# Exploring the Effects of VR-assisted Learning on Students' Learning Engagement in a University EFL Classroom

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***Abstract****: Learning engagement is vital to the learning outcomes of English as a foreign language (EFL) learners. Virtual reality (VR) can create an immersive and interactive environment for users. Nevertheless, evidence is scarce regarding whether VR can boost EFL learners' learning engagement. This study, thus, aims to explore the effects of VR technology on EFL learners' learning engagement. A quasi-experiment was designed for this study with the self-developed Situational English in Virtual Reality platform. 64 EFL learners were randomly divided into experimental and comparison groups. The experimental group with 31 students received English learning with the assistance of VR on the designed platform, while the comparison group with 33 students watched instructional videos on PC. Data was collected using an adapted VR-assisted learning engagement questionnaire. The quantitative results demonstrated that VR is beneficial in enhancing EFL learners' learning engagement, especially cognitive, emotional, and social engagement. This study offers empirical evidence of the positive impact of VR technology on EFL learners' learning engagement. Pedagogically, VR-assisted language learning could be incorporated in future language learning class as an effective instructional approach to increase students' learning engagement. This study provided some suggestions for both language instructors and technical experts in terms of task design, platform optimization, and material development.*

**Keywords**: virtual reality (VR), EFL learners, learning engagement

## 1.Introduction

Active learning is a key concern to second language learning (Dörnyei & Kormos, 2000). Many researchers try to find out how to improve the learning engagement of English as a foreign language (EFL) learner and thus promote educational progress in language learning. With the development of technology, virtual reality (VR) has been introduced into the educational sector. Researchers have explored "the distinguishing characteristics of VR that provide unique opportunities for educational use" (Petersen et al., 2022). However, the former research does not suffice to check VR's effects on EFL learners' learning engagement. To shed more light on this issue, the paper is set to investigate the influence VR-based learning has on EFL learners from four aspects, that is, cognitive engagement, behavioral engagement, emotional engagement and social engagement.

## 2.Literature Review

### *2.1. Learning Engagement*

An engaged EFL learner is actively involved in and committed to their own learning, and without engagement meaningful learning is unlikely (Hiver et al., 2024). Researchers have delved into many dimensions about EFL learning engagement, which can be summarized as cognitive, behavioral, emotional and social dimensions. Kuhlmann et al (2024) explored the importance of active cognitive engagement in STEM learning. They discovered that how active students' cognitive engagement was would influence students' learning outcomes. Doo and Kim (2024) found a small-to-medium effect of learning engagement to learning outcomes and that there was no statistical difference among behavioral, cognitive, emotional, and general engagement in affecting learning outcomes. The study of Ratan et al.

(2022) suggested that students' subjective course gains were significantly related to social engagement. In this study, behavioral engagement refers to the time and energy EFL learners spend on study; cognitive engagement indicates their mental efforts; emotional engagement equals the positive and negative emotions; and social engagement comprises the EFL learner's social interaction with other people.

### *2.2. VR and Learning Engagement*

VR has been proven to be an efficient tool for education which can provide immersive and natural face-to-face interaction (Naylor, 2023). Dubovi (2022) explored students' emotional engagement and cognitive engagement with a VR-based simulation. It indicates that the virtual environment is able to promote students' positive emotions like happiness and enhance their cognitive engagement. Another study of Dubovi (2024), though believing that there could be "excessive" affections, provided further evidence for the positive effects of VR on learning engagement, which found a complex emotional mechanism behind VR learning. However, researches on the effects of VR on learning engagement are still not adequate. Therefore, the paper aims to investigate whether VR has a positive impact on EFL learner's learning engagement.

## 3.Method

### *3.1. Research Context and Participants*

The study was conducted in Beijing University of Posts and Telecommunications from two intact English classes with 64 sophomores (53% males, aged 18-20). All of the participants are native Chinese speakers who have at least learned English for 8 years and have passed National College English Test Band 4 (CET-4). Two classes were randomly assigned to either the VR-assisted experimental group (N=31) or the computer-assisted comparison group (N=33). Both experimental group and comparison group learned the same content, while the former learning with the VR platform and the latter watching the instructional videos playing on the personal computer screens.

### *3.2. Instruments*

#### 3.2.1. The VR learning platform

The self-developed *Situational English in Virtual Reality* platform was employed in the study (Figure 1). The VR platform allows users to have an immersive check-in experience in an international airport, helping them to enhance their language learning performance.

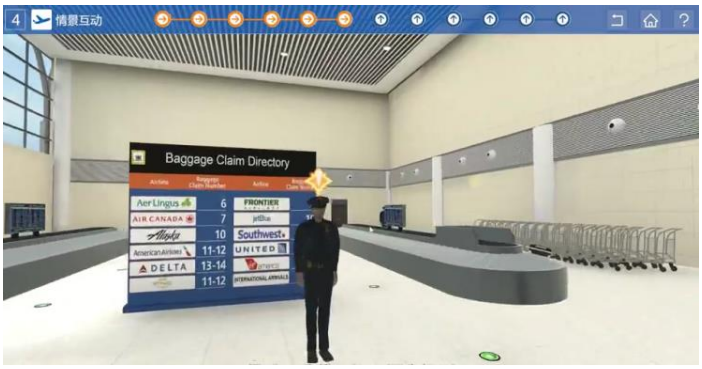


Fig.1 The self-developed Situational English in Virtual Reality platform

#### 3.2.2. VR-assisted learning engagement questionnaire

The VR-assisted learning engagement questionnaire was revised on the questionnaire of Luan et al. (2020). It adopted a 5-point Likert scale format, comprising a total of 16 questions, with 4 questions for each of the following aspects: behavioral (e.g. I stay focused in the virtual environment), emotional (e.g. I enjoy learning new things about English), cognitive (e.g. I try to understand my mistakes when I get something wrong), and social engagement (e.g. I like working with virtual characters).

### *3.3. Research Procedure*

The experiment lasted for six weeks with two 45-minute classes each week. In the first week, all participants were required to complete the VR-assisted learning engagement pre-questionnaire. In the second week, the VR group was trained to use the VR platform, while the comparison group received basic instructions about PC operation. From the third week to the fifth week, the VR players took part in English learning on the VR platform, whereas the video watchers learned English by watching the instructional videos on a PC. In the final week, the VR-assisted learning engagement post-questionnaire was administered to all participants.

### *3.4. Data Collection and Analysis*

This study employed the VR-assisted learning engagement questionnaires to collect quantitative data. A total of 64 students' responses to questionnaires were collected and measured to analyze participants' learning engagement when the two groups were respectively learning in the virtual environment and the traditional language classroom. ANCOVA was performed to compare the effects of two different learning approaches on learners' engagement.

## 4.Results

ANCOVA was conducted to identify between-group differences. The pretest was the covariate, the post-test the dependent variable, and the groups the fixed factor. Regarding learning engagement, the non-significant interaction of the independent variable and the covariate was verified ($F = 2.64$, $p = 0.11 > 0.05$), which suggests that the assumption of homogeneity of the regression slope was fulfilled. Levene's test of the homogeneity of variance was also met ($F = 0.95$, $p = 0.34 > 0.05$), indicating that the null hypothesis was tenable and the variance was equal across groups.

Afterwards, ANCOVA was employed for overall learning engagement, which revealed significant differences ($F = 5.83$, $p = 0.02 < 0.05$). The adjusted means and standard error of the experiment group were 67.08 and 0.94 and were higher than those of the comparison group of 63.93 and 0.91. Therefore, the experiment group had a better performance than the comparison group for overall learning engagement. ANCOVA was also employed to explore the difference between the scores of the pre-test and the post-test of the two groups. Results showed that the cognitive engagement ($F = 4.60$, $p = 0.04 < 0.05$), emotional engagement ($F = 4.87$, $p = 0.03 < 0.05$) and social engagement ($F = 5.85$, $p = 0.02 < 0.05$) of the experimental group was better than those of the comparison group, while existing no significant difference in behavioral engagement ($F = 0.80$, $p = 0.38 > 0.05$).

## 5.Discussion and Conclusion

The study investigated the effects of VR-assisted learning on EFL learners' learning engagement. Analysis of the VR-assisted learning engagement questionnaires indicated that, compared to traditional classrooms, VR could promote EFL learners' overall engagement, especially cognitive, emotional, and social engagement, while the impact on EFL learners' behavioral engagement is relatively small. The result echoed that of Dubovi (2022) who found that VR was beneficial for students' cognitive engagement and emotional engagement and Dubovi's (2024) finding of the positive effects of VR on learning engagement.

The study has significant pedagogical implications for instructors and educators. First, since VR can enhance the learning engagement of EFL learners, instructors and educators are encouraged to further incorporate VR into classrooms. Second, as the study witnessed no significant improvement of behavioral engagement, it is recommended to design various learning scenarios, interaction elements as well as rewarding mechanisms in order to further enhance students' behavioral engagement. It should be noted that several limitations need to be acknowledged for future studies. Researchers could utilize qualitative data (e.g., interviews) to better understand student behaviors in VR environments, and quantitative data (e.g., speaking tests) to evaluate learning outcomes. Moreover, the relatively brief duration of the experiment compromises its representativeness when factors like the novelty of VR could influence the result of the study. Future research needs to extend the experimental period for more in-depth results. Also some technical issues such as feeling dizzy when operating the platform still need optimization.

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**References**

Doo, M. Y., & Kim, J. (2024). The relationship between learning engagement and learning outcomes in online learning in higher education: A meta-analysis study. *Distance Education*, 45(1), 60–82.

Dörnyei, Z., & Kormos, J. (2000). The role of individual and social variables in oral task performance. *Language Teaching Research*, *4*, 275–300.

Dubovi, I. (2022). Cognitive and emotional engagement while learning with VR: The perspective of multimodal methodology. *Computers & Education*, 183, 104495.

Dubovi, I. (2023). Facial expressions capturing emotional engagement while learning with desktop VR: the impact of emotional regulation and personality traits. *Interactive Learning Environments*, 32(9), 5041–5057.

Hiver, P., Al-Hoorie, A. H., vitta, j. p., & Wu, J. (2024). Engagement in language learning: A systematic review of 20 years of research methods and definitions. *Language Teaching Research*, 201-230.

Kuhlmann, S. L., Plumley, R., Evans, Z., Bernacki, M. L., Greene, J. A., Hogan, K. A., Berro, M., Gates, K., & Panter, A. (2024). Students’ active cognitive engagement with instructional videos predicts STEM learning. *Computers & Education*, 216, 105050.

Luan, L., Hong, J.-C., Cao, M., Dong, Y., & Hou, X. (2020). Exploring the role of online EFL learners’ perceived social support in their learning engagement: a structural equation model. *Interactive Learning Environments*, 1-12.

Naylor, W., Debattista, K., & Chalmers, A. (2023). Perception-based high quality distributed virtual reality. *Virtual Reality*, 27 (3), 2529-2539.

Petersen, G. B., Petkakis, G., & Makransky, G. (2022). A study of how immersion and interactivity drive VR learning. *Computers & Education*, 179, 104429.

Ratan, R., Ucha, C., Lei, Y., Lim, C., Triwibowo, W., Yelon, S., Sheahan, A., Lamb, B., Deni, B., & Chen, V. H. H. (2022). How do social presence and active learning in synchronous and asynchronous online classes relate to students’ perceived course gains? *Computers & Education*, 191.