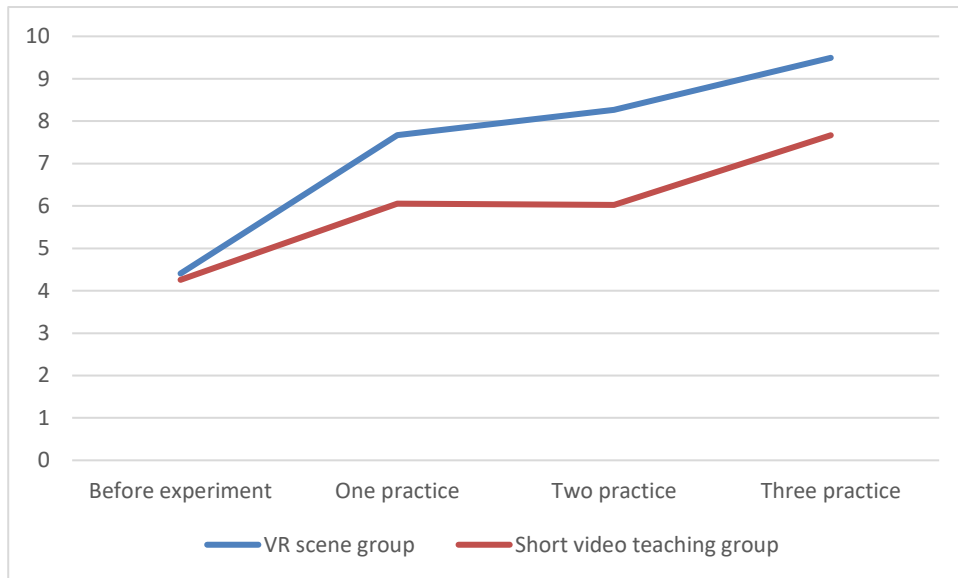


Figure 6 Comparative analysis chart of vocabulary judgment questions

It can be seen from Figure 6 that students' mastery of basic vocabulary has improved through the 3-month experiment. However, the students in the VR scenario teaching group mastered the vocabulary significantly better than the traditional short video teaching group, which indicates that the scenario design of the vocabulary in the secondary English syllabus through VR technology-assisted teaching is more conducive to the students' deeper mastery of the vocabulary they learned.

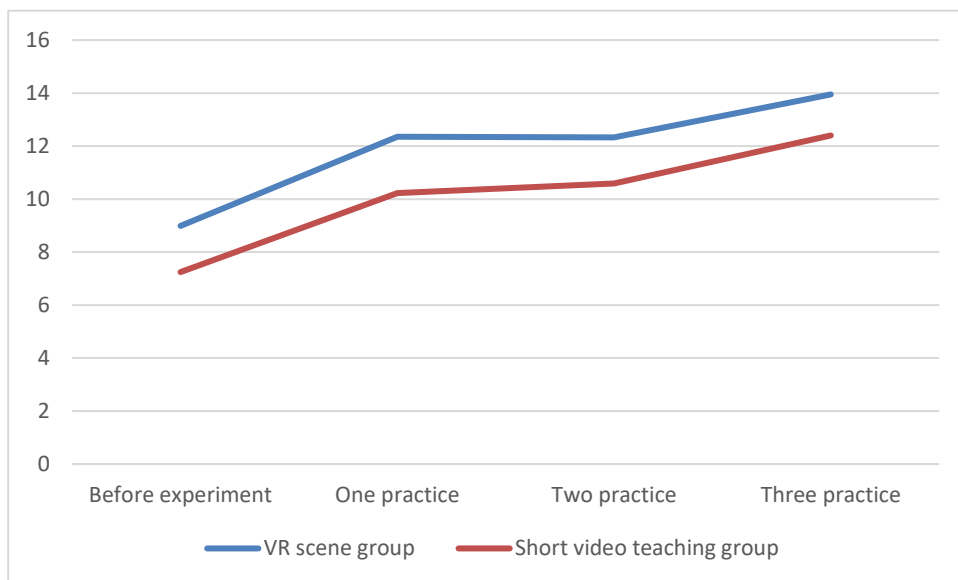


Figure 7 Comparative analysis chart of single-choice questions

It can be seen from Figure 7 that the students' mastery of multiple-choice questions has also improved through the experimental teaching. Since multiple-choice questions are a type of questions that bring together all the grammatical knowledge points in the secondary English syllabus and need to be understood and mastered by the

students through classroom lectures, the comparison of the data of this question type shows that the two groups of students' mastery of this question type is basically comparable.

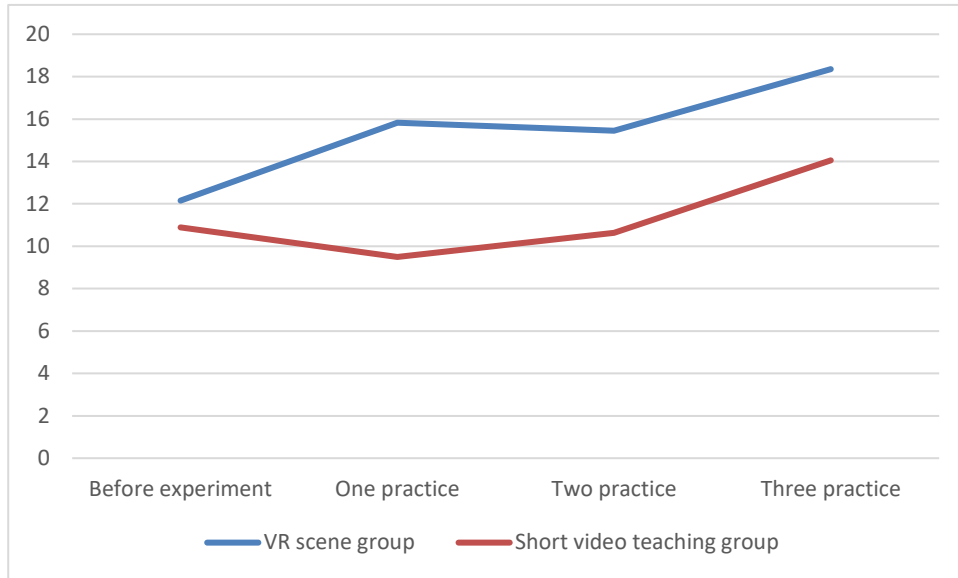


Figure 8 Complementary pair topic comparison analysis chart

It can be seen from Figure 8 that the students' oral communication ability has improved greatly after 3 months of experimental teaching, and it can be concluded from the three practice scores that the VR scene group can score 19.04 on average for a full score of 20 oral conversation topics, which is almost a full score. Through VR technology, students can experience the dialogue scenes visually and carry out speech dialogue or speech following, which makes students' mastery of daily oral communication terms easier and more natural.

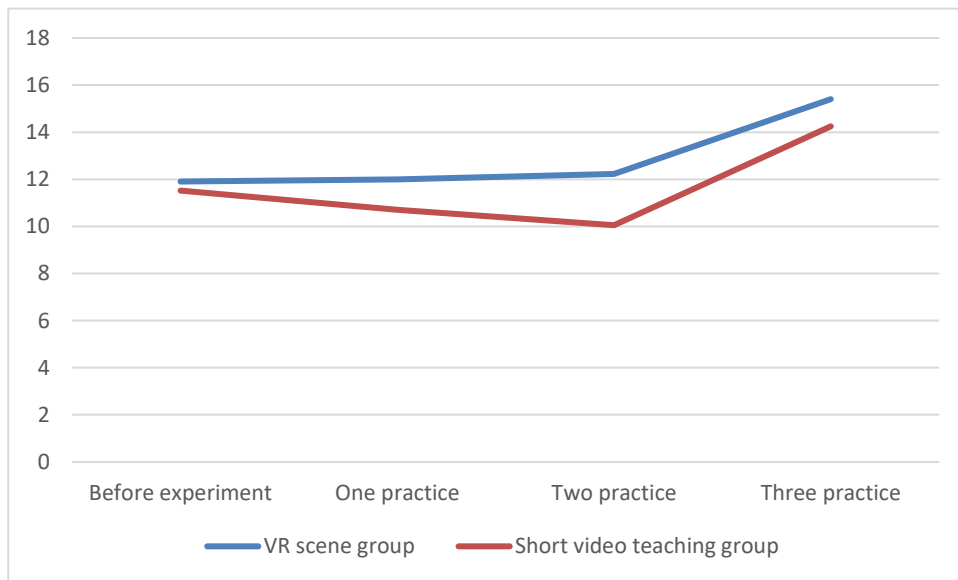


Figure 9 Comparative analysis chart of reading comprehension questions

From Figure 9, it can be seen that the experimental teaching has helped students' problem solving ability. This type of question not only requires students to have sufficient vocabulary, but also requires students to analyze and reason through the central idea and main content of the short text as well as the questions after reading the short text.

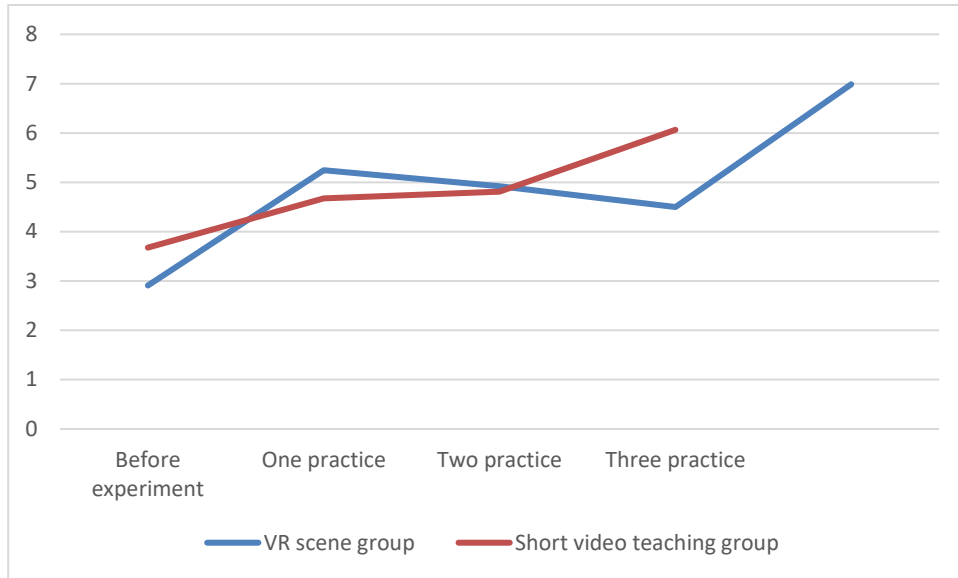


Figure 10 Comparative analysis of completion and filling questions

As Figure 10, students' vocabulary and their familiarity with core phrases, the scores of this question type are also on the rise. After a month of experimental teaching, the scores of the two groups of students on this question type have improved. This question type mainly tests the students' comprehensive English ability, including the students' own original English basic ability and analytical understanding ability, and the use of the classroom. There is no difference in the teaching form, and there is no significant difference in the performance of the two groups of students in this question type.

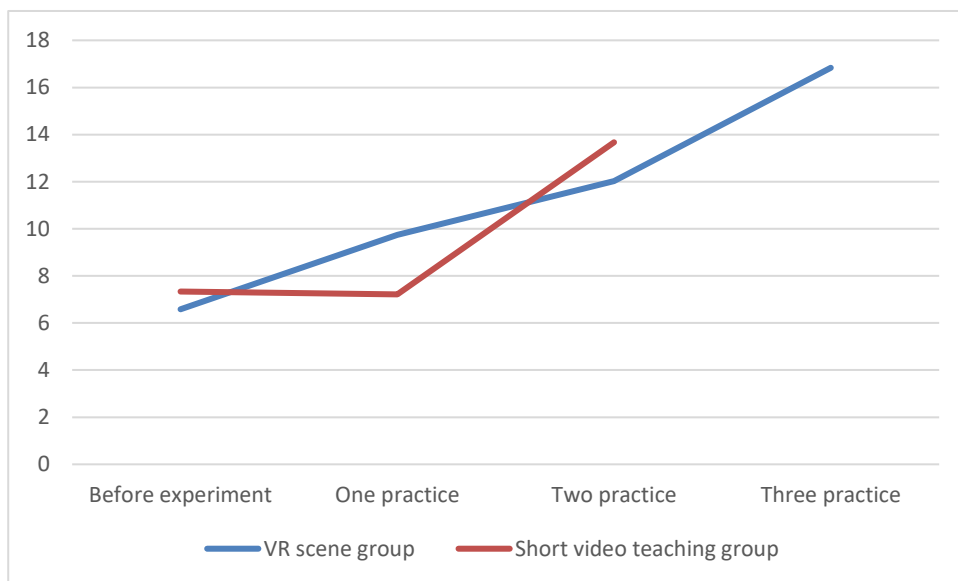


Figure 11 Comparative analysis of Chinese to English translation questions

The students in the VR scene group scored significantly better than the traditional short video teaching group on this question, which indicates that the use of VR technology in the classroom to assist teaching, allowing students to practice dialogues visually and analyze the example sentences in real time, has a very good effect on students' translation ability and mastery of core phrases. Compared with the VR scenario group, the students in the traditional short video teaching group showed limited progress in translation ability.

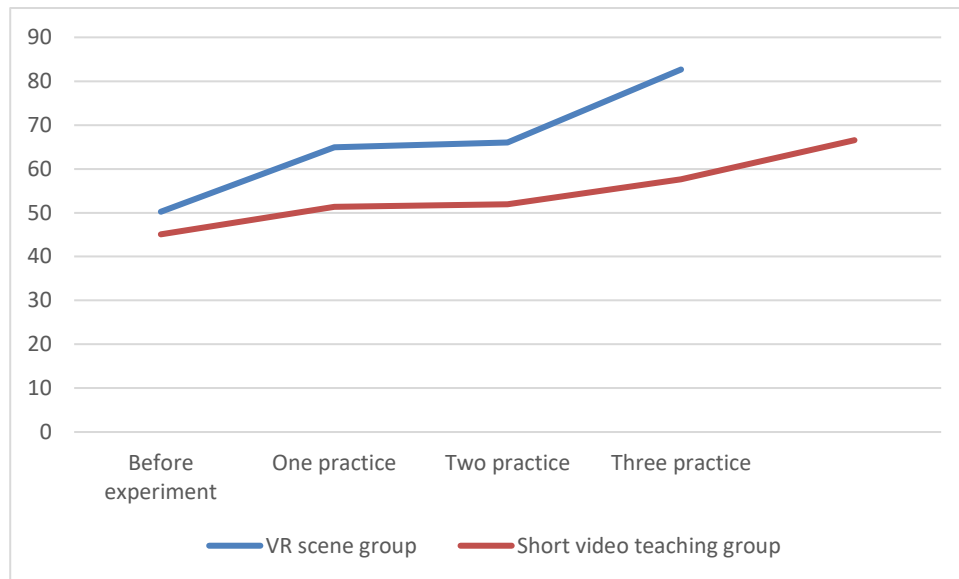


Figure 12 Total score comparison analysis chart

As can be seen from Figure 12, the average score difference between the two groups of students before the experiment was very small, indicating that the two groups of students had comparable basic levels of English before the experiment, and after a 3-month experimental comparison teaching, with reference to the students' performance in the three big exercises, the excellent rate (i.e., the proportion of students scoring above 85) of the VR scene group students was as high as 43%, and the passing rate reached 100%; while the traditional teaching group The students in the VR scene group had an excellent rate (i.e., the percentage of students with scores above 85) of 43% and a passing rate of 100%, while the students in the traditional teaching group had an excellent rate of only 9% and still failed, indicating that the students in the VR scene group had an obvious advantage over the traditional short video teaching group. The average scores of multiple tests in the above graph show that the VR scenario teaching method is more conducive to students' English learning, and with the assistance of VR technology, students' quality in all aspects of English has improved significantly.

VI. CONCLUSIONS

The introduction of VR technology into English teaching is a new way of teaching English. It is in line with the current educational environment of informational English teaching. The experiments in this paper show that VR, with its unique technology, presents the English teaching environment to students in an almost realistic way. This study found that by participating in the VR virtual scene teaching activities, not only did the students' performance rate increase to 43% and the pass rate reached 100%, but also exercised the students' ability to apply their English knowledge, and acquired new English knowledge through independent exploration and practice. Such accumulation will undoubtedly improve students' English practice and application ability in a silent way.

ACKNOWLEDGMENT

There is no specific funding to support this research.

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