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Mixed Teaching Design of College English Based on Wireless Communication and Virtual Reality Interaction

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Abstract As the Internet technology develops rapidly, wireless communication and VR interaction emerge as the times require and continue to get into people's lives. As the endless penetration of wireless communication and Virtual Reality (VR) interaction into various fields, education has become one of them. Among them, college education is a vital component in the education domain. The mixed English teaching of network technology and VR technology is a new idea. There are many problems in the current traditional college English teaching, which makes its method unable to fit in the level of contemporary economic and social development. Based on VR interaction and wireless communication technology, this paper innovatively studied the mixed college English teaching design, which combined traditional English teaching with VR technology. Through analyzing of blended teaching of college English, students' professional skills and comprehensive quality could be effectively improved. The results showed that the blended college English teaching was more conducive to improving the teaching consequence and promoting students to command expertise and their comprehensive competency could be enhanced. The first test results showed that 1444.5 was the total score of the control class, while the total score of the experimental class was 1469.5. Moreover, through statistical analysis, the average score of the experimental class was 1.3 points higher. Compared with the first month, the English scores of the two groups had little difference. However, after calculation, the average score of the experimental class was 1.6 higher. In the third exam, the students' grades in the English test of the two classes were studied, and the average scores were further improved. Based on the analysis of the survey statistics, the paper found that the mixed English teaching model constructed in this paper had certain practical application value and promotion value. Through the analysis of English teaching, this paper expounded the method of combining wireless communication technology with virtual reality technology, which carved a brand-new method for the development of mixed English teaching mode in the future.

Index Terms Blended English Teaching, Wireless Communication, VR Interaction, Design of teaching

I. Introduction

The quick Internet expansion in the 21st century not only promotes economic development, but also promotes the progress of education. As an important branch of education, college English teaching should also continue to develop and innovate, thus carrying out a wide range of education and teaching reform. The traditional college teaching has not adapted to the modern development level. Many scholars have studied the hybrid teaching design based on such platforms as Muke, and the hybrid teaching of college English based on wireless communication and VR interaction has been gradually regarded as a hot research field by many scholars.

In view of the problems such as the lack of communication, Jiang Meifang explored and analyzed the application mode and implementation effect of the online teaching mode in English teaching based on the concept of outcome aimed education, capability aimed education, goal oriented education [1]. By addressing the existing problems in college English teaching, Wang, Yong proposed a new teaching model of college English course based on blended teaching, the flipped classroom model, which would expand the depth of efficient classroom and increase the teaching content of difficulty, thus enhancing students' individual study methods and students' self-study ability [2]. Based on the teaching concept of small-scale restricted online courses, Che, Jun made an in-depth study of the benefits of the blended college English teaching mode and its application in the English teaching. Through teaching practice, it was found that the mixed teaching mode based on Small Private Online Course (SPOC) could stimulate students' enthusiasm for English learning and ultimately optimize the English study result [3]. Zubkov discussed the possibility of using large-scale online open classes in the mixed foreign language (English) teaching

of engineering students. He proposed the selection criteria and methods of large-scale online open classes using college English classroom teaching process. The research results showed that the use of large-scale mixed teaching in teaching activities promoted the progress of students' foreign language professional ability [4]. Although many scholars have studied and analyzed the blended instruction design of college English, the previous theories have some limitations due to the science and technology contemporary progress.

Kukulska Hulme and other scholars studied oral training. It was found that synchronous and out of sync interactions might occur in online and offline learning environment. At the same time, he reflected on how online language study developed so far and proposed the future direction [5]. The spread of COVID-19 brought an unheard-of challenge to the whole society and affected all areas of life, including higher education institutions. This required an immediate digital response. By combining major teaching and learning theories and related literature, Petronzi argued that higher education needed to adopt a set of digital solutions. Its overall purpose was to propose synchronous and asynchronous learning experiences [6]. Bakeer A put forward a case study, which used the existing technology to cultivate the potential of language skills and learner autonomy and used blended learning to stimulate students' interest in English learning in a university environment. The results showed that students' attitude towards blended learning accelerated the improvement of students' language skills and independent study [7]. Lee used blended learning to maximize the use of online and offline methods. He introduced in detail how to integrate analog learning into various teaching methods (such as group discussing and role playing), and summarized the role of blended learning [8]. There are many researches on wireless network, but there are still some perspectives to be studied when using wireless network to analyze university hybrid teaching.

These studies have carried out a good research and analysis for the blended college English teaching, and also confirmed the feasibility of the interaction between wireless communication and VR in the field of mixed college English teaching. On this basis, this paper would combine wireless communication and VR interaction to promote the innovation of mixed college English teaching, and use wireless communication technology and VR interaction to analyze and apply it.

II. Mixed Teaching Design of College English

II. A.Evaluation of Mixed Teaching of College English

During the Internet era, people usually use high-speed computers and intelligent facilities to obtain knowledge and promote the transmission and exchange of information in human society. Wireless networks and smart devices are indispensable for communication and consultation between countries and people's daily lives. In order to improve English teaching effectiveness, English teaching quality is improved and students' proactivity to learn college English is stimulated. Blended English teaching is a step-by-step method; appropriate selection of teaching examples can improve the adaptability of teaching with effect. The cultivation of students' team spirit is conducive to cultivating students' overall learning ability, so as to cater the demands for practical application to the teaching model finally.

II. B.Wireless Communication and VR Interaction

II. B. 1) Wireless Network

The 802.11b wireless network protocol, which reaches 11 Mbps (similar to the transmission rate of Ethernet), is also called wireless Ethernet, as shown in Figure 1. This includes the physical layer and Media Access Control (MAC) of the International Standardization Organization (ISO)/Open Systems Interconnection (OSI) model [9].

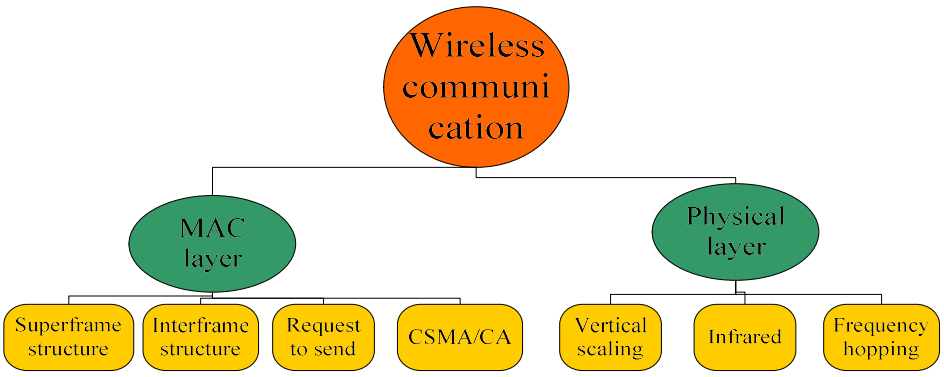

Figure 1: Wireless network protocol

Wireless network defines two devices: customer station and base station. A base station is a device that connects a wired network with a wireless bridge. User station is a device with basic wireless communication function. The communication between user stations can be base stations or point-to-point. In Figure 1, the physical layer and media access control and physical mode are two basic operation modes. In the client/server mode, there must be a base station and a set of client stations.

The MAC layer uses the Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) protocol, which can be configured with a non competitive channel-Point Coordination Function (PCF) and access methods for competing departments.

When the non intersection and inclusion exclusion principle methods are used for reliability analysis, the more the number of paths is, the greater the amount of calculation is, so that the reliability remains unchanged. It is necessary to minimize the number of paths in the network. The next step is to propose methods to keep the reliability of the network unchanged, and these methods are transformed into directed networks [10]. Here is how it is calculated:

$$i2\pi\left(\frac{i}{T_{VSF-OFCDM}}\right) \tag{1}$$

After completing the calculation, the output results of the MAC layer are obtained, and then the next step of calculation is carried out. After completing the calculation, the output results are obtained:

$$\exp\left[i2\pi\left(\frac{i}{T_{VSF-OFCD}}\right)(t-t_s)\right] \tag{2}$$

The calculation starts from t = ts can be expressed as follows:

$$s(t)=\begin{cases}\sum_{i=0}^{N-1} d-exp\left[i2\pi\left(\frac{i}{T_{VSF-OFCDM}}\right)(t-t_s)\right] \\ 0\end{cases} \tag{3}$$

II. B. 2) VR Interaction

As shown in Figure 2, computer graphics technology, computer simulation technology, sensor technology, and other technologies are the main constitution of VR interaction. In the multi-dimensional information space, it creates a virtual information environment that can immerse people in it and integrate with the surrounding environment and enlightens it [11]. Therefore, the three main characteristics of virtual reality are experience-interaction-notion. The core of virtual reality technology is simulation and reproduction.

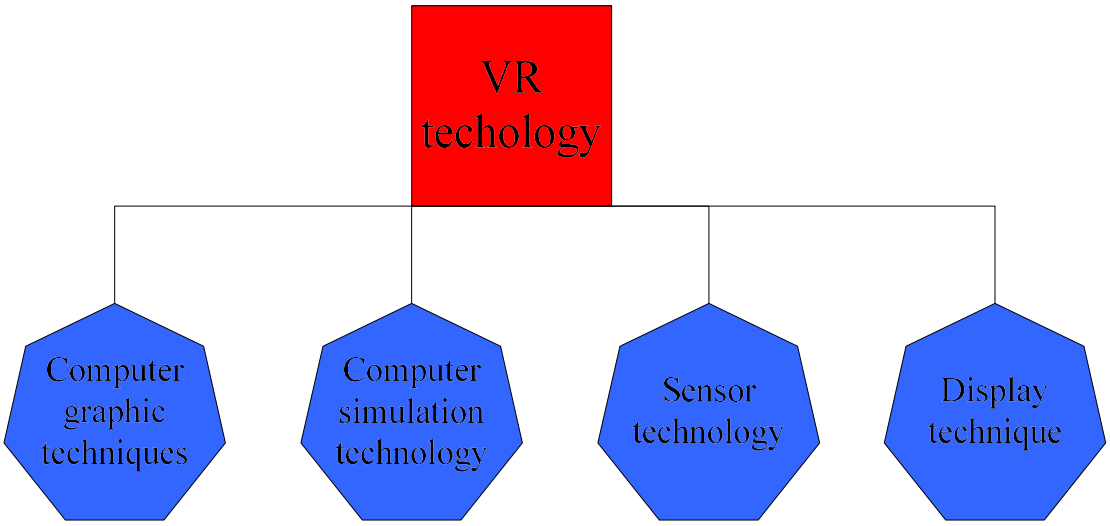

Figure 2: VR technology

First of all, the object is randomly selected, and each object initially represents the mean or center of a set while other objects are assigned to the nearest set and then averaged [12]. It repeats until the cluster standard functions are aggregated to obtain a single industrial object, which is calculated as follows:

$$V=\sum_{i=1}^{k}\ \sum_{x=jesi}\ (x_j-\mu_i)^2 \tag{4}$$

In the formula, V represents the rate; k represents k cluster centers; μ_i is the center of gravity of V; x_j is any element of V.

In the above multi-dimensional spatial data lattice VR display method, a pseudo-random number algorithm is $\mathrm{mod}\,(m)$; a stands for "multiplier"; b means "increment"; m stands for "modulus"; x_0 represents "number of clusters"; if the result is that the interval is (0, 1), it is only necessary to divide each value by m, and the calculation formula is as follows:

$$\mathrm{mod}\,(m) = b + x_0/m; \tag{5}$$

The object is divided into a space for storing particle points. With a variable as acceleration, particle positions and target positions and accelerations are used to make particle points move to the corresponding object; the MouseDown and KeyDown events are associated. After receiving the information, the data would be dealt with by the function. The requested data is presented in the statistical graph to generate data comparison; generally, a particle is one million copies of data [13].

III. Simulation Evaluation of College English Mixed Teaching Experiment

The English mixed teaching content in Principles of Wireless Communication not only includes the basic knowledge of wireless communication system and design, but also includes the application of wireless communication technology in practice. When implementing the mixed teaching plan, the characteristics of the curriculum need to be fully taken into account, so as to guide students to explore, learn and communicate independently and formulate diversified teaching plans. The online teaching of this project would use Tencent platform (WeChat, Tencent Conference) as the main content. Online courses, micro course resources and other resources are combined with online classroom teaching to form a "online+offline" hybrid teaching model with curriculum characteristics [14].

(1) WeChat official account is used to formulate curriculum and teaching plans; the project registered a WeChat official account and the platform was designed. Through the menu customized by WeChat official account, the teaching and learning of the course are clearly planned. The course has three modules: curriculum design, curriculum resources and teaching interaction, and several secondary menus are set under each unit [15]. The "curriculum design" part would introduce the teaching content, teaching plan, assessment methods, etc. of the course to students so that they can understand the knowledge they have learned, which would guide and stimulate their enthusiasm for learning; the "course resources" module sets professional terms, practical applications, problem feedback, etc. In this part, some teaching videos, famous teachers' explanations and other resources have been set up to help students guide the key content to stimulate students' interest to learn; the "teaching interaction" module sets up learning experience sharing, teaching effect survey, teaching satisfaction survey, etc. to collect opinions for subsequent improvement.

(2) WeChat official account tweets are combined with college English classes. WeChat official account instant push content has high flexibility and can provide users with text, pictures, audio, video and other resources. This course divides the teaching process into several phases, such as pre class introduction, in-class explanation and post class feedback, and shares them with students through WeChat, so that students can browse their mobile phones at any time in their spare time [16]. In the "review before class", the content of the previous class is refined and summarized and the key points of each part are listed; the "review after class" summarizes the content of this course and summarizes the main points of this course by asking questions. In "learning guidance", in addition to providing theoretical knowledge, it also closely combines with practice to constantly update and update content, such as 5G, 6G, millimeter wave, aerospace integrated communication, etc. The classroom materials are updated in a variety of forms, such as the addition of appropriate pictures and videos, to attract students and enhance their interest.

(3) The full use of massive network resources would enrich the teaching approaches and enhance students' enthusiasm for learning. There are many excellent resource databases on the network, such as Muke classes and micro classes. These courses are good teaching materials with rich content, diverse forms, strong knowledge and interest. In multimedia teaching, including cellular system design, there are corresponding multimedia digital resources, which can show the knowledge learned and have educational significance and interest. On the VR experimental platform, the course also conducted a VR experiment, which was simulated through remote login to the virtual laboratory to improve students' practical operation ability. For bilingual teaching, there are more English teaching videos on the Internet, so that students can better understand English. In addition, teachers can share some difficult teaching contents in real time through Tencent conference and other flexible ways. Online conference courses have greatly facilitated the promotion of distance education during the epidemic in 2020 [17].

(4) Comprehensive assessment and evaluation system has been established, including online and offline. For the purpose of adaption to the mixed college English teaching, it is necessary to reform the examination methods accordingly, formulate various forms of examinations, and stipulate different examination proportions and forms respectively. The evaluation methods of mixed college English teaching consists of three categories: offline final examination, 60% and 40% of the usual scores, and extracurricular practice. Among them, daily performance is mainly composed of classroom performance, online homework, offline homework, online participation, online interaction, etc. It guides students to take active part in college English blended learning and pay attention to their usual accumulation rather than temporary cramming before the exam [18]. WeChat is a tool to assist in testing and test scores, with multiple functions such as group files and homework. Students can upload their research reports to WeChat groups. Teachers can score online, which can save teaching costs and reduce the cost of teachers' energy. The correct formulation of college English mixed teaching test method is the guarantee of the achieving of the mixed teaching model, and the establishment of a set of perfect online and offline mixed evaluation system is very important to improve the teaching effectiveness.

(5) The online communication platform needs to be fully utilized to enhance teacher and student interaction. Compared with traditional network teaching, network teaching has obvious interaction and communication functions. In the traditional classroom, due to the depth of professional knowledge and the use of language and tone, many students are afraid of communicating with teachers. The effect of questioning and interaction in the classroom is not obvious, and the atmosphere of communication and discussion with teachers after class is not very good. However, according to the experience of Tencent Conference+WeChat group in online teaching, before each class, the students in the WeChat group had a very active discussion. Most of the students would engage in discussion and interaction, and the teachers would also give some encouragement. The atmosphere in the classroom was very harmonious [19]. In addition, the students also took the initiative to ask the teacher questions in the WeChat group and had a warm discussion with the students. Students in the class can conduct a integrated series of basic teaching activities such as "teaching", "question and answer" through WeChat group and other communication platforms, which has produced good results.

IV. Mixed Teaching Design and Testing of College English

IV. A. Deficiencies in the Current Mixed Teaching of College English

First of all, communication technology is a bridge connecting the world. In wireless communication, many concepts are used to being described in English. Therefore, in the English environment, the professional knowledge of wireless communication must be fully utilized; secondly, the cultivation of oral, writing and spoken English abilities would promote the autonomous learning and application of English; in addition, excellent foreign textbooks were introduced to complement and interact with each other, so as to improve students' foreign language reading ability and provide help for future wireless communication research [20]. At present, the school take classes mainly through Internet, which is mainly conducted by teachers in the classroom.

IV. B. Quality Assessment of Blended Teaching of College English

In the experiment, two classes of a university are selected for the result test. Each class would conduct mixed college English teaching based on wireless communication and VR interaction. Before the experiment, students with the same English test scores are selected. The same teacher guidance can ensure that there is no teaching disparity between the two classes before and after the experiment and can reduce the error in the experiment. There are 22 girls and 25 boys in the first class. The second class has 24 girls and 23 boys. The total number is 94. This questionnaire investigates the problems in English teaching by means of in class investigation and spot-check questionnaire survey after class. The purpose is to make a comparative study of the experiment and contrast courses in the mixed college English teaching using wireless communication technology and VR interaction.

(1) Questionnaire results

In this experiment, two questionnaires are distributed to the experimental class and the control class before the experiment and after-class survey, and the students are polled on the aspects of using mixed teaching to improve the most. The data is analyzed using the logical regression model and the findings are shown as follow:

Table 1: Questionnaire statistic results (front reliability)

Aspect	Amount	Krumbach's coefficient
Writing skill	15	0.802
reading capacity	13	0.713
Vocabulary memorization	24	0.756
Paper grading	25	0.814

Listening comprehension	17	0.750
SUM	94	0.915

Table 1 indicates that the average reliability of the pre-test is above 0.7, so the pre-test reliability is high.

Table 2: Statistical Form of questionnaire results (posterior reliability)

Aspect	Amount	Krumbach's coefficient
writing skill	17	0.892
reading capacity	20	0.856
Vocabulary memorization	26	0.893
Paper grading	15	0.862
Listening comprehension	16	0.881
SUM	94	0.962

It can be seen from Table 2 that the reliability coefficient greater than 0.7 is considered very reliable, and the post test reliability is very good. It can be seen from the reliability analysis of the previous and second questionnaires in five aspects that the questionnaire is suit for questionnaire analysis.

Table 3: Gender distribution questionnaire

		gender		male to female ratio
		male	Female	
Gender	Control class	25	22	1.136
	Experimental class	23	24	0.958

It can be seen from Table 3 that it makes no difference in terms of sex ratio between the control class and the experimental class and there is basically no statistical disparity.

(2) Statistical results of three English tests in two classes

In the experiment, students take an English proficiency test every three months and assess the implementation of the blended English teaching design. For the purpose of better understanding and analyzing of the effect of the experiment, the scores of students with odd student numbers from two classes are selected and a comparison chart of the scores of the two classes' English tests is made. Figure 3 is the data chart of the first English test:

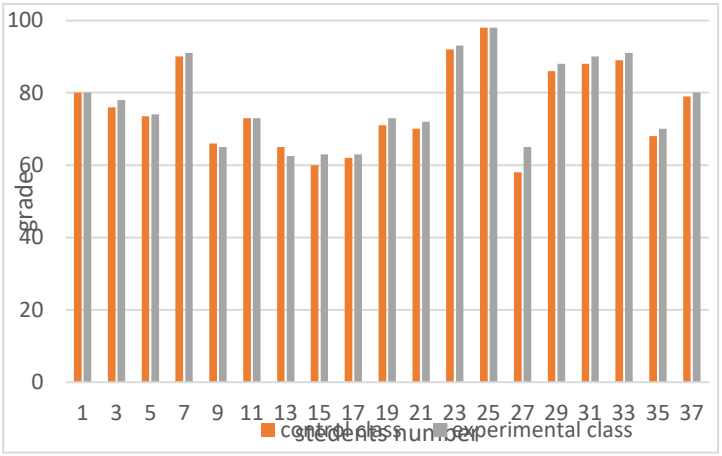

Figure 3: Statistics of first English scores

In Figure 3, after one month, the English scores of the experimental class is the same as the control class. However, after analyzing the two groups of scores, the total score of control class as the results shown is 1444.5, while the total score of the experimental class is 1469.5. Moreover, through statistical analysis, the average score of the latter is 1.3 points higher than the former. However, a score gap does not prove how effective intelligent English teaching is. More experiments are needed to understand the differences between the experimental results of the two classes. Figure 4 is the statistical chart in the second test:

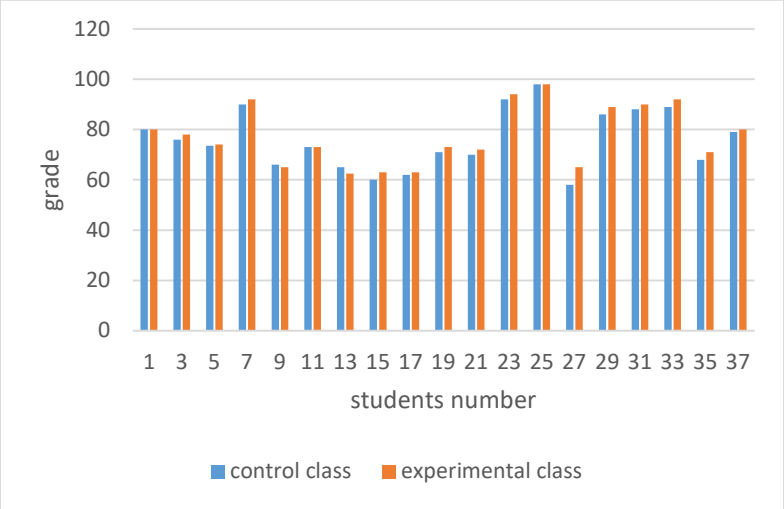

Figure 4: Statistics of the second English score

As shown in Figure 4, after more than a month, the English scores of the experimental group and the control group present almost the same. However, according to the statistics, the results show that the control group total score is 1444.5, while the total score of the experimental group is 1474.5. After calculation, the average score of the experimental class is 1.6 points, which is higher than the control class. However, a score gap does not prove how effective intelligent English teaching is, and many attempts are needed. Figure 5 is the data chart in the third test:

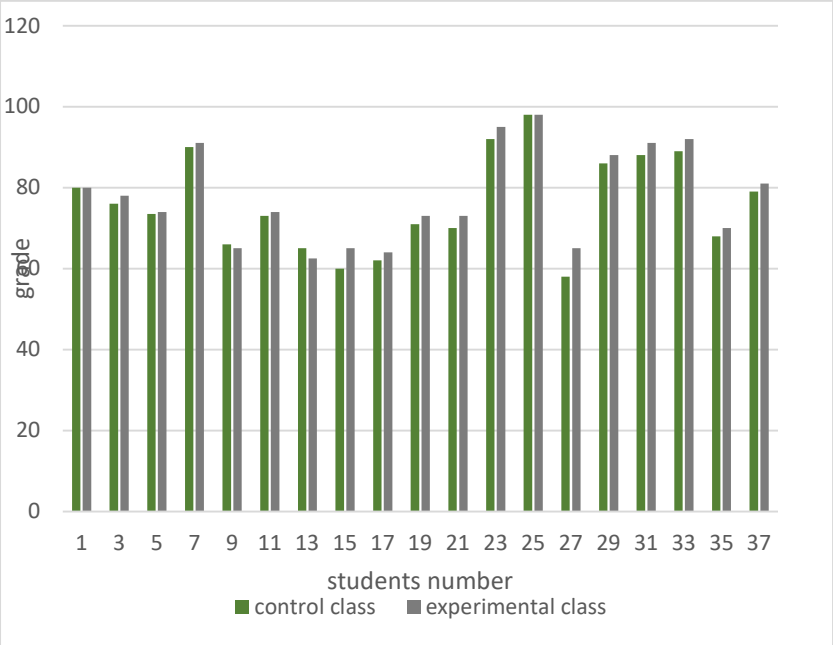

Figure 5: Statistics of the third English test

According to Figure 5, in the third exam, their scores of the two classes also indicate a similar trend in the English test. The average score of English has improved, but it is not as high as last time. This shows that although the intelligent English teaching mode can improve students' English comprehensive abilities, the effect is not unlimited. The later the time comes, the harder it would be to improve.

According to the experimental outcome, the utilization of wireless communication technology and VR interaction in English mixed teaching is proved to be feasible to improve English learning effect. This also reflects from a side that the mixed teaching mode based on wireless communication and VR interaction can not only stimulate the

interest of English study, and also make teaching experiments achieve significant results. However, there are limits. This shows that the respondents need diversity at the level of blended English teaching design.

V. Conclusions

On the one hand, combination of the mixed teaching mode of college English with wireless communication technology and VR interaction has improved the interest of English classroom to a large extent. On the other hand, it also enhanced the stability of the entire teaching system. Through a comparative study, this paper found that under the circumstance of mixed college English teaching, the overall operating atmosphere of the English classroom was different from the traditional classroom atmosphere. Students had a stronger sense of participation, and their willingness to learn independently was also greatly improved. The interaction between wireless communication technology and VR transformed students from passive acceptance of knowledge to active learning mode, thus stimulating students' willingness to learn independently. Although the mixed teaching mode of college English using wireless communication technology and VR interactive technology improved students' interest in learning and teaching effect greatly, there were also two problems: First, it depended on the demand for the network and needed a good network as a medium; second, the application of VR technology needed high technology. Therefore, in order to support the operation mode of English teaching, this is not only a requirement for the network, but also a requirement for technology. Therefore, it is difficult for the system to be applied in small-scale schools with weak network and low high-tech introduction level. This is the disadvantage of combining wireless communication technology with VR technology and college English mixed teaching. At present, most schools cannot meet the real teaching and managing extent. The Internet is the most important means of communication between schools and students, and the information processing system inside the school is the core of the whole school system. If these two conditions cannot be guaranteed, this teaching method is difficult to ensure smooth operation. However, the times are developing and science and technology are also progressing. In the near future, the hardware field would no longer be the bottleneck of scientific and technological development and application. Therefore, in the future, traditional teaching methods would inevitably be combined with wireless communication and VR interactive technology to achieve blended college English teaching goal.

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References

[1] Jiang, Meifang, and Xiaochun Wu. "Exploration and Practice of College English Multi-Blended Teaching Model Based on OBE Concept."Open Journal of Modern Linguistics 12.4 (2022): 367-379.

[2] Wang, Yong. "A study on college English high-efficiency class based on blended teaching mode of flipped classroom."Theory and Practice in Language Studies10.9 (2020): 1066-1071.

[3] Chen, Jun. "Exploration and Application of SPOC-based Belended Teaching Mode in Comprehensive English Course." Journal of Physics: Conference Series. 12.37(2019): 2-2.

[4] Zubkov, Artyom D. "MOOCs in blended English teaching and learning for students of technical curricula."Proceedings of the Conference “Integrating Engineering Education and Humanities for Global Intercultural Perspectives”. Springer, Cham 16.2 (2020):36-43.

[5] Kukulska Hulme, Agnes, and Lesley Shield. "An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction." ReCALL20.3 (2018): 271-289.

[6] Petronzi, Rebecca, and Dominic Petronzi. "The Online and Campus (OaC) Model as a Sustainable Blended Approach to Teaching and Learning in Higher Education: A Response to COVID-19." Journal of Pedagogical Research 4.4 (2020): 498-507.

[7] Bakeer A. "Students’ attitudes towards implementing blended learning in teaching English in higher education institutions: A case of Al-Quds Open University." International Journal of Humanities and Social Science 8.6 (2018): 131-139.

[8] Lee, Eunjung, Toula Kourgiantakis, and Ran Hu. "Developing holistic competence in cross-cultural social work practice: Simulation-based learning optimized by blended teaching approach." Social Work Education 41.5 (2022): 820-836.

[9] Zhao, Hanting. "Metasurface-assisted massive backscatter wireless communication with commodity Wi-Fi signals." Nature communications 11.1 (2020): 1-10.

[10] Pulham, Emily, and Charles R. Graham. "Comparing K-12 online and blended teaching competencies: A literature review." Distance Education 39.3 (2018): 411-432.

[11] Arnesen, Karen T. "Experiences with personalized learning in a blended teaching course for preservice teachers." Journal of online learning research 5.3 (2019): 275-310.

[12] Zhang, Rui. "Exploring blended learning experiences through the community of inquiry framework." Language Learning & Technology 24.1 (2020): 38-53.

[13] Saeheng, Pornpimon. "A study of e-learning, blended learning, and traditional teaching methods to motivate autonomous learning in English reading comprehension of Thais learners." IJELTAL (Indonesian Journal of English Language Teaching and Applied Linguistics) 2.1 (2017): 1-20.

[14] Aji, Mahendra Puji Permana. "English listening blended learning: The implementation of blended learning in teaching listening to university students." Kajian Linguistik dan Sastra 2.1 (2017): 25-32.

[15] Alrouji, Omar Obaid. "The Effectiveness of Blended Learning in Enhancing Saudi Students' Competence in Paragraph Writing." English Language Teaching 13.9 (2020): 72-82.
[16] Brown, Howard. "Cooperation and collaboration in undergraduate EMI: Adapting EAP to the emergence of blended academic norms and practices in a Japanese university." Integrating content and language in higher education: Perspectives on professional practice 1.3 (2017): 151-166.
[17] Ghazizadeh, Tina, and Hamidreza Fatemipour. "The effect of blended learning on EFL learners' reading proficiency." Journal of Language Teaching and Research 8.3 (2017): 606-606.
[18] Khine, Phyo Thu Thu, Htwe Pa Pa Win, and Tun Min Naing. "Towards implementation of blended teaching approaches for higher education in Myanmar." International Journal of Education and Management Engineering (IJEME) 11.1 (2021): 19-27.
[19] Arani, Jafar Asgari. "An innovative media platform-supported blended methodology in English for dental purposes program." International Journal of Emerging Technologies in Learning (Online) 12.3 (2017): 98-98.
[20] Wahyuni, Sri. "The effect of blended learning model towards students' writing ability." J-SHMIC: Journal of English for Academic 5.2 (2018): 97-111.