

An Intervention Study on the Development of University English Oral Fluency Enabled by the Virtual World in the Context of Digital Transformation of Education

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Abstract: This study explores the construction of virtual worlds in university education and their integration with English oral language classes. From a university, 105 sophomore students were selected and divided into a control group and an experimental group for a teaching intervention experiment. The experiment focused on students' English oral fluency and used the independent sample T-test method to verify the effectiveness of virtual teaching in improving students' time-related and expressive indicators. The study found that after 10 weeks of intervention, students in the experimental group showed varying degrees of improvement compared to the control group, and the improvement was significant. The English oral language virtual world built with VR technology can enhance the learning interest of university students and significantly improve the teaching effect.

Keywords: English oral language; Virtual world; Independent sample test; Oral fluency

1. Introduction

The oral language teaching module in university English teaching has always been a teaching pain point for teachers and students. Due to the limited classroom time, the large number of students, and the relatively few opportunities for teachers to have one-on-one oral conversations with students, it is impossible to provide precise guidance and correction for students' problems in oral language expression. Teachers can only hope that students practice oral language with their classmates after class, but the quality and time of such practice cannot be guaranteed [1-2]. In recent years, with the deepening of educational digital transformation and the rapid development of AI technology, the intervention of virtual worlds to promote the development of university English oral fluency has become an important way to address these challenges.

The virtual world is a virtual environment generated based on technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR). It is simulated by computers and enables users to immerse themselves in the situation through various sensing devices, allowing users to interact with the environment. It is centered around computers and has a higher sense of reality than traditional multimedia technologies, capable of breaking through limited space and time to construct a real learning environment [3-6]. In the development of university English oral fluency, the virtual world enables students to have conversations with virtual characters in a virtual environment to achieve the purpose of language training [7-8]. For example, in the teaching of the tourism chapter, students can go to English-speaking countries such as the United States and the United Kingdom through the virtual environment and communicate with standard oral virtual characters to understand local pronunciation, slang, and local customs and traditions. Secondly, the virtual world can also provide personalized learning environments. Since students' English proficiency and learning needs vary, traditional one-to-many teaching is difficult to meet the needs of all students. With the empowerment of the virtual world, personalized learning plans can be formulated based on students' levels and goals [9]. The virtual teacher in the virtual world can



provide immediate feedback based on students' performance and adjust the teaching content and difficulty according to students' needs. Thus, students can study more targetedly and improve their oral English fluency [10-12].

Regarding the research on the empowerment of university English oral fluency development by virtual worlds, literature [13] aims to discuss students' views on the effectiveness of virtual classrooms in improving their communication skills. Through a survey of female students majoring in English, the results show that the main challenges in English communication are a lack of confidence, fear of making mistakes, and insufficient vocabulary, emphasizing that virtual classrooms play an important role in promoting students' communication skills. Literature [14] explores the impact of VR tools on the communication willingness and oral language ability of English as a foreign language learners. Through experiments, it is shown that VR tools can effectively improve students' oral language ability, learning motivation, enthusiasm, cultural awareness, and self-confidence. Literature [15] uses VR technology as the entry point to study the current situation of oral teaching in universities and proposes the concept of using VR technology for oral teaching in the classroom. Literature [16] examines the impact of integrating immersive VR technology into project-based learning (PjBL) teaching scenarios on students' oral English ability and participation, and the comparative experiment shows that combining iVR with PjBL is of great significance for providing an immersive environment for language learners to achieve contextualized learning. Literature [17] analyzes the application of VR technology in oral communication teaching of English as a second language. With the advantages of immersion and interactivity, VR technology has played an important role in reducing students' anxiety, enhancing motivation, boosting confidence, and promoting communication willingness. Literature [18] elaborates on the application of VR technology in university English oral teaching, stating that the integration of information technology with teaching models has broken through the limitations of traditional teaching models and discusses the significance of information technology in university English oral teaching, emphasizing its profound impact on teaching. Reference [19] explored the possible effects of anonymity in virtual world interactions on participants with different emotional characteristics. The results indicated that there was a close relationship between self-efficacy and the anonymous effect experienced by students, but no correlation was found between the participants' foreign language proficiency or personality traits and the anonymity they gained in the virtual world. Reference [20] analyzed the participation, motivation, and autonomous learning levels of English as a second language learners in courses integrated with VR, emphasizing that VR can provide a realistic life experience, enhancing participation and promoting the improvement of communication skills. Reference [21] proposed the theoretical basis for applying VR technology to university oral English teaching, analyzed the characteristics, advantages, and disadvantages of VR technology in teaching, and put forward suggestions for the current application of VR technology in classroom oral English teaching. Reference [22] discussed the impact of using open social VR in the cross-cultural communication learning of foreign language learners in university English. The study found that learners held a positive attitude towards the social and physical presence sense provided by the VR environment. Reference [23] introduced VR technology into oral expression practice in universities, aiming to provide students with immersive and low-pressure opportunities for speech rehearsal, emphasizing that VR helps to enhance students' self-confidence and better support their preparation.

In addition, Reference [24] designed a VR-based remote learning system for spoken English and verified that students' enthusiasm for learning spoken English significantly increased after using the system. Reference [25] pointed out that there are few studies exploring whether VR can be an effective and reliable medium for assessing second language oral proficiency, aiming to fill this gap by examining to what extent VR-based group oral tests can serve as a feasible alternative to traditional face-to-face assessment. Reference [26] analyzed the key role of immersive 360-degree videos in the "professional communication English" course in enhancing oral communication skills and the perceived advantages, and the research results can provide reference for government decision-making and help improve educational quality. Reference [27] aims to explore the promoting principles that facilitate the improvement of oral proficiency in situational awareness-based learning projects based on AR, providing practical promoting principles and theoretical frameworks for achieving the best practices of oral communication through AR. Reference [28] discussed the impact of collaborative VR (CVR) teaching on the oral communication skills of English as a foreign language learners with agoraphobia, and the research results showed that CVR teaching significantly improved students' verbal and non-verbal communication skills, but no significant improvement was observed in non-verbal skills. Reference [29] conducted an English course using VR technology, aiming to enhance students' oral expression ability, emphasizing that VR technology helps students improve their oral ability by expanding academic vocabulary, improving pronunciation, enhancing fluency, and adjusting grammar. Reference [30] aimed to investigate the application of VR technology in English oral teaching and its promotion effect on

students' oral expression ability, and through a comparative experiment, it was pointed out that VR technology effectively improved students' oral fluency, pronunciation accuracy, and pragmatic ability, especially the frequency of pragmatic errors in cross-cultural contexts decreased significantly. Reference [31] explored the potential application of high-immersion VR (HiVR) in dealing with foreign language oral anxiety (FLSA), conducting a comparative experiment with Chinese English major students, emphasizing that HiVR provides students with a real and interesting teaching environment and learning activities, stimulating their learning interest; however, the use of virtual characters in HiVR sometimes becomes a communication barrier. Reference [32] investigated the impact of contextualized learning based on VR technology on learners' English oral performance. The analysis results indicated that the authenticity of the teaching context and the collaborative nature of the tasks jointly contributed to a comprehensive learning experience that was highly consistent with the principles of contextualized learning. Reference [33] analyzed the influence of immersive VR learning environments on college students' English oral learning. The survey results pointed out that immersive VR is conducive to improving students' classroom participation, oral accuracy, oral efficacy, and reducing anxiety. These studies systematically expounded the application of VR and related technologies in university English oral teaching, revealing that the virtual world has played an important role in enhancing students' participation, English oral ability, and the development of oral fluency. However, most of the current research focuses on the application of VR technology, while the application research of AR and MR related technologies is relatively lacking.

This paper analyzes the enabling effect of virtual technology on university English oral education in the context of educational digital transformation. It designs the implementation of key vocabulary, core phrase explanations, and daily communication oral language in the virtual world, and constructs the steps of English oral virtual teaching through four major steps. The virtual teaching model is built using Krashen's monitoring theory, and a sample of sophomore students from a certain university is selected as the research subject. Experimental classes and control classes are set up, and teaching intervention experiments are designed and implemented. For the measurement of English oral fluency, eight time-related indicators and expressive indicators are adopted, and the research purpose is verified through statistical analysis.

2. Construction of a Virtual World for College English Oral Language Teaching

2.1. Design Content of the Virtual World

2.1.1. Design of Key Vocabulary and Core Phrase Explanations

In this design stage, the VR technology is utilized for the voice input design of key vocabulary and core phrases. The original audio files are pre-recorded by professional English oral teachers, and the voices are imported into the virtual scene in units. Through the VR technology, the university English vocabulary is designed. This technology provides a three-dimensional voice function, embedding the voice directly into the virtual scene [34-35]. For the scenes in the virtual scene, pronunciation, Chinese translation and example sentence explanations related to the vocabulary are provided. Students repeat and imitate after playing the audio, until they master it. Compared with traditional English teaching courseware, students have more free conditions and space. With the example sentence explanations, the students' mastery is more considerable. Through specific classroom implementation, students' mastery of vocabulary has greatly improved, and they are less likely to forget. Most importantly, when facing the vocabulary judgment types in the college entrance examination, they can handle it with ease. The vocabulary explanation design not only helps to improve students' English grades, but also cultivates students' autonomy and confidence in learning English.

2.1.2. Design of Oral Language Learning Resources for Daily Communication

Daily communication is a good starting point for learning spoken English. Through the practice of daily communication, students can gradually develop their English habits and oral English skills, which reflects the value of English as a language for daily communication. The design process of virtual teaching resources for spoken English is shown in Figure 1. By pre-designed VR conversation scenarios combined with daily communication voice files, students can experience it themselves, immerse themselves in the VR scenarios, and more realistically experience the daily oral expression situations, and have a deeper understanding and more proficient application of the daily oral conversation content. The design of oral conversation scenarios is not only for improving oral English expression, but also for cultivating students' comprehension and integration of the cultural connotations of English. Through VR technology, learners can be provided with rich oral learning resources, enabling them to experience

different teaching styles more, and to truly and intuitively feel the English culture, expand their horizons and integrate with the international community, and achieve understanding and practical application of oral learning.

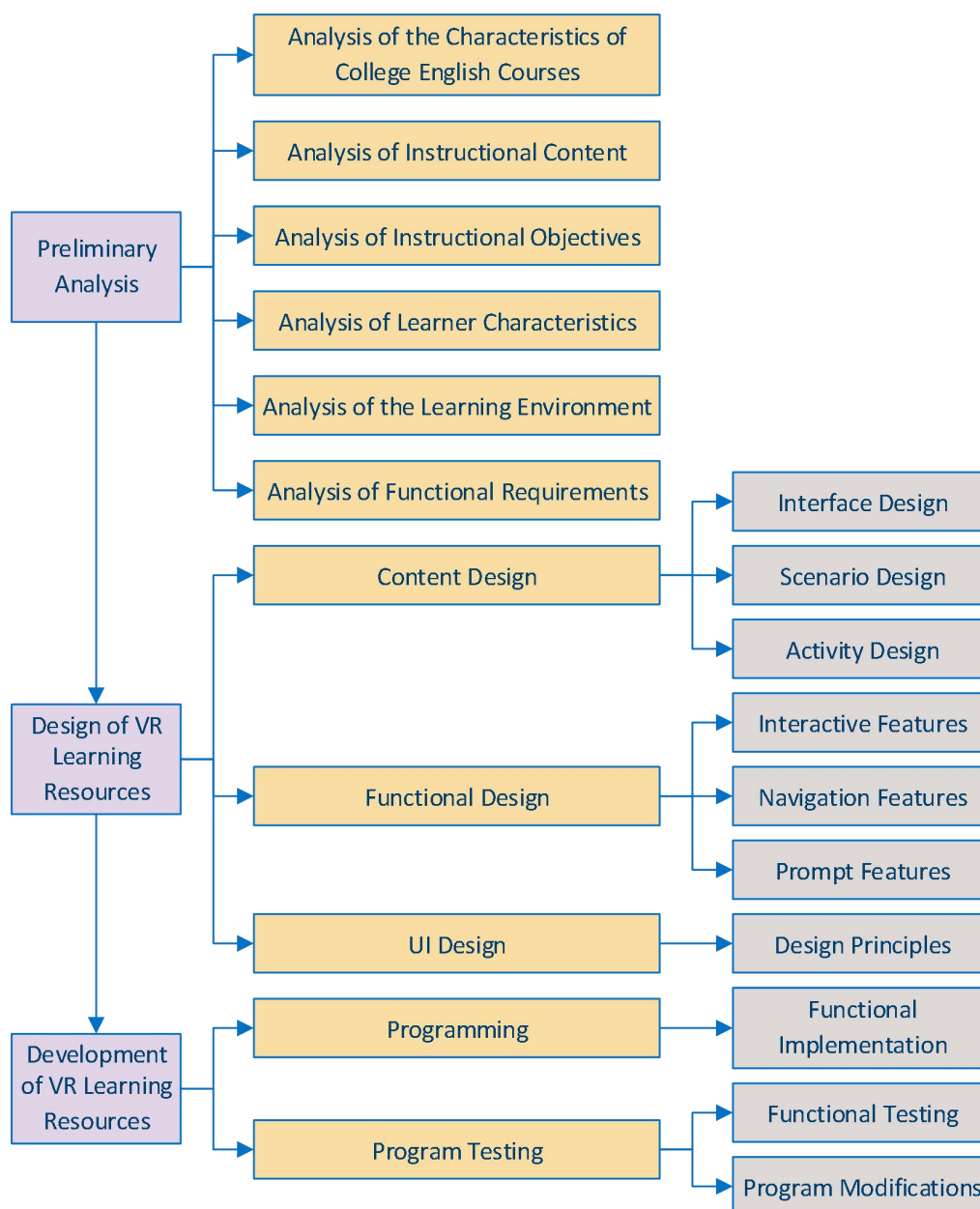


Figure 1. Design Process of Virtual Teaching Resources for English Speaking

2.2. Design Steps

In order to help students adapt to the new teaching methods, the instructors need to integrate teaching resources with the new teaching approaches and gradually guide students to engage in autonomous learning. The design steps are summarized as follows:

(1) Presenting the problem

In each class, the teacher should make students understand the learning objectives. The learning objectives should be designed as thought-provoking questions and presented to the students, allowing them to conduct autonomous learning and cooperative exploration with these questions. The thought-provoking questions designed by the teacher must reflect the key points and difficult areas of the textbook, contain main knowledge, have certain depth and hierarchy, be able to arouse students' interest in exploration, enhance their learning ability, and also meet the learning needs of students of different levels.

(2) Cooperative exploration

This part needs to be carried out in the classroom. The teacher should set a time limit and provide

guidance while circulating around the class, as well as record the problems students encounter and the students who have problems. This is an important part of teaching. During the exploration, the teacher's circulating participation can not only reveal students' unique learning and innovative solutions to problems, but also see different-level students expressing their opinions, deepening their understanding and thinking of the problems, and preparing for the next step of guiding students to think about the problems and answering their doubts. This part is the key to the success of the teacher's teaching in this class, which requires the instructor to frequently patrol and participate in group discussions, grasping the students' understanding of the problems.

(3) Solving doubts

This part should be carried out in conjunction with the students' presentation and evaluation. The teacher should provide a key point summary and precise guidance. The teacher should comment on the students' presentations, affirm the correct ones while also pointing out the existing problems. For students' unclear questions, accurate answers should be given, and the existing problems should be explained by summarizing the thinking methods, skills, rules, and precautions. After the explanation, the teacher must require students to write an analysis of the reasons for the mistakes and insights on correcting them, allowing them to grow through reflection and improve through error correction.

(4) Consolidation and improvement

The teacher should carefully design the assessment questions, which should be precise and typical to ensure the assessment effect. After students practice, the teacher should provide timely feedback and correction based on the grading, re-explaining and emphasizing the existing problems, striving to achieve the effect of enabling students to apply the problems in a general way and draw analogies from similar cases.

2.3. Implementation of Oral Dialogue Scenarios

The main obstacle for college students in their English oral language learning process is the limitation of the language environment. When teachers give lessons in English, students cannot keep up with the pace. Some students with weak foundations still remain confused even if the teacher uses bilingual teaching. Over time, they lose interest in learning. In a virtual scenario, by changing the scene, embedding oral language demonstration and pronunciation in appropriate time and scene, it can not only attract students' attention but also stimulate them to speak English, even just repeating after the sound. Long-term accumulation of oral expression can improve students' language application ability to a certain extent. VR technology can create spatial voice effects. Such sounds have their own sound sources and can simulate the sound transmission method in reality, giving students a realistic listening experience.

In the virtual reality modeling language, Audio Clip, Movie Texture and Sound nodes can be used to add sound nodes. Audio Clip and Movie Texture are used to create sound sources, and Sound is used to specify the playback method of the sound. The virtual reality modeling language supports WAV, MIDI and MPEG-1 sound files.

3. English oral language teaching model and intervention design based on the virtual world

3.1. Construction of the Virtual Teaching Model for English Oral Language

The English oral language teaching model based on virtual reality technology is guided by Krashen's monitoring theory [36]. This teaching model combines the simulated physical environment, cross-cultural environment and emotional environment. It achieves a new kind of heuristic and immersive English oral language teaching through situational communication activities and specific learning tasks. The English oral language teaching model based on virtual reality technology is shown in Figure 2. According to this teaching model, the teaching of oral language courses will be divided into two forms: online and offline. The specific teaching process is divided into the following six stages.

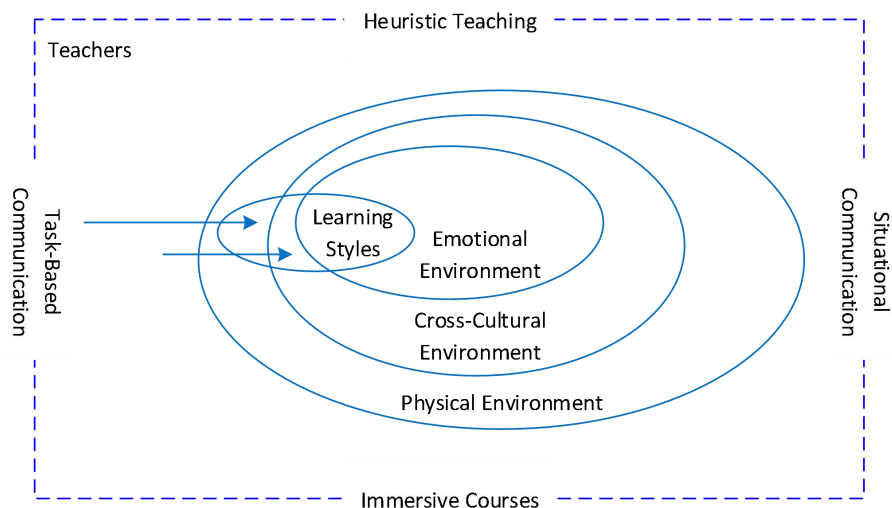


Figure 2. An English Speaking Teaching Model Based on Virtual Reality Technology

(1) Pre-class Preparation

Teachers design representative tasks based on the teaching content and provide relevant materials (such as MOOCs, micro-lectures) to demonstrate the communicative scenarios in the textbook and embed heuristic communication strategies. Students engage in online pre-study to get involved in the course in advance. Teachers also design in-class tests covering the knowledge points and predict and arrange classroom activities.

(2) Autonomous Learning

During this stage, students have ample time to prepare for the classroom presentation and can choose group members independently. Students enhance their skills by consulting materials, collaborate with group members to exchange results, and improve their communication skills. Adjustments to personalized learning plans can avoid repetitive learning and improve classroom efficiency.

(3) In-class Test Stage

Before the classroom presentation, tests are conducted to assess students' mastery of the learning content, ensuring they have a preliminary understanding of the teaching content and motivating students to actively communicate. Thus, most of the class time can be used for presentations, encouraging students to apply the knowledge in simulation activities. Teachers can understand the learning gaps through test results and promptly adjust teaching strategies.

(4) Classroom Presentation Stage

In the virtual simulation language laboratory, teachers and students wear virtual reality devices for the presentation. Students present in groups based on the pre-class preparation, and the teacher connects the knowledge points through interaction to promote knowledge understanding and internalization.

(5) Summary and Evaluation Stage

After the presentation, students conduct self-evaluation and mutual evaluation. The teacher assesses from aspects such as language expression, group synergy, and performance, and provides detailed guidance to optimize oral skills and expression abilities.

(6) Teaching Reflection Stage

After the class, teachers reflect and summarize the teaching process, promptly solve problems, and optimize subsequent teaching. The structured process ensures the comprehensive integration and optimization of teaching resources, which is conducive to improving teaching effectiveness and learning experience. At the same time, by evaluating students' completion of course resources, the actual effect of the teaching model can be accurately evaluated, and scientific basis for further improvement can be provided.

3.2. Design of Virtual English Oral Language Teaching Intervention Experiment

3.2.1. Objectives of the Intervention Experiment

This experiment was conducted to examine the impact of English oral learning activities based on the virtual world on students' learning outcomes, particularly their oral fluency. A control group and an experimental group were set up respectively. The English oral fluency levels of the two groups were

compared through test papers, thereby verifying whether the construction of the virtual world could be effectively applied in university English classes.

3.2.2. Intervention Subjects

This experiment selected two classes from a certain university's sophomore year, involving a total of 105 students. Both classes were taught by the same English teacher, and the students had already mastered a certain amount of English knowledge and computer operation skills before the experiment. Among them, Class A was the control group, consisting of 52 students; Class B was the experimental group, consisting of 53 students.

3.2.3. Intervention Experimental Variables

Independent variable: The virtual reality technology used in English oral language teaching. The experimental class adopted learning activities based on the construction of a virtual world, while the control class adopted traditional teaching activities.

Dependent variable: The fluency of students' English oral language after learning.

Control variables: The duration of teaching, the teacher, the teaching content, the prior knowledge of the students were the same. The gender ratio was close. The same questionnaire and interview questions were used.

3.2.4. Measurement Indicators

This study aimed to explore the impact of English oral learning activities based on the virtual world on college students' learning. Different types of tests, questionnaires, and interview questions were designed.

This article uses two categories of indicators - temporal indicators and expressive indicators - totaling 8 indicators to examine the second language oral fluency of learners. Among these indicators, pauses are an indispensable keyword for quantitative research on fluency. Pauses are basically divided into two types: full pauses and silent pauses. After resolving the issue of defining pauses, the following will list each temporal indicator and its calculation method:

(1) Speech rate (SRa): The number of syllables produced per minute. It refers to the ratio of the total number of syllables in a speech sample to the total time required to produce the speech sample. The speech sample includes pronunciation time and pause time.

Calculation formula: $\text{Speech rate} = \text{Total number of syllables in the speech sample} / \text{Total time of the speech sample} \times 60$

(2) Pronunciation speed (PSe): It refers to the average number of syllables produced per second by the test subject in a speech sample. It is expressed as the ratio of the total number of syllables in the speech sample to the pronunciation time of the speech sample. The pronunciation time of the speech sample does not include pause time.

Calculation formula: $\text{Pronunciation speed} = \text{Total number of syllables in the speech sample} / \text{Pronunciation time}$

(3) Pronunciation time ratio (PTRa): It refers to the ratio of the total pronunciation time (excluding pause time) in a speech sample to the total time required to produce the speech sample.

Calculation formula: $\text{Pronunciation time ratio} = \text{Total pronunciation time (excluding pause time)} / \text{Total time required for the speech sample}$

(4) Average speech flow length (AULe): It refers to the average length of the speech flow between each two pauses that reach or exceed 0.22 seconds in a speech sample.

Calculation formula: $\text{Average speech flow length} = \text{Total number of syllables in the speech sample} / \text{Number of speech segments}$

(5) Average pause duration (APDu): It refers to the average length of pauses that reach or exceed 0.22 seconds in a speech sample. It is expressed as the ratio of the total pause time in the speech sample to the total number of pauses (excluding the initial and final pauses).

Calculation formula: $\text{Average pause duration} = \text{Total pause time in the speech sample} / \text{Total number of pauses (excluding the initial and final)}$

When speakers are worried about making mistakes, to ensure the correctness of language expression, they usually overuse monitoring strategies, resulting in phenomena such as paraphrasing and repetition. From the listener's perspective, the language expression of the speaker will affect the listener's judgment of their fluency. Therefore, those phenomena involving non-fluent aspects in speech output can be quantified as indicators and together with temporal indicators, they can be used as measurement standards to examine the learners' oral fluency.

At the same time, expressive indicators are used to examine the load of learners when processing a

second language. Specifically, these indicators manifest as some hesitation features in oral output. These features include full pauses, repetition, and correction. This study selects three indicators as expressive indicators, and these three are also the causes of non-fluent phenomena in oral language. The total number of non-fluent occurrences is the total number of full pauses, repetitions, and corrections.

(1) Frequency of full pauses per hundred syllables (FPPHS): It is expressed as the number of full pauses per hundred syllables. Full pauses include intonation words such as "um" and "ah".

Calculation formula: Frequency of full pauses per hundred syllables = Number of full pauses / Total number of syllables $\times 100$

(2) Frequency of repetitions per hundred syllables (RPHS): It is expressed as the number of repetitions per hundred syllables. Specifically, it refers to the frequency of speech that repeatedly appears without syntactic and semantic functions per hundred syllables.

Calculation formula: Frequency of repetitions per hundred syllables = Number of repetitions / Total number of syllables $\times 100$

(3) Frequency of corrections per hundred syllables (CPHS): It is expressed as the number of corrections per hundred syllables. Correction refers to the process where, after the language is produced, the speaker makes modifications to the output language through self-monitoring of their speech.

Calculation formula: Number of corrections per hundred syllables = Number of corrections / Total number of syllables $\times 10$

3.2.5. Experimental Procedure

This intervention experiment study lasted for a total of 10 weeks. The experimental group and the control group both underwent the same pre-tests and questionnaires to assess the English oral fluency of college students. Before starting the learning activities, the students in the experimental group needed to learn the routine operation of the VR software. After the intervention experiment activities ended, a post-test and questionnaire were conducted on both the experimental group and the control group in the 10th week to understand the differences in the changes of students' English oral fluency.

4. Results of Virtual English Oral Language Teaching

After a semester of teaching experiments, specific temporal indicators of fluency were obtained through two consecutive oral tests. Then, a paired sample t-test will be conducted based on the fluency indicators of the two oral tests for a detailed analysis.

4.1. Pre-test Analysis Before the Experiment

4.1.1. Comparison of Time-related Indicators

The pre-test was conducted before the teaching experiment, with the test subjects being the students of the experimental class and the control class. The purpose was to test the English oral fluency of the students in the experimental class and the control class before the experiment, to verify whether the English oral fluency of the students in the two classes was similar, and whether the English oral fluency could be compared. The independent sample T test was carried out using SPSS25.0, and the pre-test results of the time-related indicators are shown in Figure 3. The independent sample T test results are presented in Table 1, where Eva and Evna represent the assumed equal variance and the non-assumed equal variance, Sig.(2) represents the two-sided significance, MD represents the mean difference, Low and Upp represent the upper and lower limits of the 95% confidence interval of the difference. Before the experiment:

In terms of English oral speech speed, the average score of the control class was 2.368, and that of the experimental class was 2.345. According to the independent sample T test data, the mean difference was 0.023, and the score of the experimental class was less than the average score of the control class. The accompanying probability was 0.702, which was greater than the significance level of 0.05, and the variance was homogeneous. Taking the data when the variance was equal in the first row, the accompanying probability of the T statistic was 0.247, which was greater than the significance level of 0.05. Therefore, it can be considered that in terms of speech speed, there was no significant difference between the experimental class and the control class, that is, the levels of the two classes were similar.

In terms of English oral speech speed, the average score of the control class was 2.337, and that of the experimental class was 2.378. According to the independent sample T test data, the mean difference was -0.041, and the score of the experimental class was greater than the average score of the control class. The accompanying probability was 0.951, which was greater than the significance level of 0.05, and the variance was homogeneous. Taking the data when the variance was equal in the first row, the

accompanying probability of the T statistic was 0.309, which was greater than the significance level of 0.05. Therefore, it can be considered that in terms of speech speed, there was no significant difference between the experimental class and the control class, that is, the levels of the two classes were similar.

In terms of English oral speech time ratio, the average score of the control class was 2.426, and that of the experimental class was 2.478. According to the independent sample T test data, the mean difference was -0.052, and the score of the experimental class was less than the average score of the control class. The accompanying probability was 0.654, which was greater than the significance level of 0.05, and the variance was homogeneous. Taking the data when the variance was equal in the first row, the accompanying probability of the T statistic was 0.266, which was greater than the significance level of 0.05. Therefore, it can be considered that in terms of speech time ratio, there was no significant difference between the experimental class and the control class, that is, the levels of the two classes were similar.

Similarly, for the remaining two indicators of average speech length and average pause duration in the time-related indicators, the accompanying probabilities of the T statistics are all greater than 0.05. The levels of the two classes were similar before the experiment.

In conclusion, in the five levels of English oral fluency, the scores of the experimental class and the control class were similar and there was no significant difference. Therefore, the two classes can be used as parallel classes for experimental comparison.

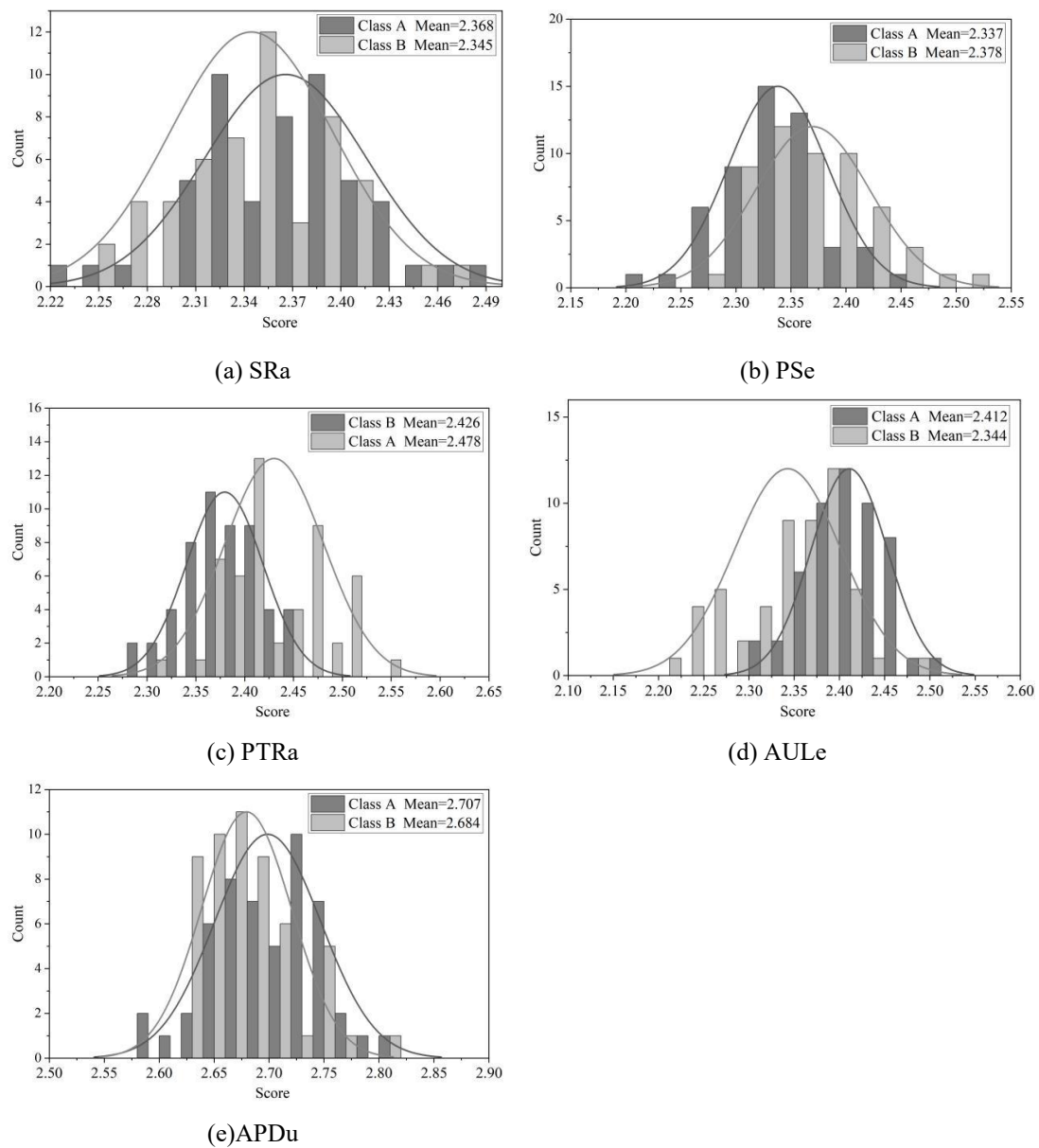


Figure 3. The pre-test results of the temporal indicators

Table 1. Independent sample T-test results

		Levene test		T-test of the mean equation					
		F	Sig.	t	Sig.(2)	MD	STD	Low	Upp
SRa	Eva	0.784	0.702	1.807	0.247	0.023	0.0513	-0.215	0.168
	Evna	-	-	1.495	0.254		0.0404	-0.223	0.158
PSe	Eva	2.651	0.951	1.785	0.309	-0.041	0.0217	-0.249	0.143
	Evna	-	-	1.162	0.384		0.0824	-0.21	0.053
PTRa	Eva	1.054	0.654	1.531	0.266	-0.052	0.0113	-0.214	0.261
	Evna	-	-	1.663	0.133		0.0434	-0.222	0.154
AULc	Eva	1.233	0.707	1.805	0.141	0.068	0.0774	-0.198	0.124
	Evna	-	-	1.325	0.314		0.0091	-0.21	0.226
APDu	Eva	0.555	0.716	1.222	0.269	0.023	0.0807	-0.23	0.232
	Evna	-	-	1.119	0.387		0.0568	-0.195	0.186

4.1.2. Comparative Analysis of Expressive Indicators

In order to verify whether there are differences in the expressive indicators of the students' English oral fluency between the experimental class and the control class, this study imported the scores of the expressive indicators of the students' English oral fluency from both classes into SPSS 25.0 for an independent sample T-test. The pre-test results of the expressive indicators are shown in Figure 4, and the results of the independent sample T-test are presented in Table 2. The mean number of full pauses per hundred syllables in the control class and the experimental class were 2.503 and 2.516 respectively. The significance value of the independent sample T-test was 0.179, which was greater than 0.05. The levels of the two classes were similar. Additionally, the number of repetitions per hundred syllables and the number of corrections per hundred syllables also showed no significant difference in the independent sample T-test. The expressive indicators of the pre-test English oral fluency of the two classes remained basically consistent before the experiment.

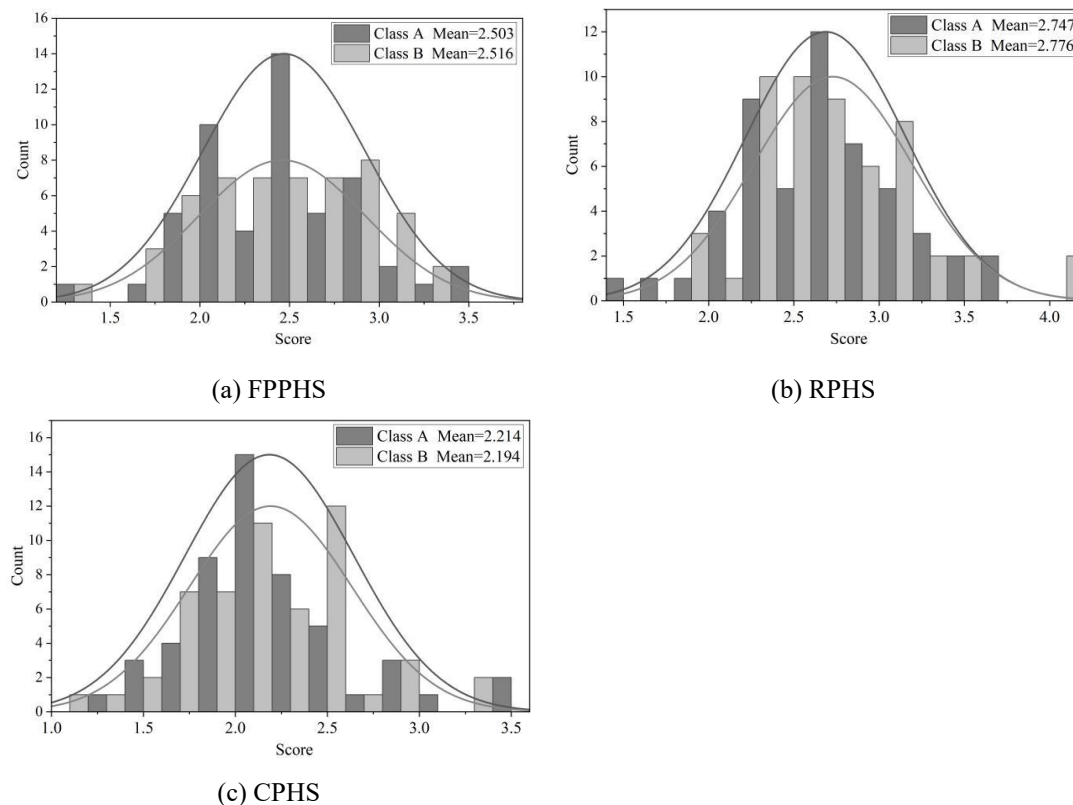


Figure 4. The pre-test results of the expressive indicators

Table 2. Independent sample T-test results

		Levene test		T-test of the mean equation					
		F	Sig.	t	Sig.(2)	MD	STD	Low	Upp
FPPHS	Eva	1.482	0.553	-1.504	0.179	-0.013	0.0176	-0.14	0.008
	Evna	1.027	0.413	-1.93			0.019	-0.28	0.095
RPHS	Eva	0.541	0.307	-1.241	0.204	-0.029	0.0103	-0.188	0.072
	Evna	1.127	0.78	-1.191			0.0162	-0.276	0.03
CPHS	Eva	0.507	0.286	1.804	0.229	0.020	0.0172	-0.172	0.038
	Evna	1.409	0.398	1.717			0.0048	-0.163	0.189

4.2. Post-experiment Analysis

4.2.1. Comparison of Time-related Indicators

This test was conducted after a 10-week virtual world English oral communication teaching experiment. The test subjects were the students of the experimental class and the control class. The purpose was to assess the level of English oral fluency of the students in the two classes after the experiment, in order to compare their scores with those before the experiment and to examine the specific effect of the teaching experiment. The students' score data were input into SPSS25.0 for independent sample T test. The statistics of the two classes after the intervention experiment are shown in Table 3, and the independent sample test is shown in Table 4. After the experiment:

In terms of English oral speaking speed, the average score of the control class was 2.619, and that of the experimental class was 2.990. According to the independent sample T test data, the mean difference was -0.371. The score of the experimental class was higher than that of the control class, and the accompanying probability was 0.094, which was greater than the significance level of 0.05. The variance was homogeneous. When the variance was equal in the first row, the data were taken, and the accompanying probability of the T statistic was 0.000, which was less than the significance level of 0.05. Therefore, it can be concluded that in terms of English oral speaking speed, there was a significant difference in the scores between the experimental class and the control class.

In terms of English oral pronunciation speed, the average score of the control class was 2.441, and that of the experimental class was 3.066. According to the independent sample T test data, the mean difference was -0.625. The score of the experimental class was higher than that of the control class, and the accompanying probability was 0.122, which was greater than the significance level of 0.05. The variance was homogeneous. When the variance was equal in the first row, the data were taken, and the accompanying probability of the T statistic was 0.000, which was less than the significance level of 0.05. Therefore, it can be concluded that in terms of English oral pronunciation speed, there was a significant difference in the scores between the experimental class and the control class.

Similarly, the experimental class students' pronunciation time ratio, average speech length, and average duration of pauses compared with the control class all achieved more significant differences. In the five levels of English oral fluency, the experimental class scored higher than the control class, and the differences were significant. It can be concluded that the teaching method based on the virtual world has a positive effect on university English oral communication, can improve students' fluency, help students appropriately express their emotions and attitudes, and improve their pragmatic ability.

Table 3. Statistical data of the two classes in the intervention experiment

Indicators	Group	N	Mean	SD	Standard error of the mean
SRa	Class A	52	2.619	0.61	0.079
	Class B	53	2.990	0.682	0.145
PSe	Class A	52	2.441	0.657	0.125
	Class B	53	3.066	0.917	0.134
PTRa	Class A	52	2.601	0.686	0.15
	Class B	53	2.976	0.768	0.069
AULe	Class A	52	2.465	0.902	0.123
	Class B	53	2.704	0.801	0.074
APDu	Class A	52	2.863	0.565	0.158
	Class B	53	3.332	0.89	0.053

Table 4. Independent sample test

		Levene test		T-test of the mean equation					
		F	Sig.	t	Sig.(2)	MD	STD	Low	Upp
SRa	Eva	2.473	0.094	-6.107	0.000	-0.371	0.1153	-0.285	-0.263
	Evna	2.315	-	-5.738			0.2658	-0.397	-0.179
PSe	Eva	2.461	0.122	-4.216	0.000	-0.625	0.2628	-0.968	-0.854
	Evna	4.436	-	-6.626			0.2172	-0.295	0.061
PTRa	Eva	3.426	0.075	-4.131	0.000	-0.375	0.2712	-0.58	-0.24
	Evna	2.884	-	-6.837			0.2333	-0.416	-0.201
AULe	Eva	2.881	0.118	-6.396	0.000	-0.239	0.1457	-0.406	-0.253
	Evna	3.959	-	-6.302			0.2153	-0.444	-0.091
APDu	Eva	4.094	0.105	-4.195	0.000	-0.469	0.159	-0.463	-0.177
	Evna	3.753	-	-4.407			0.1955	-0.405	-0.306

4.2.2. Comparative Analysis of Expressiveness Indicators

In order to verify that the students in the experimental class showed an improvement in the indicators of oral fluency and expressiveness after implementing the English teaching method based on the virtual world compared to the students in the control class, this study conducted a paired sample T-test on the oral fluency and expressiveness indicators of the two classes. The statistical results after the intervention experiment are shown in Table 5, and the independent sample test results are shown in Table 6. The difference in the average number of full pauses per hundred syllables between the post-test English oral performance of the control class and the post-test score of the experimental class after the intervention is -0.629. This means that after the implementation of the teaching method based on the virtual world, the average post-test score of the English oral performance of the students in the experimental class is 0.629 points higher than that of the control class, and the significance of the difference is 0.000, which is less than 0.05, indicating that the difference in the post-test scores of full pauses per hundred syllables between the experimental class and the control class is significant. From the perspective of the number of repetitions per hundred syllables and the number of corrections per hundred syllables, the experimental class also has a significant advantage over the control class.

Table 5. Statistical data of the two classes after the intervention experiment

Indicators	Group	N	Mean	SD	Standard error of the mean
SRa	Class A	52	2.692	0.423	0.111
	Class B	53	3.145	0.476	0.048
PSe	Class A	52	2.952	0.473	0.053
	Class B	53	3.078	0.378	0.061
PTRa	Class A	52	2.386	0.385	0.067
	Class B	53	2.723	0.383	0.051

Table 6. Independent sample test

		Levene test		T-test of the mean equation					
		F	Sig.	t	Sig.(2)	MD	STD	Low	Upp
SRa	Eva	3.417	0.054	-3.694	0.000	-0.629	0.158	-0.428	-0.221
	Evna	2.954	0.122	-2.751			0.112	-0.56	-0.062
PSe	Eva	4.149	0.107	-3.158	0.000	-0.302	0.083	-0.421	-0.152
	Evna	3.695	0.112	-3.517			0.21	-0.634	-0.138
PTRa	Eva	2.540	0.097	-3.127	0.000	-0.529	0.181	-0.46	-0.042
	Evna	4.150	0.120	-3.894			0.148	-0.491	-0.21

5. Conclusion

This article focuses on the integration application of the virtual world and English oral communication. Through the design of virtual teaching content and teaching methods, a virtual teaching intervention experimental process is created. The teaching effect is verified through empirical research and statistical analysis. Before the experiment, the analysis of the pre-test confirmed that the experimental class and the control class were basically similar in terms of English oral fluency. After 10 weeks of intervention, the experimental class had significantly improved in all indicators compared to the control class. Under independent sample T-test, there was a significant difference. In the practice of English oral communication, the main advantages of virtual reality technology include enhancing immersion,

promoting active learning, and improving classroom interaction. The application of virtual reality technology in university English oral communication teaching has constructed an innovative teaching model and promoted the modernization and informatization of education. Future research should further optimize the design of virtual reality teaching resources, improve teaching effectiveness, and solve potential problems in practice to promote the continuous innovation of teaching models.

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