

Optimization of English Teaching Strategies Based on Computer Virtual Reality Technology and 5G Network

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Abstract: English teaching reform is the focus of the current society. Under the current educational background, teachers are no longer restricted to traditional teaching on the podium, but combine the way of teaching English with modern technology. This teaching mode has changed the previous teaching characteristics and broken the ecological balance in the traditional classroom, and brought advantages to English teaching. As a new technology in the new century, computer virtual reality technology (VR for short) and 5G network have been rapidly integrated into the education industry. This paper had a novel idea and rigorous framework, and constructed a teaching model based on hybrid teaching. The cooperative classroom teaching model based on mixed teaching was applied to the actual teaching, and the classroom teaching reform was carried out around English grammar, vocabulary and discourse, which effectively improved the students' comprehensive ability of using English. The cylinder projection algorithm proves the feasibility of applying VR technology and 5G network to English teaching. In the experimental part, based on the questionnaire of College A, this paper found out the changes of English teaching mode, students' attitude and psychology towards learning English in recent years. Finally, the views of students on the new teaching mode and the problems existing in this teaching mode were discussed. The data showed that under the new teaching mode, students' learning ability has been improved, 78.8% of the students have effectively improved their interest in learning English, and 57.8% of the students have improved the efficiency of learning English. Based on the existing problems, this paper gave a new teaching model at the end, which provided a reference for the change of English teaching model.

1. Introduction

At present, various emerging technologies are gradually integrated into English classroom teaching, bringing unprecedented changes to English teaching. More and more students have access to various learning resources through computers, and students can learn English in different ways. The teaching elements of teachers have also changed, such as teaching concepts and teaching

methods. Finally, the English teaching environment has also changed. The teaching environment is not single and rigid, but gradually presents the characteristics of informatization. Information technology has gradually become a part of the teaching environment[1]. Under the background of the reform of English teaching mode, this paper aims to optimize the design of teaching strategies. By discussing the learning and teaching status of students and teachers in College A, the improvement of teaching mode is provided with a reference angle to effectively solve the problem of English teaching mode development, and verifies the feasibility of the optimization strategy through the cylindrical projection algorithm to make it meet the educational goals of English teaching.

Based on the practical teaching practice of this paper, this study explored the innovative practice of English teaching based on blended teaching, taking the weak points of students' English learning as the breakthrough point. It effectively solved the problems that students are difficult to integrate into the learning atmosphere. The innovation of this paper lies in the ingenious use of VR technology and 5G network to create new teaching methods.

2. Related Work

Under the current educational background, English teaching has become the most important field. Looking at the world, many scholars are doing research in this field. Yao J believed that students' English learning cannot be separated from the training of listening and speaking ability, and teachers should strengthen the guidance of listening and speaking ability in the teaching process [2]. Yan K believed that the development of corpus not only enriched teaching resources and realized resource sharing, but also reflected advanced educational technology and learning concepts and improved learning ability [3]. Lu X found through the study of business English education in Chile that private language centers, foreign cultural, and educational organizations jointly promote the development of business English in Chile [4]. These scholars have their own opinions on English teaching strategies, but the direction of analysis is relatively traditional. They do not use new technologies to study English teaching problems, such as VR technology.

VR technology is a popular technology now. Many scholars have studied it and applied it to various fields. Bun P raised the importance of VR technology in medicine, using low-cost VR equipment to treat phobias through exposure to stress-generating factors in an immersive virtual environment. Several usage scenarios are presented for a simple application designed to expose patients to acrophobia [5]. Zhao C analyzed the function of virtual system in real life through the research on virtual fitness and extracted the user's needs through information, and made corresponding control [6]. Ren Y applied the virtual system to various sports training. Through the setting of the virtual environment, it helps coaches and sports to better complete training, and provides technical support for athletes to achieve better results [7]. Zhong J analyzed the technical movement of the cross kick through computer virtual technology, supplemented by dynamic analysis. The basic movements of Taekwondo were studied from different angles. Combined with the survey data, the training movements in the virtual environment were designed, which provided convenience for the daily training of athletes [8]. These scholars have carried out research and discussion on computer virtual technology to varying degrees, but there are few analysis on the optimization of English teaching strategies by computer virtual reality technology.

3. Evaluation Method of English Teaching Strategy Optimization Based on Computer Virtual Reality Technology

3.1 Optimization of English Teaching Strategies

The importance of English as the universal international language in the world is obvious. Therefore, the learning and teaching of English becomes more and more important. There are many professional theoretical knowledge involved in English teaching, including linguistics, lexicology, corpus theory and cognitive psychology [9]. However, there is a common problem in English teaching at present. Teachers are self-centered and only care about their own teaching in the classroom, and are indifferent to whether the students can accept it. The basic elements of the classroom are teachers, students and teaching materials, which is also the focus of classroom teaching. However, this has also caused some problems, such as unbalanced teacher allocation and unbalanced teacher training; students' learning state is poor and the phenomenon of passive reception is serious; teaching materials are not properly connected, and teaching materials are not matched. Therefore, only by changing the teaching mode from the most basic places and solving the original problems, can it be mentioned that the teaching level can effectively change the current situation of students' difficulty in learning English [10]. Figure 1 is the English teaching model.

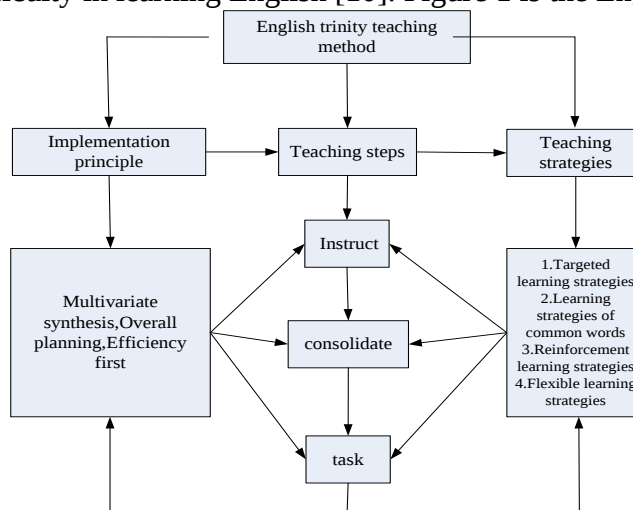


Figure 1 Model diagram of the English Trinity teaching method

3.2 Virtual Reality Technology

VR technology is a simulation system that can design and simulate a real environment through a computer. It builds a three-dimensional artificial environment, namely virtual environment, through computer hardware and software and sensors [11]. VR technology has 3I characteristics, including immersion, interaction and conception [12]. At present, VR technology has been applied in many fields, such as the film and television field, medical field, military field, etc., and has received great attention in various fields. This change in learning mode can enable students to better grasp classroom knowledge [13].

The optimization of English teaching through existing methods is mainly reflected in the construction of a new simulation environment through the design of images. The image is reconstructed by cylindrical projection algorithm, and the picture sequence is stitched into a continuous panoramic image, and then a virtual panoramic space is formed [14]. The cylindrical projection algorithm of the real image would be deduced below.

Cylindrical orthographic projection algorithm: the cylindrical orthographic projection algorithm is to edit and reshape the real scene image and project it onto a cylindrical surface.

Among them, A represents the image, and $M(x, y)$ represents any pixel on the image. The coordinate of M is $M(x - a/2, y - b/2, -c)$. Among them, a and b represent the width and height of the image, and c is the radius of the cylindrical surface. Next, the coordinate $M'(x', y')$ of the point M in the cylindrical image under the projection point N is derived.

The coordinate system origin and pixel point formula can be expressed as:

$$\begin{cases} u = t(x - w/2) \\ v = t(y - w/2) \\ w = t(-c) \end{cases} \quad (1)$$

Among them, t is the design parameter, and the formula can be expressed as:

$$u^2 + w^2 = c^2 \quad (2)$$

Cylindrical backprojection algorithm: the cylindrical backprojection algorithm is to reconstruct the corresponding view from the image [15-16].

Image B is a new panoramic image; N is any pixel on image B and the coordinate is $N(x', y')$; L is the view to be generated. The corresponding point of N on L is assumed to be M , and the image coordinate of M on L is (x, y) .

According to the orthographic projection algorithm, the corresponding point of (x', y') on the cylindrical surface is:

$$\begin{cases} u = c \cdot \sin\left(\frac{x' - c \cdot \arctan(w/2c)}{c}\right) \\ v = y' - b/2 \\ w = c \cdot \cos\left(\frac{x' - c \cdot \arctan(w/2c)}{c}\right) \end{cases} \quad (3)$$

The formula of the line connecting point O and point N is:

$$r = tu', s = tv', q = tw' \quad (4)$$

In the coordinate system, the formula of the view plane is:

$$q = -c \quad (5)$$

By combining Formulas (4) and (5), the result can be obtained:

$$t = -\frac{c}{w} \quad (6)$$

4. Experiment and Evaluation of English Teaching Strategy Optimization Based on Computer Virtual Reality Technology

4.1 Scheme Formulation of English Teaching Strategy Optimization

4.1.1 The Change of Teaching Mode

The teacher's teaching method would directly affect the students' understanding and is the most

important part of teaching. Different scholars have their own views on teaching methods, but there is a consensus: different teachers have different teaching methods, but their purpose is to achieve a certain teaching task [17].

It can be seen from the changes in the figure that the English teaching mode has developed from a single centralized teaching mode to a diversified one. At present, personalized teaching, multimedia teaching and virtual teaching have gradually become the mainstream teaching modes in English classrooms. Therefore, teachers themselves need to be familiar with and understand new technologies, and at the same time, they also need to teach students how to skillfully use new resources for English learning.

4.1.2 Students' Concept of Language Learning

Students' language learning concepts are closely related to students' self-learning effect. A good learning concept can promote students to study harder and affect the formulation of learning process plans. Table 1 shows the questionnaire on language learning concept of students in College A.

Table 1 Survey of students' language learning concepts

Learning concept	In full agreement	Basic agreement	unclear	disagree
Learning English is of great significance	42.3%	21.4%	19.2%	17.1%
Learning English takes a lot of time	28.1%	22.6%	33.5%	15.8%
You need to learn English in different ways	38.2%	20.4%	23.7%	17.7%
It's normal to make mistakes in learning	45.2%	27.4%	18.8%	8.6%

The survey shows that most students think that learning English is of great significance, accounting for 63.7%. 19.2% of the students did not know and 17.1% of the students did not agree. 50.7% of students think that it takes a long time to learn English, which shows that many students have not found an effective learning method. In terms of methods of learning English, 58.6% of the students believed that learning English requires various methods, which is conducive to students' autonomous learning and individualized training for students. Finally, 72.6% of students believed that mistakes are inevitable in the process of learning English, and only 8.6% of students disagreed with this view. This shows that most students understand the phenomenon of mistakes in the English learning process. The above survey and research show that students have their own opinions and views on English learning, but they are still relatively traditional and have not mastered effective learning methods.

4.1.3 Students' Perceptions of the Role of VR Technology in English Teaching

Table 2 Survey of students' perceptions of the role of VR in English teaching

Role	In full agreement	Basic agreement	Unclear	Disagree
Improve students' interest in learning English	52.7%	26.1%	8.4%	12.8%
Improve students' learning efficiency	34.2%	23.6%	11.6%	30.6%
Strengthen interaction with teachers	19.6%	20.4%	11.6%	48.4%
Provide different learning methods	44.6%	21.7%	13.7%	20%

It can be seen from table 2 that 78.8% of the students believe that mixed English teaching can improve students' interest in learning English, and 57.8% of students believe that it can improve learning efficiency. However, when it comes to interacting with teachers, only 40% of students report an improvement. Finally, 66.3% of the students believe that English teaching under the computer virtual reality technology could provide different teaching methods. According to the above data, it can be found that VR technology can promote English teaching to a certain extent, but it still lacks in enhancing classroom interaction.

4.1.4 Teachers' awareness and Usage of VR Technology

In order to apply VR technology to teaching, teachers should strengthen the study of relevant theories and be familiar with basic operation methods. Finally, combining with their own teaching methods, they should reorganize and analyze the obtained resources and design a virtual English learning environment [18]. Figure 2 shows the degree of teachers' awareness of VR technology.

It can be seen from Figure 2 that 64% of the teachers think they are fully aware of the significance of the new teaching mode to English teaching, and 33% of the teachers are basically aware of it; only 3% of teachers do not realize its importance. According to Figure 3, in terms of using the new teaching mode, 45% of the teachers have never used it, and only 8% of the teachers often use the new teaching mode for English teaching [19].

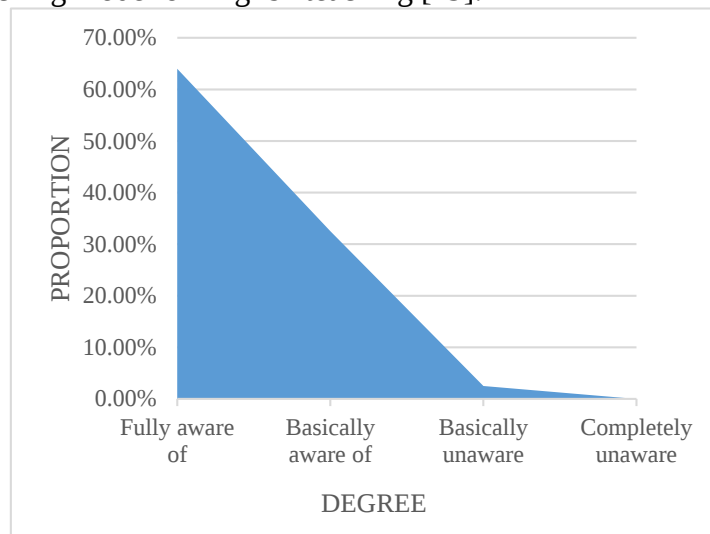


Figure 2 Teachers' awareness of VR technology

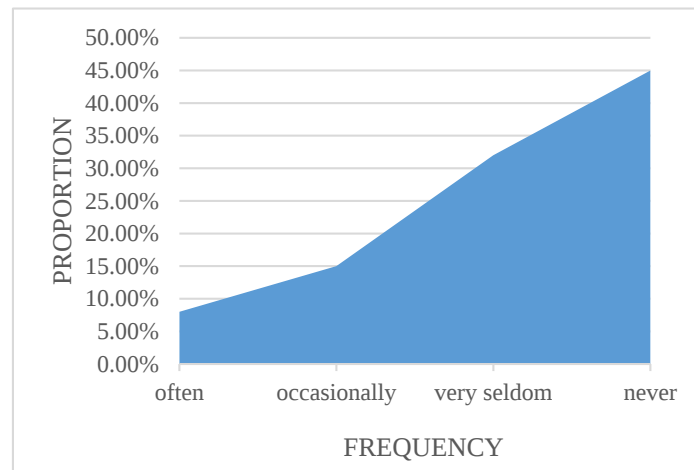


Figure 3 Frequency graph of teachers using VR technology for teaching

4.1.5 Problems in the application of VR technology in English Teaching

In order to better understand the reasons for the low frequency of teachers using the new teaching mode, the problems of this teaching mode were further investigated, as shown in Figure 4.

According to the survey, teachers rarely use virtual technology for English teaching mainly because of limited application level, accounting for 89%; secondly, 77% of teachers believe that

schools lack professional technical personnel and 69% of teachers believe that schools lack related equipment; finally, 40% of the teachers think that this teaching mode needs to take longer time and more energy.

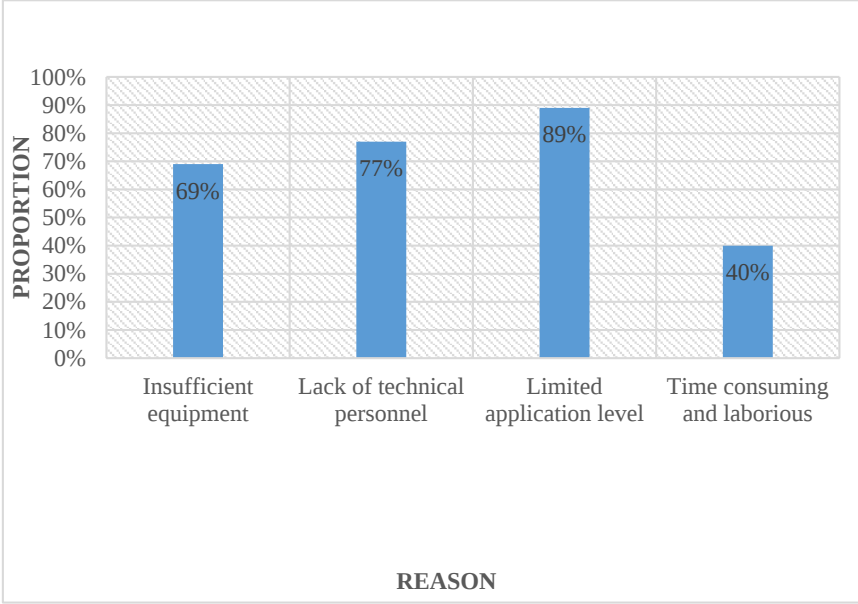


Figure 4 Problems in the application of VR technology in English Teaching

4.2 Evaluation of the Results of the Optimization of English Teaching Strategies

At present, the teaching form of English teaching has been normalized and diversified, but there are still some problems in the teaching mode that need to be solved [20]. In order to solve the problems in English teaching, this paper makes a survey of College A.

The English teaching is no longer a simple centralized teaching mode, but a multi-directional development, gradually emerging personalized teaching, virtual teaching and other new teaching methods. English teaching is no longer limited to textbooks and blackboards, but gradually introduces personalized teaching, using multimedia technology, VR technology and other technologies to achieve a more intelligent teaching mode. However, the importance of teachers would not be weakened by the intelligence of the teaching model. Under the new teaching model, the transformation of the teacher's role, the innovation of teaching methods and the success of the educational model are closely related. At the same time, it is also the teacher's teaching goal to use information technology to implement various novel teaching methods in English classrooms.

Based on the survey data analysis of students' language learning concepts in Table 1, most students know the importance of learning English. However, in the daily learning process, because people can't find the correct and their own learning method, it often takes more time than others in the learning process. In addition, students' learning concepts are relatively general, and they fail to quickly change their learning methods under different teaching modes, and have strong dependence on Teachers' guidance. Therefore, while optimizing the English teaching mode, it is also very important to help students change their learning attitudes and cultivate their study habits, and adjust their learning motivation.

According to table 2, although this teaching mode can improve the quality of students' learning, the effect is not ideal in the interaction between teachers and students. As a brand-new teaching mode, its role in enhancing students' interest in learning is unquestionable. This is a common problem among students today. In the face of new things, it can always stimulate interest in new things. However, how to maintain this freshness and how to increase the interaction in the

classroom are the problems that need to be solved at present.

4.3 Optimization of English Teaching Strategies Based on Computer Virtual Reality Technology

With the support of VR technology, teachers can build relevant learning environments so that students can obtain English learning environments in various real scenarios in the classroom. On this basis, students conduct real-world dialogues, which can lead to students' active thinking and exploration, and complete their learning goals [20]. Before the start of virtual teaching activities, both teachers and students need to make certain preparations. Teachers need to establish a virtual simulation scene related to the teaching content, so that students can quickly integrate into the learning environment and enter the learning state. Secondly, students need to build a knowledge system in the virtual simulation scene. During the learning process, students do a preview in advance. When the teacher introduces the teaching content, they would ask questions about the question, and the teacher would answer it in a targeted manner. After the practical training, in the virtual simulation scene, various roles are simulated, so that the students are immersed in the atmosphere brought by the simulation scene. Finally, the construction of meaning is further developed using virtual reality technology. After teaching, students can continue to learn and evaluate through classrooms with virtual simulation equipment to discover their own problems [21].

5. Discussion

With the continuous change of teaching methods, VR technology has gradually played an important role in education. Educational researchers have gradually strengthened the research on this technology, and its importance is self-evident [22]. From the perspective of English teaching optimization, this paper introduced VR technology into teaching. Taking College A as an example, this paper investigated and analyzed the advantages of VR technology in English teaching and the difficulties to be overcome. On this basis, a set of English teaching mode based on VR technology was designed.

By combining VR technology with English teaching, this paper not only promoted the development of VR technology, but also innovated the teaching mode. The following problems can be found through the survey data of students and teachers in College A. First, teachers' related technologies are not mature enough to use virtual teaching skillfully. In this regard, schools should strengthen professional training for teachers and deepen teachers' mastery of relevant technologies; second, the lack of relevant equipment and professionals in schools hinders the application of virtual teaching. However, from research and surveys, it is found that as long as schools solve these problems, VR technology can be applied to teaching. Teachers can use the virtual environment designed before class to let students integrate into the atmosphere of learning English more quickly, so as to shorten the time for students to enter the learning state; teachers can also explore new teaching theories and engage in relevant research when designing virtual environment, so as to improve the teaching and research level.

6. Conclusions

The application of VR technology and 5G network in education has promoted the development of English teaching system towards a more reasonable and scientific direction. Unlike traditional English teaching, teachers can simulate virtual scenes in teaching and conduct field teaching for students through VR technology [23]. This teaching mode allows students to integrate into the real environment and conduct on-the-spot simulation training face-to-face, so as to strengthen the

students' ability to use English on the spot. Moreover, because of the novelty of this mode, students would have a continuous sense of freshness when they are contacted.

This paper analyzes the relevant situation of students and teachers in College A in English teaching, discusses the development plan of English teaching system under VR technology and 5G network, and establishes a complete teaching system for the existing development problems. First of all, the teacher's basic ability to use VR was guided and strengthened to master the most basic VR knowledge and operation methods. Secondly, the comprehensive quality of teachers should be strengthened, and advanced teaching methods, teaching methods and educational theories should be mastered. Finally, schools around the country should introduce a large number of VR equipment and professional and technical personnel, and vigorously support the development of new teaching models.

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References

- [1] Gu, Y. Enhancement of College English Teachers' Information Literacy in Information Environment. *International Education Studies*, 2020,13(4), 106-112.
- [2] Yao J, Zhang F, Li H. Research on the Optimization of Oral English Teaching in Junior High School in the Environment of Man-machine Dialogue. *Journal of Language Teaching and Research*, 2019, 10(5). 1047.
- [3] Yan K. Optimization of english teaching and Effect analysis in hainan primary school based on computer aided corpus. *Boletin Tecnico/Technical Bulletin*, 2017, 55(4):770-775.
- [4] Lu X. Business English Education Developments in Chile. *Open Journal of Social Sciences*, 2022, 10(1):315-323.
- [5] Bun P, Gorski F, Grajewski D. Low – Cost Devices Used in Virtual Reality Exposure Therapy. *Procedia Computer Science*, 2017, 104:445-451.
- [6] Zhao C. Application of Virtual Reality and Artificial Intelligence Technology in Fitness Clubs. *Mathematical Problems in Engineering*, 2021, 2021(1):2446413.
- [7] Ren Y, Li J. The Conception of Application of Computer Virtual Reality Technology in Sports Training. *Journal of Physics: Conference Series*, 2021, 1861(1):012110.
- [8] Zhong J, Xu J. Taekwondo Action Design Combining CAD and Virtual Reality Technology. *Computer-Aided Design and Applications*, 2021, 19(S5):132-142.
- [9] Khan I U, Rahman G, Hamid A. Poststructuralist Perspectives on Language and Identity: Implications for English Language Teaching Research in Pakistan. *Sir Syed Journal of Education & Social Research (SJESR)*, 2021, 4(1): 257-267.
- [10] Yadav M K, Yadav M S. A Theoretical Overview on the Impacts and Strategies of Morphology in English Language Teaching to the L2 Learners. *International Journal of Research*, 2021, 8(3):311-331.
- [11] Maples-Keller J L, Bunnell B E, Kim S J. The Use of Virtual Reality Technology in the Treatment of Anxiety and Other Psychiatric Disorders. *Harvard Review of Psychiatry*, 2017, 25(3):103-113.
- [12] Hughes, Sally, Warren-Norton. Supporting Optimal Aging through the Innovative Use of Virtual Reality Technology. *Multimodal Technologies and Interaction*, 2017, 1(4):23.
- [13] Li J, Hou T. Application of Virtual Reality Technology in Analysis of the Three-Dimensional Evaluation System of Rural Landscape Planning. *Mathematical Problems in Engineering*, 2021, 2021(5):1-16.
- [14] Lu X, Tang Q, Jiang M. Automated robot trajectory planning for double-layer spray painting based on genetic algorithm. *Computer Integrated Manufacturing Systems, CIMS*, 2018, 24(9):2157-2167.
- [15] Li X, Zhou S, Yang L. A New Fast Factorized Back-Projection Algorithm with Reduced Topography Sensibility for Missile-Borne SAR Focusing with Diving Movement. *Remote Sensing*, 2020, 12(16): 2616.
- [16] Su W. How to Use Modern Teaching Methods to Improve English Chinese Translation Ability. *Open Access Library Journal*, 2021, 8(12):6.
- [17] Gu S, Li X. Optimization of Computer-Aided English Translation Teaching Based on Network Teaching Platform. *Computer-Aided Design and Applications*, 2021, 19(S1):151-160.
- [18] Zhang Y. Design and curriculum optimization of college english teaching model based on esp. *International Journal for Engineering Modelling*, 2018, 31(1):359-364.

- [19] Cao P. An optimization analysis of business English curriculum design based on motivation theory. *Revista de la Facultad de Ingenieria*, 2017, 32(12):226-232.
- [20] Elsa E, Anwar K. The Perception of Using Technology Canva Application as a Media for English Teacher Creating Media Virtual Teaching and English Learning in Loei Thailand. *Journal of English Teaching Literature and Applied Linguistics*, 2021, 5(1):62-69.
- [21] Chen C C. Restorying a "Newbie" Teacher's 3D Virtual Teaching Trajectory, Resilience, and Professional Development through Action Research: A Narrative Case Study. *TESOL Quarterly*, 2020, 54(2):375-403.
- [22] Wang S, Zhang H, Meng X. Design of Video Teaching System Based on Virtual Reality Technology. *Electronics Science Technology and Application*, 2021, 7(4):72.
- [23] Meng N. Application of intelligent virtual reality technology in Clothing virtual wear and color saturation after COVID-19 epidemic situation. *Journal of Intelligent and Fuzzy Systems*, 2020, 39(4):1-9.