An Empirical Study of the Effect of Non-Immersive Virtual Reality on College Students' English Writing

Xiaokun Liu

School of Humanities, Tianjin University of Technology, Tianjin, China
Email: 931915579@qq.com

Abstract

Foreign language virtual reality applications have long existed, and have been referred to as "3D virtual contexts", "3D virtual language learning environments", and so on. Previous studies have shown that virtual reality technology has great potential in assisting foreign language teaching, and has applications in foreign language vocabulary, speaking, listening, cross-cultural communication, and other aspects. At present, the application of virtual reality technology in empowering foreign language teaching in language learning is still in its infancy, and only a few studies have examined its special advantages in second language learning, mainly focusing on vocabulary learning and communication, while research in writing is relatively insufficient. Moreover, current research on virtual reality technology assisted foreign language teaching mainly focuses on head worn virtual reality devices, with few empirical studies based on desktop virtual reality devices. Therefore, this thesis takes first-year non-English major undergraduate students from a certain university as the experimental subjects, and explores the advantages of virtual reality technology in promoting English writing through comparative media research. The results show that learning based on non-immersive virtual panorama can improve the overall performance of writing, but has no effect on students' learning satisfaction.

Subject Areas

Language Education

Keywords

Virtual Reality, Descriptive Writing, Learning Satisfaction, English Writing

1. Introduction

The integration of Virtual Reality technology in the field of learning will become a new trend in the future development of education. Chinese scholar Ma Chongyu (2008-2015), relying on foreign typical cases, systematically studied the theories, methods and technologies of virtual reality-assisted language teaching by means of induction and logical speculation, and proposed V-CALL (Computer-Aided Language Learning based on Virtual reality) theory according to traditional CALL. This study uses a scientific empirical method to explore the comparison of writing effects between desktop VR and traditional graphic materials, investigate the impact of writing learning based on virtual reality technology on writing effects, the impact of virtual reality technology on students' writing cognitive process, and the internal mechanism of virtual reality technology's impact on students' foreign language writing. In terms of research methods and contents, the V-CALL theory is further deepened and enriched. At the practical application level, this study provides scientific guidance for the application of VR technology in foreign language teaching, guides the design of virtual reality foreign language teaching and the development of teaching activities, and deepens the integration of VR technology and teaching reform.

In terms of the application of virtual reality to writing teaching, there are few empirical studies in China, and few litterateurs pay attention to the comparative study between desktop VR and traditional graphic materials. Therefore, the research results of this paper can provide important theoretical and practical significance. Theoretically, these findings can test, support or extend existing theories, promote the development of writing teaching in the field of virtual reality, and inspire more scholars to pay attention to the impact of different forms of virtual reality technology on students' writing effects. In practice, a comparative study of desktop VR and graphic materials was conducted to test the impact of desktop VR on the writing effect of students, providing a reference for the reform of foreign language writing teaching practice in the future.

2. Literature Review

2.1. On Virtual Reality

Virtual Reality (VR) is a kind of digital environment with computer technology as the core and related science and technology, which is highly similar to the real or imaginary environment in terms of sight, sound and touch (Zhao Qinping, 2009) [1]. Foreign language virtual reality applications have long been known as "3D virtual situation", "3D virtual language learning environment" and so on. Previous studies have shown that virtual reality technology has great potential in foreign language teaching and has been applied in foreign language vocabulary, oral English, listening, cross-cultural communication and so on. For example, Zheng Yanqun (1999) [2] first proposed the application of virtual reality technology to foreign language teaching, and proposed the virtual word space theory based on virtual reality from the perspective of knowledge simulation (2015). Li

Ying (2018) [3] applied virtual reality to English speech training and pointed out that virtual reality is an effective means to train students in cross-cultural communication. Although virtual reality technology has an optimistic prospect in enabling foreign language teaching, its application in language learning is still in its infancy. Only a few studies have investigated its special advantages in second language learning, mainly focusing on vocabulary learning and communication, while the studies on writing are relatively insufficient. Moreover, current researches on virtual reality technology assisting foreign language teaching mainly focus on head-mounted virtual reality devices, and there are few empirical studies based on desktop virtual reality devices.

2.2. On Descriptive Writing

Researchers have highlighted the correlation between language proficiency and foundational education in the respective professional domain, emphasizing its significance within an academic context. (Chapelle, 2013) [4]. The development of language ability includes the four aspects of listening, speaking, reading and writing, among which writing is the most challenging (Hwang & Fu, 2019 [5]; Lin, Lee, & Chen, 2004 [6]). Researchers have revealed that writing is a complicated representation of language ability; it not only includes basic understanding, but is also relevant to such abilities as organizing, summarizing and language application (Dunn & Sweeney, 2018) [7]. The writing activity can develop students' high social insight, examination and cultural literacy, and enhance their language ability and interactive communication to support their future academic studies and career (Tse & Hui, 2016) [8]. Of all the writing article formats, descriptive writing is a basic and useful form of writing training. Descriptive writing refers to the type of writing that engages students in giving clear and concise descriptions of specified places, people, objects or events. The aim of writing a descriptive article is to frame an image of the place, people or events in readers' minds by describing the details to enable them to feel the contexts. It presents the writing style and literacy esthetics from the observation of time, events, people, places and things to the description of details (Yeung, Ho, Chan, & Chung, 2013) [9]. Foxworth, Mason, and Hughes (2017) [10] reported that descriptive articles can express personal experience and share authentic, meaningful or imaginative incidents such as stories, personal descriptions or biographies. Besides, it can be cross-thematic to promote in-depth understanding of its content for an individual.

In the past, numerous studies have attempted to increase students' interest in writing descriptive articles through the design of various teaching activities (Graham, Harris, & Olinghouse, 2007) [11]. Mahadi *et al.* (2018) [12] revealed that when students engaged more and had more interest in the materials and topics, they had lower writing anxiety and increased their writing preparation. Several researchers have further shown that the ability of using metaphors in descriptive article writing would be influenced by many internal and external

factors such as vocabulary size, cognition and emotional maturity, and personal experience and perception. As a result, teachers should consider how to guide students to use writing techniques and increase their experience and perceptions (Refika & Devi, 2018) [13].

However, in descriptive writing activities, there are numerous situations that students cannot physically encounter. Therefore, within traditional technology-enabled learning approaches, educators often employ visual aids such as pictures and videos to provide students with a contextual understanding of descriptive essays. Nevertheless, this method solely offers learners with contextual information through passive reception of visual stimuli, limiting their potential for deep engagement, perception, and motivation to learn. Consequently, the integration of virtual reality (VR) is implemented in this study to establish an immersive learning environment that fosters profound motivation for descriptive writing.

2.3. On Teaching of Writing Based on Virtual Reality Technology

The innovation of technical education environment provides an opportunity for the redesign of writing learning practice model. At present, the application of virtual reality environment has also emerged in the field of writing learning. Lamb *et al.* (2019) [14] used virtual reality technology to simulate the process of scientific activities and applied it to scientific argument writing, finding that students' physical stimulation in VR is almost the same as their experience in the real world, which helps to promote students' understanding of scientific content and improve the quality of students' scientific argument writing. Huang *et al.* (2020) [15] applied spherical video virtual reality technology to high school Chinese writing learning and found that reasonable use of visual, tactile and auditory perceptual scaffolding cues in SVVR could effectively improve students' self-efficacy and writing scores. Chen Yuting (2020) [16] and other EDU Venture VR tools designed an immersive virtual writing environment and found that multi-sensory interactive experience can change the drawbacks of traditional disembodied writing and improve students' writing effect.

While the above studies suggest that virtual reality technology stimulates and benefits second language learning, other researchers (e.g., Dolgunsoz *et al.*, 2018 [17]) found no statistically significant improvement in language learning outcomes based on virtual reality. For example, Dolgunsoz *et al.* (2018) [17] studied the impact of mobile VR on EFL learners' writing skills. Twenty-four English learners watched VR and traditional videos at different times. The results showed that although most learners enjoyed the learning process, learning based on mobile virtual reality did not have a positive impact on learners' writing performance. In view of the existing research results showing that there is some uncertainty about the impact of virtual reality technology on foreign language writing, more research on virtual reality is necessary to verify its usefulness in foreign language writing learning.

3. Research Design

3.1. Research Questions

VR video technology enables students to move from a traditional physical classroom into a 3D virtual world, where students are able to participate in the learning process in a more intuitive and direct way. In order to test the application effect of VR video technology in classroom writing learning, this study uses desktop VR and traditional graphic materials to allow students to conduct descriptive writing through media comparison. On the basis of the comparison with traditional graphic materials, the paper analyzes whether desktop VR has a better effect on promoting college students' foreign language writing performance. This study attempts to answer the following questions:

1) Compared with traditional graphic materials, can virtual reality technology (desktop VR) promote the improvement of college students' foreign language writing performance?

2) Will students who accept different learning styles differ in different dimensions of writing achievement (organization, content, appropriateness of language expression, accuracy of language expression)?

3) Do different writing learning styles affect students' learning satisfaction?

3.2. Research Subjects

This study selected first-year non-English major students in a university as subjects. Before the formal experiment, 60 non-English major students in the first year of undergraduate were randomly selected. The subjects were divided into two groups. Group A (graphic materials), Group B (desktop VR). Each group 30 people, a total of 60 people.

3.3. Research Instrument

1) Descriptive writing assessment Scale. The present study referred to the writing performance descriptors proposed by the Texas Education Agency (2006) to develop the rubrics of descriptive article writing performance from the affective and creativity perspectives. The rubrics consisted of four dimensions: organization, content, appearance and vocabulary use. The score of each dimension was 30, with a perfect score of 120. The four dimensions evaluated whether students accurately used the correct article format, how they described the topic of the descriptive article, how they described the facts and supporting points of view, whether their writing was appropriate, whether they could use the correct spacing, font and format of a descriptive article, and whether they could accurately use the vocabulary.

2) Learning satisfaction questionnaire. From the learning satisfaction questionnaire adopted in the doctoral thesis of scholar Yang Jiumin. The 5-point scoring method is adopted, and the α coefficient of internal consistency is 0.77.

3.4. Research Procedures

1) Selection of experimental materials.

The materials selected in this experiment are from "HTC VIVE". Materials can be experimentally watched and learned using both non-immersive VR and immersive VR. Non-immersive VR mainly watches VR materials through the computer display, and interacts with the virtual environment through the keyboard and mouse.

2) Formal experiment

① To carry out formal writing activities on the theme of "the Louvre". After assigning the writing task, the teacher asked the students in the experimental group and the control group to observe the writing situation through non-immersive VR and graphic materials respectively, and then instructed the students to conduct descriptive writing. (1 to 5 weeks)

② After the formal writing activities, relevant questionnaires were distributed, and then the writing performance was assessed and different dimensions of writing were analyzed. (Weeks 6 - 10)

3) Data Collection and Statistics

In the composition evaluation, three college teachers with many years of experience in English teaching were hired to score the compositions. In the data statistical link, the main use of SPSS statistical software to analyze the variables.

4. Data Analysis and Discussion

4.1. Compared with Traditional Graphic Materials, Can Virtual Reality Technology (Non-Immersive VR) Promote the Improvement of College Students' Foreign Language Writing Performance?

This section examines the impact of two distinct writing learning styles, non-immersive VR, and graphic materials, on students' writing performance. Additionally, it investigates whether VR-based writing learning styles can enhance students' writing proficiency.

In order to explore whether there are differences in the writing scores of the two groups of students under different writing learning styles, this study adopts the statistical method of one-way ANOVA to analyze their writing scores (Table 1).

The average scores of group A (graphic materials) and group B (non-immersive VR) were 72.867* and 85.724*. As the homogeneity of variance was satisfied, the single sample variance test was adopted, and the P value of the ANOVA result was 0.010*** ≤ 0.05, so the statistical result was significant, indicating that there were significant differences in the total score of different basic information.

The results of data analysis demonstrate that the utilization of desktop virtual reality technology yields superior writing performance among students compared to those relying on traditional graphic materials. This phenomenon can be attributed to the immersive learning environment facilitated by virtual reality technology, which enables students to deeply engage in the writing process. By means of virtual reality technology, students are afforded personal experiences within diverse scenarios and situations, fostering their creative thinking and

Table 1. One-way analysis of variance.

	Variable	n	M	SD	variance test	Welch's variance test
Writing scores	Group A	30	72.867	18.207	F = 7.197 P = 0.010***	F = 7.191 P = 0.010***
	Group B	29	85.724	18.607		
	Total	59	79.186	19.363		

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively.

self-expression. This intuitive and sensory engagement effectively stimulates students' imagination and creativity, thereby enhancing their proficiency in written expression.

4.2. Will Students Who Accept Different Learning Styles Differ in Different Dimensions of Writing Achievement (Organization, Content, Appearance, And Vocabulary Use)?

The second part explains the differences in different dimensions of students' writing performance based on different learning styles. The present study referred to the writing performance descriptors proposed by the Texas Education Agency (2006) to develop the rubrics of descriptive article writing performance from the affective and creativity perspectives. The rubrics consisted of four dimensions: organization, content, appearance and vocabulary use. The first dimension is mainly to evaluate whether students can accurately write the descriptive article in the spatial, sensory and affective aspect in the correct format. The second dimension is to see whether students can write the concrete context, detailed sensory descriptions and conversion of emotion level. The third dimension is mainly to evaluate whether students can accurately use the words and sentences with effective use of various sentence types and deepens the connotation of the work and enhances its artistic value. The last dimension is to see if there are any spelling mistakes in the student's essay and whether the student can accurately use punctuation to promote emotion expression and persuasion.

To investigate potential variations in various dimensions of students' writing proficiency according to their learning styles, this study employs the statistical technique of one-way analysis of variance (ANOVA) to examine their writing scores (Table 2).

The mean values of group A (graphic materials) and group B (non-immersive VR) in the first dimension are 21.667* and 23.276*. As the homogeneity of variance was satisfied, the single sample variance test was adopted, and the P-value of the ANOVA result was 0.335 and greater than 0.05. Therefore, the statistical result was not significant, indicating that there was no significant difference between different groups in the first dimension. For the third dimension "appearance", it can be seen from the figure above that the P-value is also greater than 0.05, so there is no difference between different groups in the third dimension.

However, the mean values of group A (graphic materials) and group B (non-immersive VR) in the second dimension are 18.267* and 21.759*. The P

Table 2. One-way analysis of variance.

	Variable	n	M	SD	variance test	Welch's variance test
Organization	Group A	30	21.667	6.738	F = 0.946 P = 0.335	F = 0.95 P = 0.334
	Group B	29	23.276	5.928		
	Total	59	22.458	6.35		
Content	Group A	30	18.267	4.82	F = 6.624 P = 0.013**	F = 6.591 P = 0.013**
	Group B	29	21.759	5.585		
	Total	59	19.983	5.457		
Appearance	Group A	30	17.233	4.918	F = 3.559 P = 0.064*	F = 3.552 P = 0.065*
	Group B	29	19.724	5.223		
	Total	59	18.458	5.181		
Vocabulary use	Group A	30	15.7	5.535	F = 13.201 P = 0.001***	F = 13.196 P = 0.001***
	Group B	29	20.966	5.596		
	Total	59	18.288	6.122		

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively.

value of the ANOVA result is 0.013** ≤ 0.05, so the statistical result is significant, indicating that different groups have significant differences in the second dimension. Similarly, it can be seen from the figure that different writing learning styles will also have an impact on the fourth dimension of students' writing achievement.

From the above data analysis, it can be seen that the group of students who learn writing based on desktop virtual reality technology scored higher on the content of their compositions than the group of students based on traditional graphic materials. This may be because virtual reality technology can provide a more real, intuitive and immersive experience, so that students can better understand and feel the theme and emotion to be expressed. At the same time, in the virtual reality environment, students can freely explore and interact with the scene, thus stimulating their interest and imagination in writing materials and creative ideas. Therefore, their writing content is more vivid and rich, and the quality is also higher.

It is noteworthy that the writing group utilizing desktop virtual reality technology exhibited superior performance in terms of accurate punctuation and vocabulary usage in their compositions compared to the group using traditional graphic materials, plausibly due to the immersive nature of the virtual environment which enables students to experience and comprehend the depicted scenes and situations. Through interaction with avatars and meticulous observation of details within this simulated realm, they are able to acquire a more profound understanding and application of proper punctuation and vocabulary. In addition, desktop virtual reality technology also provides more diverse and interesting learning resources. Compared with traditional graphic materials, virtual re-

ality technology can simulate various scenes and scenarios and place students in them. For example, in the writing process, students can choose different themes or backgrounds to stimulate creativity; They can also improve their writing skills by having conversations with virtual tutors and participating in role plays.

4.3. Is there any Difference in Writing Learning Satisfaction among Students with Different Writing Learning Styles?

In order to explore whether there are differences in the learning satisfaction of the two groups of students under different writing learning styles, this study adopts the statistical method of one-way ANOVA to analyze their scores (Table 3).

As can be seen from the figure above, the mean values of group A and Group B in learning satisfaction are 10.800* and 11.000*, respectively; Because the homogeneity of variance was not satisfied, Welch's variance test was used, and the P value of ANOVA was 0.757 > 0.05, so the statistical result is not significant, indicating that different groups do not have significant differences in learning satisfaction. And the learning satisfaction of group B is slightly higher than that of group A.

5. Research Findings and Conclusion

5.1. Research Findings

With the rapid development of virtual reality technology, the development of writing learning resources has changed from two-dimensional plane form to three-dimensional form. This change not only provides students with a new way of learning, but also provides students with a realistic and intuitive learning environment, which enables students to be immersive when observing these resources and interact with them when operating these resources. Be inspired when listening to these resources. Therefore, this study takes first-year non-English major undergraduate students in a university as experimental subjects and explores the advantages of non-immersive virtual reality technology in promoting English writing through a comparative study based on non-immersive virtual reality technology and traditional graphic materials, with a view to providing references for the improvement of college students' English writing learning ability and the reform of writing teaching practice. The major findings of this research are summarized as follows.

Firstly, the analysis of the quantitative data collected from the research reveals that there are significant differences in the writing performance of the two groups of students based on different learning styles. Further observation found that of the two learning styles, students who used non-immersive virtual reality (VR) for writing learning demonstrated higher levels of writing ability. They did better in descriptive writing. This result shows that non-immersive virtual reality technology can effectively improve students' descriptive writing level. Therefore, in the future writing teaching, teachers can make full use of non-immersive

Table 3. One-way analysis of variance.

	Variable	n	M	SD	variance test	Welch's variance test
Learning satisfaction	Group A	30	10.8	2.976	F = 0.096	F = 0.098
	Group B	29	11	1.813	P = 0.757	P = 0.756
	Total	59	10.898	2.454		

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively.

virtual reality technology to provide students with a variety of writing materials. For example, when writing about historical events, teachers can allow students to travel through time and space through desktop virtual reality technology to witness historical events and make detailed observations.

Secondly, this study analyzes the data of different dimensions (organization, content, appearance, vocabulary use) of writing achievement of two groups of students. The findings of this investigation indicate that the two groups of students based on different learning styles have differences in different dimensions of writing achievement. From the above data analysis, it can be seen that the group of students who learn writing based on desktop virtual reality technology scored higher on the content and vocabulary use of their compositions than the group of students based on traditional graphic materials. This shows that virtual reality technology will have a positive impact on students' writing content and the use of vocabulary and sentence patterns.

Thirdly, through the analysis of questionnaire data, it can be seen that different writing learning styles have no influence on students' learning satisfaction. In the future, researchers can do more related studies to explore how to improve students' writing learning enthusiasm.

5.2. Limitations of the Research

Due to the limited research level of the researcher and some other objective conditions, this research inevitably has some shortcomings, which are summarized as follows.

First, this study was conducted only with non-English major undergraduates. Younger learners, older learners and English major students may respond differently. What's more, only one content was used to assess EFL writing performance, more videos may be used in a long-term study. Thirdly, the number of research subjects in this experimental study is small, and thus the representativeness needs to be broadened to obtain more reliable data. Due to the limited research level of the researcher and other factors, the researcher cannot expand the study population. The findings would have been more convincing if there were more students from schools in different areas with a large enough sample.

5.3. Conclusions

According to the results of data analysis and discussion, the conclusion is sum-

marized as follows.

Firstly, this research aims to investigate the impact of non-immersive virtual reality technology on students' English writing performance through comparative research using two different media. The results show that non-immersive virtual reality technology can significantly improve students' performance in descriptive writing. And it will have a positive impact on two dimensions (content, vocabulary use) of students' writing.

In addition, the research also explores the impact of virtual reality technology on students' learning satisfaction. The results show that different writing learning styles have no influence on students' learning satisfaction. Hence, additional research is imperative to delve deeper into the subject matter.

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] Zhao, Q.P. (2009) Virtual Reality Overview. *Scientia Sinica* (*Informationis*), **39**, 2-46.

[2] Zheng, Y.Q. (1999) Virtual Reality Technology and Language Teaching Environment. *Chinese Teaching in the World*, **13**, 4-7.

[3] Ye, L.L. and Ma, Y. (2018) The Design and Application of Virtual Simulation Technology in Cross-Cultural Communication. *Jiangsu Science and Technology Information,* **35**, 56-58.

[4] Chapelle, C. (2013) The Wiley-Blackwell Encyclopedia of Applied Linguistics. Wiley, Hoboken. https://doi.org/10.1002/9781405198431

[5] Hwang, G.J. and Fu, Q.K. (2019) Trends in the Research Design and Application of Mobile Language Learning: A Review of 2007-2016 Publications in Selected SSCI Journals. *Interactive Learning Environments*, **27**, 567-581. https://doi.org/10.1080/10494820.2018.1486861

[6] Lin, J.M.C., Lee, G.C. and Chen, H.Y. (2004) Exploring Potential Uses of ICT in Chinese Language Arts Instruction: Eight Teachers' Perspectives. *Computers and Education*, **42**, 133-148. https://doi.org/10.1016/S0360-1315(03)00068-X

[7] Dunn, J. and Sweeney, T. (2018) Writing and iPads in the Early Years: Perspectives from within the Classroom. *British Journal of Educational Technology*, **49**, 859-869. https://doi.org/10.1111/bjet.12621

[8] Tse, S.K. and Hui, S.Y. (2016) Chinese Writing Curriculum Reforms in Hong Kong in Recent Years and Their Impact on Teaching and Learning. *Reading and Writing*, **29**, 1013-1037. https://doi.org/10.1007/s11145-015-9595-7

[9] Yeung, P.S., Ho, C.S.H., Chan, D.W.O. and Chung, K.K.H. (2013) Modeling the Relationships between Cognitive-Linguistic Skills and Writing in Chinese among Elementary Grades Students. *Reading and Writing*, **26**, 1195-1221. https://doi.org/10.1007/s11145-012-9411-6

[10] Foxworth, L.L., Mason, L.H. and Hughes, C.A. (2017) Improving Narrative Writing Skills of Secondary Students with Disabilities Using Strategy Instruction. *Exceptionality*, **25**, 217-234. https://doi.org/10.1080/09362835.2016.1196452

[11] Graham, S.T.E.V.E., Harris, K.R. and Olinghouse, N.A.T.A.L.I.E. (2007) Addressing

Executive Function Problems in Writing. In: Meltzer, L., Ed., *Executive Function in Education: From Theory to Practice*, The Guilford Press, New York, 216-236.

[12] Mahadi, T.S.T., Husain, F.M., Jaganathan, P., Hassan, A., Fesal, S.N.H.S. and Mohamad, A. (2018) Developing Narrative Writing Skills via a Reading Programme for Low English Language Proficiency Undergraduates. *GEMA Online Journal of Language Studies*, **18**, 1-16. https://doi.org/10.17576/gema-2018-1802-01

[13] Refika, A. and Devi, W. (2018) Improving Students' Writing Skill in Narrative Text by Using Storybird. *ELTLectura*, **5**, 78-85. https://doi.org/10.31849/elt-lectura.v5i1.1550

[14] Lamb, R.L. and Etopio, E. (2019) Virtual Reality Simulations and Writing: A Neuroimaging Study in Science Education. *Journal of Science Education and Technology*, **28**, 542-552. https://doi.org/10.1007/s10956-019-09785-9

[15] Huang, H.L., Hwang, G.J. and Chang, C.Y. (2020) Learning to Be a Writer: A Spherical Video-Based Virtual Reality Approach to Supporting Descriptive Article Writing in High School Chinese Courses. *British Journal of Educational Technology*, **4**, 1386-1405. https://doi.org/10.1111/bjet.12893

[16] Chen, Y.T., Yang, G. and Yang, J. (2020) An Analysis of Learning Participation and Writing Learning Effects Supported by SVVR. M*odern Educational Technology,* **10**, 57-64.

[17] Dolgunsoz, E, Yildirim, G. and Yildirim, S. (2018) The Effect of Virtual Reality on EFL Writing Performance. *Journal of Language and Linguistic Studies*, **14**, 278-292.