

Exploring English Language Learners' Conceptions of and Engagement in a Virtual Reality Learning Environment

Huilin WANG, Hanyong LIU, Zhihong LU & Chunping ZHENG*
Beijing University of Posts and Telecommunications, China
*zhengchunping@bupt.edu.cn

Abstract: With the progress of science and technology, virtual reality (VR) technology has attracted increasing attention in the field of education technology and language teaching. This inquiry explored English learners' conceptions of learning and learner engagement in a VR learning environment. Participants were English learners from a comprehensive university in northern China. Data were collected from questionnaires and interviews. The results indicated that learners' conceptions of learning English include eight factors, namely presence, motivation, extending, attention, interaction, understanding, obstructing conventional learning and diminishing imagination and learner engagement consists of four factors, including cognitive, behavioral, emotional and social engagement. Moreover, the present study found that there were several benefits and challenges of learning in a virtual reality environment.

Keywords: Virtual reality, conceptions of learning English, learner engagement

1. Introduction

The development of emerging technologies has increasingly influenced language education, which has been accompanied by a major expansion of research on Computer Assisted Language Learning (CALL) (Choi & Baek, 2011). Virtual reality (VR) technology has become a hot topic in second language studies by virtue of permitting researchers to design and construct the contexts according to educational objectives (Oblinger & Oblinger, 2005). What's more, conceptions of learning and learner engagement play an important role in learning process and outcomes. Previous studies showed that conceptions of learning and learner engagement exerted a profound influence on learning process and academic achievement (Cheng, 2018). Based on the above research background, this study, from the perspective of individual characteristics of language learners, focused on college students' conceptions of learning English and learner engagement in a VR learning environment.

2. Literature Review

2.1 *Virtual Reality Technology and language education*

VR technology was regarded as a powerful and promising tool in education because it could be pedagogically exploited through its unique technological characteristics (Mikropoulos & Bellou, 2011). Previous studies showed that learners improved their interest and learned effectively by learning target language in VR learning environments (Peterson, 2010). The design and construction of VR learning environments based on VR technology can provide learners with a realistic and situational language learning environment, promote learners' communication and interaction, and enable them to attain an immersive learning experience (Hsu, 2017).

2.2 *Conceptions of Learning and Learner Engagement in VR Learning Environment*

The dimensions and features of conceptions of learning have been explored in early studies (Säljö, 1979). Recently, Cheng (2018) explored students' conceptions of learning science by augmented reality (AR), including increasing presence, drawing attention, fostering motivation, extending content, attaining in-depth understanding, enhancing interaction, obstructing reading, and diminishing imagination. As an educational technology similar to AR, VR still lacks relevant studies on conceptions of learning. Fredricks and his fellows firstly defined that learner engagement included three dimensions: behavioral, emotional and cognitive engagement (Fredricks et al, 2004; Wang et al, 2011). In addition to the three components of engagement, Fredricks et al. (2016) added a social engagement dimension.

In order to explore the above issues, this research aimed at answering the following three questions: (1) What are the main factors of conceptions of learning English among college students in the VR-supported environment? (2) What are the main factors of learner engagement among college students in the VR-supported environment? (3) What are the benefits and challenges of the VR learning environment for English language learning?

3. Methodology

3.1 Research Context

The present study was conducted in a comprehensive university with emphasis on Computer Science and Technology, providing good technology support. The research took the course named 'Learning English Through Culture: Viewing, Listening, Speaking' as the research situation, combined the self-developed learning platform called 'Situational English in Virtual Reality' (SE in VR), and simulated the international airport as one of the main interactive contexts for situated English language learning. 'SE in VR' belongs to desktop VR where users can interact with the virtual reality environment using keyboard and mouse. It simulated the international airport for situational English language learning. There were ten learning tasks, encompassing word recognition, word matching, spot dictation, contextual interaction, rearranging order, short answers, compound dictation, summary writing, verbal report and role play.

3.2 Participants

A total of 69 EFL learners of this course participated in the study, including 52 males and 17 females, with an average age of 19. They came to the course on Tuesday or Thursday every week. All participants were non-English majors from different departments of this university. The 69 EFL learners used the platform to learn English, and then completed the questionnaires. Four of the participants were interviewed for the following qualitative research.

3.3 Data Collection and Analysis

This study was conducted in a mixed-method approach including quantitative and qualitative parts. A total of 69 participants in the study volunteered to respond to the questionnaires online, and all of them completed the questionnaires anonymously. In addition, four participants were interviewed. Data analyses involved the following three phases. First of all, the construct reliability of the two questionnaires was conducted and the related descriptive data were reported. Then, learners' responses to open-ended questions of the questionnaires were analyzed. Finally, the interview data were analyzed.

4. Results

4.1 Quantitative Results

4.1.1 The reliability analysis of CLEVE survey

Corresponding to the previous studies (Cheng, 2018), the results showed that there were seven factors generated with a total of 30 items. Table 1 demonstrates the mean and standard deviations for each item of the CLEVE survey, as well as the details of these items. The reliability coefficients for these factors were 0.97 (Presence, P), 0.95 (Attention, A), 0.94 (Motivation, M), 0.95 (Extending, E), 0.93 (Understanding, U), 0.92 (Interaction, I), 0.87 (Obstructing conventional learning, OCL), and 0.96 (Diminishing imagination, DI). The alpha coefficient of this study was around 0.87-0.97. Accordingly, these factors were considered to be sufficiently reliable to assess the students' conceptions of learning English in the VR-supported environment. It should be remarkable that the factors of the CLEVE survey were divided into the two categories of positive and negative conceptions. Table 1 demonstrates that the students' rating scores on the factors of positive conceptions are all higher than 3.7 points, indicating that the students of this study generally exhibited positive attitudes toward the VR-supported environment. Among their positive conceptions, they showed stronger conceptions of learning regarding increasing presence that learners experienced in the 'SE in VR'.

Table 1. The Descriptive Data and Reliability Analysis of the CLEVE (n=69).

Factors, specific items and descriptive data	Mean	S D	Factors, specific items and descriptive data	Mean	S D
I think learning English in the SE in VR is to			Factor 5: Understanding: Cronbach's Alpha =.93		
Factor 1: Presence: Cronbach's Alpha =.97			U-16 understand English knowledge in more depth.	3.93	.83
P-1 engage students in English language learning and apply it into the real scenes.	3.9	.84	U-17 increase understanding of language learning.	3.88	.80
P-2 help students learn and apply English from 3D perspective.	3.94	.84	U-18 deepen the understanding of cross-cultural communication.	3.90	.79
P-3 increase the feeling of being in real scenes.	3.96	.88	Factor 6: Interaction: Cronbach's Alpha =.92		
Factor 2: Attention : Cronbach's Alpha =.95			I-19 strengthen the interactivity of communication.	3.78	.80
A-4 attract attention.	3.88	.83	I-20 create the opportunity for students to explore English language learning.	3.84	.82
A-5 enhance attraction of language learning.	3.86	.88	I-21 provide more opportunities to learn actively.	3.83	.77
A-6 strengthen the students' focus on the materials of learning English.	3.83	.92	I-22 provide more opportunities to interact with the situational content.	3.87	.86
A-7 stop students from being distracted when they learn English.	3.78	.94	Factor 7: Obstructing Conventional Learning (OCL): Cronbach's Alpha =.87		
Factor 3 : Motivation : Cronbach's Alpha =.94			OCL-23 break the continuity of learning English.	3.20	1.09
M-8 strengthen motivation of learning English.	3.80	.85	OCL-24 reduce concentration in learning English.	3.12	1.08
M-9 foster interest in learning English.	3.81	.88	OCL-25 make us more willing to communicate with computers.	3.57	1.05
M-10 arouse curiosity in learning English.	3.80	.87	OCL-26 make us not used to learning and applying English in real environment.	3.03	1.08
M-11 enhance interest in real scenes.	3.88	.81	Factor 8: Diminishing Imagination (DI): Cronbach's Alpha =.96		
Factor 4: Extending: Cronbach's Alpha =.95			DI-27 have a negative impact on our imagination.	3.03	1.20
E-12 extend learning content.	3.90	.83	DI-28 reduce our imagination of real interaction.	2.94	1.15
E-13 replenish English knowledge.	3.84	.80	DI-29 prevent us from thinking freely.	2.96	1.14
E-14 enrich the learning materials .	3.91	.84	DI-30 limit our imagination.	2.93	1.20
E-15 provide students with more materials.	3.91	.76			

4.1.2 The reliability analysis of LEVE survey

The results showed that a total of 35 items were presented and further grouped into four factors in Table 2. There were the mean and standard deviations for each item of the LEVE survey, as well as the details of these items. The four factors were 'Cognitive engagement (CE)' ($\alpha = 0.94$), 'Behavioral engagement (BE)' ($\alpha = 0.96$), 'Emotional engagement (EE)' ($\alpha = 0.95$) and 'Social engagement (SE)' ($\alpha = 0.98$). The alpha coefficient of this study was around 0.94-0.98, indicating satisfactory internal consistency of assessing learner engagement in the VR-supported environment. According to Table 2, the students' rating scores on the factors of learner engagement were all higher than 3.2 points, indicating that learners had good engagement in the SE in VR. They were more engaged socially while they reported the least cognitive engagement of the four factors.

Table 2. The Descriptive Data and Reliability Analysis of the LEVE (n=69).

Factors, specific items and descriptive data	Mean	S D	Factors, specific items and descriptive data	Mean	S D
When I learning English in the SE in VR, ...			BE-18 I will stick to them, if I meet difficulties.	3.78	.86
Factor 1: Cognitive Engagement (CE): Cronbach's Alpha =.94			Factor 3: Emotional Engagement (EE): Cronbach's Alpha =.95		
CE-1 I will check the tasks carefully.	3.59	1.08	EE-19 I'm looking forward to participating.	3.84	.90
CE-2 I will think about different methods.	3.30	.94	EE-20 I love to experience new technologies.	3.81	.96
CE-3 I connect things to what I have learned before.	3.65	.94	EE-21 I hope to know what I can learn.	3.90	.84

CE-4 I will reflect what I didn't do well enough.	3.57	1.05	EE-22 I feel happy when doing the tasks.	3.65	.94
CE-5 I don't want to get the answer directly.	3.28	1.01	EE-23 I am not frustrated when doing the tasks	3.41	1.06
CE-6 I like to learn English in this environment.	3.64	.97	EE-24 I find this learning form very interesting.	3.71	.96
CE-7 I try to think hard.	3.61	.79	EE-25 I am willing to try similar projects.	3.74	.98
CE-8 I will think positively and try to challenge.	3.68	.83	Factor 4: Social Engagement (SE): Cronbach's Alpha = .98		
CE-9 I am not satisfying teachers.	3.77	.91	SE-26 I care about the learning content	3.74	.95
Factor 2: Behavioral Engagement (BE): Cronbach's Alpha=.96			SE-27 I feel very excited.	3.70	.96
BE-10 I will focus on learning in the context.	3.75	.88	SE-28 I like meeting new things, not anxious.	3.68	.93
BE-11 I will try to integrate myself into the situation and reflect the problems after the tasks.	3.71	.89	SE-29 I refer to the prompts given by other students or situational tasks.	3.83	.84
BE-12 even if I feel confused at the beginning of participant, I will still try.	3.90	.93	SE-30 I will try to understand the situations and relevant prompts.	3.81	.85
BE-13 I will finish the tasks within stipulated time.	3.61	.94	SE-31 I will try to do the tasks with classmates.	3.84	.83
BE-14 I will share or talk about the experience with students who are not involved in this study.	3.57	1.02	SE-32 I will try to help the students who meet difficulties during the task.	3.84	.83
BE-15 I would like to participate in such VR learning environment projects.	3.65	.91	SE-33 I am very concerned about the ideas and suggestions of others	3.75	.88
BE-16 I will be very focused on learning tasks.	3.75	.99	SE-34 I like to share achievements and ideas.	3.83	.82
BE-17 I will not give up, if I meet with difficulties.	3.75	.86	SE-35 I like to work with others.	3.83	.90

In sum, the quantitative results indicated that learners' conceptions of learning English included eight factors, namely presence, motivation, extending, attention, interaction, understanding, obstructing conventional learning and diminishing imagination, and learner engagement consisted of four factors, namely cognitive, behavioral, emotional and social engagement.

4.2 Qualitative Results

4.2.1 The benefits of the VR-supported environment for language learning

According to the subjective questions and answers in the questionnaire, it was found that 56 students had a good learning experience in the SE in VR. The results of sorting out their comments showed that their good learning experiences in the VR-supported environment were mainly divided into seven aspects. Table 3 shows all kinds of good experiences and examples of students' comments.

Table 3. *The Description of Learning Experiences and Examples of Students' Comments.*

Description of learning experience	Examples of students' comments
Learning many English expressions	"I learned daily expressions in the airport situation."
Learning English in a new way	"It's my first time to learn English in this way."
Improving interests and motivation	"It improved my enthusiasm for learning English."
Applying knowledge into practice	"I can put what I just learned into practice immediately."
Having immersive experience	"The airport is so realistic that I immerse myself in it."
Reducing the difficulty of learning	"It's easier to learn English in simulated situations."
Reflecting on their own shortcomings	"I found my lack of problem-solving ability."

In a word, the study showed that the benefits of the VR-supported environment are not only created an authentic language learning environment, but also provided a new way which can promote motivation, apply knowledge into practice, enhance immersive experience, reduce the difficulty, and test shortcomings. All such benefits can help students to learn English more efficiently and effectively.

4.2.2 The challenges of the VR-supported environment for language learning

Since the SE in VR is still in its developmental stage, some problems encountered during the process. At the same time, corresponding solutions was proposed. As for the system, the computer equipment did not match the software configuration requirements, resulting in system jam, crash and delay. Frequent crash caused the completed task schedule disappeared and needed to be restarted.

"Crashing three or four times caused a bad mood. When I finish eight or nine parts, the system may crash suddenly." (Translated and excerpted from the focus interview transcripts of S4)

"The environment is too complicated. It's a waste of time to find the designated items. I always get Chinese prompt after typing in the contextual interaction." (Translated and excerpted from the focus interview transcripts of S3)

In short, there are still some problems in the VR-supported environment, including technical issues, unreasonable scene design, inconvenient operation and insufficient scaffolding. Students'

solutions are worthy of consideration. Their insightful suggestions are conducive to designing and developing VR-supported environments for EFL learners.

5. Discussion

5.1 Conceptions of Learning English in the VR-supported Environment

In this inquiry, a CLEVE survey was developed to investigate conceptions of learning English among college students in a VR-supported environment. The findings indicated that learners' conceptions of learning English included eight factors. The instrument displayed similar factor structures as revealed by Cheng's work (2018), and it showed satisfactory alpha reliability. The instrument validated in this research could assist instructors and researchers to gain an overall understanding of learners' conceptions of learning English. According to the students' rating scores in the survey, learners generally expressed positive conceptions of learning English while they might not have strong negative conceptions of learning English.

5.2 Learner Engagement in the VR-supported Environment

The present study investigated learner engagement in the VR-supported environment. Corresponding to the previous study of Wang et al. (2016), this study identified that learner engagement consisted of four factors, and showed the reliability of the LEVE survey. Consistent with the recent literature, the findings of this study supported learner engagement as a multidimensional construct (Wang & Degol, 2014). The results of this study demonstrated that learner engagement consisted of four theoretically distinct dimensions, and did not support recent research to regard learner engagement as a continuum (Sinatra, Heddy, & Lombardi, 2015). The multidimensional perspective of learner engagement provided a richer characterization of how learners behave, think, feel, and socialize with others in the SE in VR, rather than exploring each of the dimensions separately (Wang et al., 2016). In this study, learners generally had positive engagement in learning English in the VR-supported environment.

5.3 Benefits and Challenges in Applying VR to English language Learning

Plenty of literature supported the effective use of the VR-supported environment in foreign language learning because of its potential of providing learners with the suitable language contexts and the possibility of enhancing learners' language competences (Lan et al., 2013; Peterson, 2011). The results from this study indicated that the beneficial characteristics of VR helped learners learn English in creating an authentic learning environment and enhancing immersive experience. Immersive simulations made the language contexts more realistic, resulting in heightened involvement and positive learning outcomes (Liou, 2012). Although students encountered many unexpected challenges during the learning process, most students are positive on learning English in the VR-supported environment because of their good learning experience. They hope that the SE in VR can be continuously improved and put into practical teaching.

6. Conclusion

This study investigated learners' conceptions of learning English and learner engagement in a VR-supported environment. The findings indicated that learners' conceptions of learning English in the VR-supported environment included eight factors, namely presence, motivation, extending, attention, interaction, understanding, obstructing conventional learning and diminishing imagination. Learners generally expressed positive conceptions of learning English. The relatively stronger factor of conceptions of learning English was presence, while they tended to consider learning English in the SE in VR as obstructing conventional learning. What's more, learner engagement in the VR-supported environment consisted of cognitive, behavioral, emotional and social engagement. Among their engagements, learners reported more social participation in SE in VR. This study also explored benefits and challenges in applying VR to English language learning and provided suggestions to design and

develop VR learning environments in the future. However, the sample of this research was constrained, so future studies could consider a larger group of students with different background and this study only analyzed a part of the data with the limited time. Follow up studies concerning relationship between conceptions of learning and learner engagement are expected in the future.

Acknowledgements

This research is supported by the Teaching Reform Project of Beijing University of Posts and Telecommunications (2019Y003) and the Project of Discipline Innovation and Advancement (PODIA)-Foreign Language Education Studies at Beijing Foreign Studies University (2020SYLZDXM011).

References

- Cheng, H. K. (2018). Surveying Students' Conceptions of Learning Science by Augmented Reality and their Scientific Epistemic Beliefs. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(4), 1147-1159.
- Choi, B. & Baek, Y. (2011). Exploring factors of media characteristic influencing flow in learning through virtual worlds. *Computers & Education*, (57), 2382-2394.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74, 59-109.
- Fredricks, J. A., Wang, M. T., Schall Linn, J., Hofkens, T. L., Sung, H. C., Parr, A. K., & Allerton, J. J. (2016). Using qualitative methods to develop a survey measure of math and science engagement. *Learning and Instruction*.
- Hsu, T. C. (2017). Learning English with augmented reality: Do learning styles matter. *Computers & Education*, (106), 137-149.
- Lan, Y. J., Kan, Y. H., Hsiao, I. Y., Yang, S. J., & Chang, K. E. (2013). Designing interaction tasks in Second Life for Chinese as a foreign language learners: A preliminary exploration. *Australasian Journal of Educational Technology*, 29(2).
- Liou, H-C. (2012) The roles of Second Life in a college computer-assisted language learning (CALL) course in Taiwan, ROC, *Computer Assisted Language Learning*, 25, 4, 365-382.
- Mikropoulos, T. A., & Natsis, A. (2011). Educational virtual environments: A ten-year review of empirical research (1999 - 2009). *Computers & Education*, 56(3), 769-780.
- Peterson, M. (2010). Learner participation patterns and strategy use in Second Life: an exploratory case study. *ReCALL*, 22(3), 273-292.
- Peterson, M. (2011). Towards a Research Agenda for the Use of Three-Dimensional Virtual Worlds in Language Learning. *CALICO Journal*, 29(1), 67-80.
- Säljö, R. (1979). Learning in the learner's perspective. I. Some common-sense conceptions. *Abstract Reasoning*, (76), 25.
- Sinatra, G. M., Heddy, B. C., & Lombardi, D. (2015). The challenges of defining and measuring student engagement in science. *Educational Psychologists*, 50, 1-13.
- Wang, M. T., & Degol, J. (2014). Staying engaged: knowledge and research needs in student engagement. *Child Development Perspectives*, 8, 137-143.
- Wang, M. T., Fredricks, J. A., Ye, F. F., Hofkens, T. L. & Linn, J. S. (2016). The Math and Science Engagement Scales: Scale development, validation, and psychometric properties. *Learning and Instruction*, 43, 16-26.
- Wang, M. T., Willett, J. B., & Eccles, J. S. (2011). The assessment of school engagement: examining dimensionality and measurement in-variance across gender and race/ethnicity. *Journal of School Psychology*, 49, 465-480.