Virtual Reality as a Pedagogical Tool in English Education: a Systematic Literature Review

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Abstract

The purpose of this systematic literature review was to evaluate the effects of virtual reality (VR) as a pedagogical tool on English education. To explore this, the current systematic review examined the VR based English education empirical studies published from 2012 to 2021 in the academic DB using PRISMA. A literature search yielded 10 publications that were deemed suitable for inclusion. The empirical studies were further examined in terms of publications, participants, VR technologies, VR program, and the effectiveness of VR based English education results. To confirm academic achievement in VR-based English education, a meta-analysis was conducted using data from n=461 in six articles. The results showed that the relationship between VR and English learning is quite positive.
Keywords: English Education, PRISMA, Systematic Literature Review, Virtual Reality

Introduction

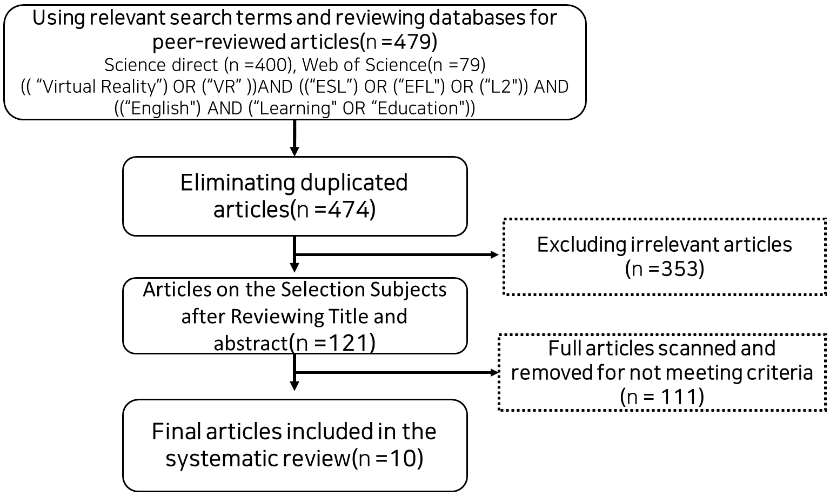
Virtual reality (VR) has received a considerable amount of attention in the recent past as the next generation of educational media for foreign language learning in that it is useful for providing situated context in the learning process and facilitating learner interaction (Radianti et al., 2020; Wang, Petrina, & Feng, 2017). However, it was also mentioned that if VR-based English learning reported in the current study is applied without considering the educational environment or learner characteristics, it would have a negative effect on learners' learning activities (Makransky, Terkildsen, & Mayer, 2019). Therefore, this study aims to present the direction and educational implications of VR-based English education through a systematic literature review.

Research Methods

The literature analyzed in this study are previous studies on VR-based English education published overseas from 2012 to 2021, and Figure 1 shows the process of selecting the analysis target. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Liberati et al., 2009) method was used for literature retrieval and screening. For data analysis and coding, a total of three researchers designed a coding sheet with the agreement.

In the process of selecting a study, 10 studies were finally selected as the target of analysis, excluding studies wherein opinions were not coordinated after consultation between researchers.

Figure 1
Flow chart of the study selection process



Results and Conclusion

An analysis was carried out on the 10 pieces chosen for the final analysis literature. Table 1 summarizes the research subjects and research countries, including the papers used for the literature review.

Table 1
Paper with literature review

No.	Articles	Participant	Country
1	Chen, J. C. (2016). The crossroads of English language learners, task-based instruction, and 3D multi-user virtual learning in Second Life. *Computers & Education, 102*, 152-171.	college student	Australia (EFL student)
2	Yang, F. C. O., Lo, F. Y. R., Hsieh, J. C., & Wu, W. C. V. (2020). Facilitating communicative ability of EFL learners via high-immersion virtual reality. *Journal of Educational Technology & Society, 23*(1), 30-49.	middle school student	Taiwan
3	Wang, Z., Guo, Y., Wang, Y., Tu, Y. F., & Liu, C. (2021). Technological Solutions for Sustainable Development: Effects of a Visual Prompt Scaffolding-Based Virtual Reality Approach on EFL Learners' Reading Comprehension, Learning Attitude, Motivation, and Anxiety. *Sustainability, 13*(24), 13977.	college student	China
4	Tai, T. Y., & Chen, H. H. J. (2021). The impact of immersive virtual reality on EFL learners' listening comprehension. *Journal of Educational Computing Research, 59*(7), 1272-1293.	middle school student	Taiwan
5	Chen, C. H., Hung, H. T., & Yeh, H. C. (2021). Virtual reality in problem-based learning contexts: Effects on the problem-solving performance, vocabulary acquisition, and motivation of English language learners. *Journal of Computer Assisted Learning, 37*(3), 851-860.	college student	China
6	Chen, Y. L. (2016). The effects of virtual reality learning environment on student cognitive and linguistic development. *The Asia-Pacific Education Researcher, 25*(4), 637-646.	college student	Taiwan
7	Alfadil, M. (2020). Effectiveness of virtual reality game in foreign language vocabulary acquisition. *Computers & Education, 153*, 103893.	middle school student	Saudi Arabia
8	Liaw, M. L. (2019). EFL learners' intercultural communication in an open social virtual environment. *Journal of Educational Technology & Society, 22*(2), 38-55.	college student	Taiwan
9	Tseng, W. T., Liou, H. J., & Chu, H. C. (2020). Vocabulary learning in virtual environments: Learner autonomy and collaboration. *System, 88*, 102190.	elementary school student	Taiwan
10	Wu, J. G., Miller, L., Huang, Q., & Wang, M. (2021). Learning with Immersive Virtual Reality: An Exploratory Study of Chinese College Nursing Students. *RELC Journal*, 00336882211044860.	college student	Taiwan

Meta-analysis was conducted on six papers to verify the academic achievement in VR-based English education. Table 2 illustrates the results of the meta-analysis on academic achievement.

Table 2
academic achievement in VR-based English learning

			Estimated Effect Size		Heterogeneity	
	k	*n*	Hedges's *g*	95% CI	*Qr*	I^2(%)
academic achievement	6	462	.647***	[.47~.83]	3.218	.00

Note. *k* = Number of effect sizes, *Qr* = Homogeneity statistics, I^2 = Heterogeneity of effect sizes (%), Hedges's *g* = corrected effect sizes

First, the amount of research using VR technology in the field of English education is continuously increasing, and research by country is as follows. The research was conducted in high proportions within Asian countries (Taiwan: 60%, China: 20%), involving English learners in English-speaking Australia, whereas 10% of studies were conducted in Saudi Arabia on middle school students in their countries.

Second, through the age analysis of learning participants, it was observed that experiments on the university (graduate) students accounted for a fairly high rate of 60%, while no studies were conducted on high school students. The difference was reported to be attributed to environmental factors (content shortage, technical support, etc.) according to the learner's age in the actual learning environment. Considering this in the future, it will be possible to effectively apply the latest technology to the learning environment with a view to reducing the gap between school levels.

Third, the educational effect of the teaching and learning design method was confirmed. In particular, the theory of situational learning is 50% overall, which can be construed to confer many advantages in English vocabulary learning by contextual information. This could be a major theory in designing VR-based English education in the future, and it could be a guide to suggest the direction of studies.

Fourth, the method of using teaching media using VR was examined. Notably, 80% of all studies used commercial programs, and only 40% of HMD was used. In addition, the criteria for media use time according to instructional design remained ambiguous. It is necessary to directly produce the necessary content and to accurately standardize the use of the technology to implement learner-centered smart learning.

Fifth, a method of measuring the educational effect of the teaching medium using VR was examined. All studies identified learners' achievement evaluation, motivation, anxiety, immersion, and reality as self-report questionnaires. As a result of a meta-analysis and confirmation of six articles related to academic achievement, English education using VR exhibited a positive relationship with academic achievement. Therefore, VR-applied learning is expected to be effective in English education in the future.

References

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