A Study on the Impact of A spherical video-based virtual reality on Teaching English Writing Guided by Experiential Learning Circle Theory

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Abstract: English as an international language, English writing is a very important skill as an important form of language output, which is not only an important means of expressing emotions and awareness, but also reflects the ability to use language in an integrated way. In language teaching, the development of English writing skills is an important and challenging teaching task. English writing language is expressed not only at the basic level of vocabulary, grammar, and sentence structure, but also at the higher-order level of text organization, logical reasoning, and argumentation. However, in traditional English writing teaching, students usually do not have the opportunity to have an in-depth experience of the context of the topic, which leads to a lack of motivation and poor writing results. Therefore, this study developed an SVVR learning system based on spherical video-based virtual reality (SVVR) technology and conducted a quasi-experiment in a university English major classroom. The results of the study showed that the SVVR-supported approach to English writing could improve students' writing performance, enrich writing content, and increase learning motivation.

Keywords: English writing; SVVR; experiential learning circle; learning motivation;

1. Introduction

In English learning, listening, speaking, reading and writing are the most basic foundation skills (Yang et al., 2021). Among them, English writing is a way to express

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personal opinions in the form of written texts, which is a concentrated expression of students' comprehensive level. At the same time, English writing is also an important and difficult point in English teaching and learning, and is the key to students' improvement of English proficiency. English writing is one of the most complex skills in English proficiency development, and many students have many difficulties in learning to write, and the main factors affecting English writing learning are as follows: (1) Insufficient motivation to write. A national survey in the United States found that the lack of perception and experience of real situations in the writing learning process makes it difficult to evoke students' knowledge and experience, resulting in empty and disorganized writing content; (2) poor writing quality. Some studies point out that students in the UK do not have enough materials and resources to use in the classroom, and lack authentic, meaningful or imaginative experiences to form high-quality compositions (Foxworth, 2017); (3) untimely feedback on writing. Due to the large number of students and the time and effort required to review essays, the use of traditional teacher feedback leads to a heavy task of teacher review and untimely feedback (Ferris, 2013).

Virtual Reality (VR) is a computer-based technology, combined with related science and technology, to generate a digital environment close to the real one, and the user can interact with the objects in the virtual environment with the help of tools and equipment, which can produce the feeling and experience of being in the corresponding real environment (Wu et al., 2021). Research has found that virtual reality technology can provide students with a highly immersive experience and inspire their writing, thus enhancing their learning and fostering their creativity (Huang et al., 2020). At the same time, it has also been found that the use of VR technology applied to writing instruction can effectively improve students' writing performance and promote students' transferability (Yang, 2021). Although traditional VR educational applications have many advantages, they are difficult to be promoted at the basic education level because of their high cost and difficult development deficiencies (Chien et al., 2020). While spherical Spherical Video-based Virtual Reality (SVVR) is a relatively inexpensive and simple VR technology that allows the virtual world to be presented in a dynamic form by embedding 360-degree spherical video in the VR environment, bringing learners a more realistic sensory experience of sound, color, and shape (Walshe & Driver, 2019), thus inspiring learners to write and motivating them to learn.

Based on this, to solve the above problems as well as based on the research of related technologies, this study provides students with a deep writing experience by designing a virtual immersive English writing learning environment based on SVVR; at the same time, virtual writing situations are designed to inspire students' writing and improve their motivation to write. This study attempts to address the following questions: (1) Can SVVR-based English writing instruction improve students' English writing performance compared to traditional English writing instruction? (2) Does SVVR-based English writing instruction improve students' motivation? (3) How do students feel about learning English writing in the SVVR environment?

2. Explanation of key concepts

2.1. Empirical learning circle theory

In 1984, David Kolb, a famous American educator and psychologist, developed the empirical learning theory proposed by Kurt Lewin and others and constructed the empirical learning circle theory (Kolb, 1984). Experiential learning circle theory suggests that a complete learning process consists of four stages: the acquisition of concrete experiences, the reflective observation stage, the

abstract conceptualization stage, and the active experimentation stage. The learner's learning begins with actively engaging in an experience or activity, and after passing through the concrete experience stage, the learner consciously and actively reflects on the experience while simultaneously conceptualizing a theory or model of what was observed, and finally testing the conceptualized theory or model to gain a new experience. The ultimate goal is to help learners actively engage in new practices after they have passed the first three stages. Experiential learning circle theory has been widely used in teaching. For example, Kwon incorporates experiential learning circle theory in VR teaching, and shows through his research that VR technology can make learners see virtual experiences as direct experiences and improve students' learning effectiveness and motivation (Kwon, 2019). He constructed a flipped classroom teaching model based on the experiential learning circle theory to improve the efficiency of classroom teaching. For writing learning, some studies have combined experiential learning theory with writing learning and found to improve students' writing performance and emotional engagement (Yang et al., 2021).

2.2. Learning Motivation

Gardner and Lambert categorized motivation as “integrative motivation” and “instrumental motivation”. The two main categories of motivation are “integrative motivation” and “instrumental motivation”. Integrative motivation refers to the learner's genuine or special interest in the target language community; the desire to communicate better with people in the target language community; and the expectation to participate or integrate into the social life of the target language community, or even to become a member of the community. Instrumental motivation refers to learners' desire to improve their social status and qualifications for a specific purpose, such as passing an exam to obtain a certain position or to acquire new information in the target language country, such as reading scientific and technical literature. Currently, studies have been conducted to investigate the relationship between VR and motivation for learning English writing. For example, Wang et al. found that VR-based English writing instruction was effective in increasing students’ motivation through an empirical study of English writing instruction based on a digital writing platform. The study found that a hybrid learning approach of VR and English writing could improve students' motivation, process, and performance in writing. However, the current studies have only explored the relationship between VR and English writing learning motivation from the superficial side.

3. Experiential learning circle model based on “SVVR + English writing”

Based on SVVR technology, this study proposes a learning model and framework that incorporates the theory of experiential learning circles and guides students in English writing, as shown in Figure 1.

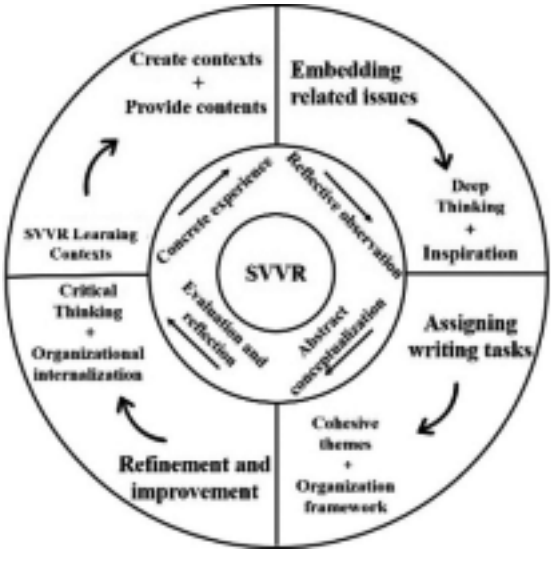

Figure 1. Experiential learning circle model based on “SVVR + English Writing”

(1) Concrete experience stage

This phase is the initial stage of the English

writing learning activity, in which students watch the learning video of the lesson through VR experience, and teachers guide students by using situational awareness. On the one hand, the teacher explained the SVVR system and guided students to get familiar with the "SVVR + English writing" based experiential learning environment; on the other hand, the teacher guided students to watch the video and clarify the topic of the lesson. Afterwards, students build up a holistic perception of the topic of the lesson and form a concrete experience through the initial observation of the tourist attractions in London.

(2) Reflective observation stage

This stage is mainly used to stimulate students' inspiration and deep thinking by using questions to guide them through the system's textual prompts and explanations of London's tourist attractions, and to consolidate and deepen their thinking by answering the questions set in the system. In this process, students are guided to read the text and the questions in the video, to learn new vocabulary and to construct ideas in their minds, while observing the sights of London.

(3) Abstract conceptualization stage

This stage is the English writing stage, where students express the content of their writing through the use of written symbols. Students build on the visualization gained in the previous two stages by abstracting further observed information into concepts, forming a writing framework and writing in depth, in conjunction with the writing tasks and examples assigned by the teacher. At the same time, students focus on memorizing vocabulary during the writing process.

(4) Evaluation and Reflection Stage

This stage is when students use critical thinking to evaluate, revise, and recreate what they have written. First, students critically read the problems in the written content, including semantic coherence, typos, grammar, content, etc. This is followed by revising and adjusting the problems that arise in the written text.

The learning materials for this study were selected from the college English course chapters on "Traveling in London" and "Environmental Protection," and the selected learning videos were edited accordingly to provide an immersive writing learning environment for the students. Guided by various text prompts and question clues, students use multiple senses to experience a trip to London, which not only makes up for the regret of not being able to reach the tourist sites in person, but also continuously stimulates students' creativity in writing in order to help them write better, especially in terms of writing content richness. Figure 2 illustrates the SVVR-based writing learning environment.

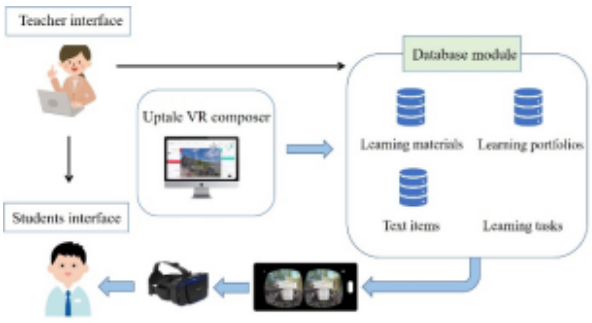

Figure 2. English writing learning environment based on SVVR system

4. Experimental design

4.1. Participants

The experimental participants in this study were freshmen at a university with an average age of 18 years old, including 37 in the experimental group and 40 in the control group. The experimental group and the control group were taught by the same teacher in the same classroom at different time periods. The experimental group was taught using the SVVR-based English writing teaching model, and the control group was taught using the traditional English writing teaching model. This study mainly used the virtual

reality environment in the reflective observation phase of the experimental group, which was about 5-6 minutes long.

4.2. Experimental process

This study designed an experimental process as shown in Figure 3. First, a writing test was administered to the students in the two selected classes as a pre-test. Before starting the formal experiment, the students in the experimental group were familiarized with the interface and basic usage of the SVVR-based experiential writing learning environment, a learning motivation questionnaire was administered to the students in the experimental and control groups, and some students were interviewed about their writing learning. In the formal experiment, two writing learning activities were conducted: the first was a writing activity on the theme of "viewing the giant pandas in Chengdu", in which students were asked to describe what they saw and thought after watching the video; the second was a writing activity on the theme of "traveling to London", in which students were asked to describe what they thought after watching the video. The second writing activity was based on the theme of "Travel in London", in which students were asked to record their experiences in the form of a diary after watching the video. In both writing activities, the teacher assigned the writing tasks and asked the experimental and control group students to observe the writing situations through SVVR and traditional PowerPoint teaching methods, and then instructed them to write descriptive essays. At the end of the writing activity, the students were again administered a learning motivation questionnaire and randomly interviewed by the experimental group students. The experimental process lasted for 2 weeks, and the weekly sessions lasted about 50 minutes. Finally, the essays were collected, and 37 and 40 valid essays were collected from the experimental and control groups, respectively.

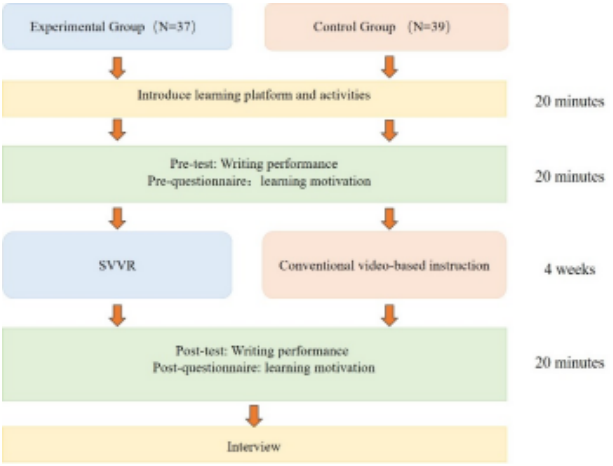

Figure 3. Experimental process

4.3. Measurement tools

The writing test in this study was selected and revised by expert English teach-ers with many years of experience in teaching English. The test aims to examine students' mastery of chapter structure, vocabulary use, spelling and grammar, and con-tent of EFL writing. The rubric of English writing performance consisted of five dimensions: organization of content, linguistic accuracy, originality, fluency, and elaboration. It was developed by referring to the measures from Fu et al. (2019) and was examined by two experienced teachers who had taught English writing for many years. Each dimension was scored as 30 out of 120. These four dimensions assess whether students accurately use the correct format of the essay, how well they describe the essay's topic, facts, and supporting ideas, whether the writing is appropriate, whether they are able to use the correct spacing, font, and format, and whether they are able to use vocabulary accurately.

The learning motivation questionnaire was adapted from Wang and Chen (2010) with six items (three for intrinsic motivation and three for extrinsic motivation). For example, one aspect of intrinsic motivation is: I prefer course material that really challenges me so that I can learn new things. One aspect of extrinsic motivation was: Getting a good grade in this course is by far the most satisfying

thing I can do. The questionnaire was administered on a 5-point Likert scale with a Cronbach's alpha coefficient value of 0.79.

5. Analysis of the results

5.1. Analysis of English writing performance

To analyze the effects of traditional English writing instruction and SVVR-based English writing instruction on students' English writing scores, independent sample t-tests were done on the pre-test and post-test scores of students in the experimental and control groups, respectively. Firstly, the pre-test of the two classes' compositions showed (see Table 1) that there was no significant difference between the pre-test scores of the two classes (t=1.539, p=0.128>0.05), which were at homogeneous level; according to the independent sample t-test of the two classes' English writing post-test scores showed (see Table 2) that the post-test scores of the experimental group and the control group showed significant differences (t=2.728, p= 0.008<0.05). According to the above results, SVVR-based English writing instruction is more effective than traditional English writing instruction in promoting students' English writing performance and better learning outcomes.

Table 1 Results of independent sample t-test for pretest English writing scores

Group	N	M	SD	F	df	t	p
Experimental group	37	68.65	3.773	3.683	75	1.539	0.128
Control group	40	66.90	5.878				

Table 2 Results of independent sample t-test for posttest English writing scores in the experimental and control groups

Group	N	M	SD	F	df	t	p
Experimental group	37	79.00	8.307	1.013	75	2.728	0.008*
Control group	40	73.47	9.378				

p*<0.05

5.2. Writing motivation analysis

In this study, the independent samples t-test was used to compare the pre-test learning motivation of the two groups of students, and the results are shown in Table 3. From Table 3, we can see that there is no significant difference between the pre-test motivation of the two groups of students (t=0.570, p=0.570>0.05), which indicates that there is no significant difference in their original motivation to learn English writing. And then the independent samples t-test was used to analyze the post-test learning motivation of the two groups of students, and the results are shown in Table 4. From Table 4, there was a significant difference between the students in the experimental group and the control group in terms of posttest motivation (t=3.810, p=0.000<0.05). This indicates that VR-based English writing instruction is more capable of increasing students' motivation to learn English writing compared to traditional English writing instruction.

6. Conclusion

In this paper, we found that SVVR-based English writing instruction is more beneficial to students' writing ability and learning motivation than traditional English writing instruction. The SVVR has a significant effect on students' writing performance, but it is worth exploring how to effectively integrate this technology with English writing instruction and give

Table 3 Results of independent sample t-test for pretest learning motivation

Group	N	M	SD	F	df	t	p
Experimental group	37	22.76	4.400	0.343	75	0.570	0.570
Control group	40	22.23	3.779				

Table 4 Results of independent sample t-test for posttest learning motivation in the experimental and control groups

Group	N	M	SD	F	df	t	p
Experimental group	37	23.08	2.994	3.733	75	3.810	0.000*
Control group	40	19.77	4.423				

p*<0.05

full play to its unique advantages.

For one thing, from the perspective of English writing teaching, teachers should actively learn advanced technologies about teaching, improve their own information literacy, and deeply integrate English writing teaching with intelligent technologies. In addition, when integrating SVVR technology with the teaching process, teachers should focus on designing effective teaching activities, learning resources, and learning situations to stimulate students' learning motivation and give full play to the immersion and interactivity that virtual reality has.

Second, from the perspective of integrating technology and teaching, technology cannot be independent of teaching design and play an independent role. Only by effectively integrating it into the writing teaching process and optimizing writing learning activities through the improvement of the learning environment can the writing learning effect be effectively improved.

Third, from the perspective of English writing learning, students should not only accumulate relevant vocabulary and grammar, but also read widely to provide necessary materials, experience and logic for their writing, observe more situations in life, record them in real time, learn to transfer and perceive the context.

References

BChien, S. Y., Hwang, G. J., & Jong, M. S. Y. (2020). Effects of peer assessment within the context of spherical video-based virtual reality on EFL students' English-Speaking performance and learning perceptions. Computers & Education, 146, 103751.

Ferris, D. R., Liu, H., Sinha, A., & Senna, M. (2013). Written corrective feedback for individual L2 writers. Journal of second language writing, 22(3), 307-329.

Foxworth, L. L., Mason, L. H., & Hughes, C. A. (2017). Improving narrative writing skills of secondary students with disabilities using strategy instruction. Exceptionality, 25(4), 217-234.

Fu, Q. K., Zou, D., Xie, H., & Cheng, G. (2022). A review of AWE feedback: types, learning outcomes, and implications. Computer Assisted Language Learning, 1-43.

Huang, H. L., Hwang, G. J., & Chang, C. Y. (2020). Learning to be a writer: A spheri-cal video□based virtual reality approach to supporting descriptive article writing in high school Chinese courses. British Journal of Educational Technology, 51(4), 1386-1405.

Kolb David, A. (1984). Experiential learning: experience as the source of learning and development. Englewood Cliffs, NJ.

Kwon, C. (2019). Verification of the possibility and effectiveness of experiential learning using HMD-based immersive VR technologies. Virtual Reality, 23(1), 101-118.

Walshe, N., & Driver, P. (2019). Developing reflective trainee teacher practice with 360-degree video. Teaching and Teacher Education, 78, 97-105.

Wang, L. C., & Chen, M. P. (2010). The effects of game strategy and preference-matching on flow experience and programming performance in game-based learning. Innovations in Education and Teaching International, 47(1), 39-52.

Wu, W. L., Hsu, Y., Yang, Q. F., Chen, J. J., & Jong, M. S. Y. (2021). Effects of the self-regulated strategy within the context of spherical video-based virtual reality on students' learning performances in an art history class. Interactive Learning Environments, 1-24.

Yang, G., Chen, Y. T., Zheng, X. L., & Hwang, G. J. (2021). From experiencing to expressing: A virtual reality approach to facilitating pupils' descriptive paper writing performance and learning behavior engagement. British Journal of Educational Technology, 52(2), 807-823.