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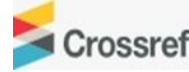
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The Use of Virtual Reality (VR) for Language Acquisition: A Comprehensive Analysis with Scientific and Practical Consequences

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Abstract

Purpose: This study examines VR's suitability for language classes. Despite past research on virtual reality's instructional usefulness, nothing is known about its influence on language acquisition. This research examines VR's usefulness, benefits, and drawbacks in language training.

Materials and Methods: A comprehensive review of 26 2015–2018 scientific papers was c onducted. These papers were selected from 17 respected edtech and CAL magazines and conferences. The examination examined resources, learning settings, study time, advantages and drawbacks, and future research.

Findings: Virtual reality may boost language learning via engaging and immersive experiences, according to studies. Pros include increased engagement and contextual learning; drawbacks include pedagogical challenges and technology limits. The data also reveals aspects that require more study to optimise VR in language acquisition.

Implications to Theory, Practice and Policy: The study's authors recommend further research on virtual reality and language learning. It suggests correcting technological and instructional concerns to improve implementation. To make virtual reality (VR) a feasible tool for language training, future research should improve VR tools, integrate them into curriculum, and measure long-term student learning.

Keywords: *Computer-Assisted Language Learning; 21st Century Skills; Language Acquisition; Immersive Virtual Reality; Pedagogy*

INTRODUCTION

Among technological advancements in education, Virtual Reality (VR) stands out as one of the most intriguing. The technology offers boundless opportunities for researchers to access experiences otherwise impossible, such as interacting with anatomical structures or exploring space. Despite VR's numerous potential benefits in education, some studies highlight the reluctance of instructors and trainers to adopt VR due to its high cost and the technical expertise required. Given the rapid advancements in VR technology, an up-to-date review of its influence on specific fields such as language acquisition would be highly valuable.

Merchant et al. (2014), one of the most recent reviews on VR and language acquisition, emphasized the need to incorporate instructional design principles when developing VR-based courses (Berns & Reyes Sánchez, 2020). Researchers and practitioners must keep up with these fast-paced developments, which are shaping students' learning experiences, and contribute to the growing body of literature on VR and education. By documenting current VR research in language learning from 2015 to 2018, this study seeks to encourage further exploration into VR's role in language acquisition and address the present challenges.

The primary objectives of this extensive literature review are to:

a. Provide an overview of VR technology, the language learning environment, and the time devoted to educational processes.
b. Identify the potential advantages and disadvantages of VR as a teaching tool in language classrooms.
c. Propose future research directions concerning VR in education based on existing literature.

For several important reasons, we limited the review to 2015–2018 papers. First, many studies examined the use of virtual reality (VR) in the classroom, particularly for language instruction. These years saw advances in VR technology and software, making immersive learning tools more accessible and increasing empirical study on their educational potential. Choosing this timeframe allows the assessment to incorporate the most relevant studies when virtual reality technology was available for educational application. As VR advanced from experimental to rigorous, peer-reviewed research, publications issued during this period were more likely to meet high academic standards. Without empirical validation or a focus on theory, prior research was not necessarily suitable for evaluating real-world applications. By limiting the research to these years, we can keep it focused and avoid a flood of information that may dilute the findings. This research offers a good foundation for understanding virtual reality's initial impacts on language learning. More studies are needed to examine improvements achieved after 2018 and their implications.

Methodology

The papers were electronically searched to provide a general overview of VR and language learning, dating from 2015 to 2018. Although VR was proposed earlier (in 2012), this study focuses on the most recent innovations in the field. The systematic review process is summarized in Figure 1. Previous studies, including Parmaxi and Zaphiris's (2017) review of Web 2.0 technologies in Computer-Assisted Language Learning (CALL) and Spolaôr and Benitti's (2017) synthesis of robot applications grounded in learning theories, informed the methodology for this study (Chen, Wang & Wang, 2022).

Figure 1 Process Flow Diagram for This Review (Chen, Wang and Wang, 2022)

Identification of Manuscripts

To construct the VR corpus, articles published between 2015 and 2018 on VR in language education were selected. The corpus included research articles from 15 prestigious journals in the fields of educational technology and CALL, as well as conference papers from the IEEE database. This process was guided by the work of Smith and Lafford (2009), who rated journals based on article quality, impact, and the Google Scholar h-index. Table 1 provides a complete list of highly regarded publications and conferences included in the review.

1.	Computers & Education
2.	British Journal of Educational Technology
3.	The Internet and Higher Education
4.	Journal of Educational Technology & Society
5.	Journal of Computer Assisted Learning
6.	The International Review of Research in Open and Distributed Learning
7.	Educational Technology Research and Development
8.	International Conference on Learning Analytics And Knowledge
9.	Australasian Journal of Educational Technology
10.	International Journal of Computer-Supported Collaborative Learning
11.	IEEE Transactions on Learning Technologies
12.	Language, Learning & Technology
13.	ReCALL
14.	Computer Assisted Language Learning
15.	CALICO Journal
16.	International Conference on Virtual System & Multimedia (VSMM)
17.	International Conference of Educational Innovation through Technology (EITT)

Figure 2 Journals (Familoni and Onyebuchi, 2024)

Terms for Searches

A manual keyword search was conducted across the titles, abstracts, and keywords of each paper to determine inclusion. The terms were divided into two groups:

1. Keywords related to VR: ("virtual environment" OR "immersive environment" OR "virtual reality learning environment" OR "virtual world").
2. Keywords related to language learning: ("language learning" OR "computer-assisted language learning" OR "technology-enhanced language learning").

This search resulted in 34 publications relevant to VR in language learning from 2015 to 2018.

Journal	Number of papers identified in the search	Number of papers meeting inclusion criteria
1. Computers & Education	1	1
2. British Journal of Educational Technology	1	1
3. The Internet and Higher Education	0	0
4. Journal of Educational Technology & Society	1	1
5. Journal of Computer Assisted Learning	0	0
6. The International Review of Research in Open and Distributed Learning	0	0
7. Educational Technology Research and Development	2	2
8. International Conference on Learning Analytics And Knowledge	0	0
9. Australasian Journal of Educational Technology	2	2
10. International Journal of Computer-Supported Collaborative Learning	0	0
11. IEEE Transactions on Learning Technologies	3	2
12. Language, Learning & Technology	8	5
13. ReCALL	14	7
14. Computer Assisted Language Learning	2	2
15. CALICO Journal	2	1
16. International Conference on Virtual System & Multimedia	1	1
17. International Conference of Educational Innovation through Technology (EITT)	1	1
Total	**37**	**26**

Figure 3 *The Total Number of Articles Found in Each Journal/Conference, together with The Number That Were Considered Relevant (Li and Wong, 2021)*

Evaluation and Data Collected

The manuscripts were thoroughly reviewed, with data collected regarding publication identification, reported activities, educational foundations, and evaluation methods. The findings were synthesized following Spolaôr and Benetti's (2017) framework, which offers insight into key areas of research (Lin & Lan, 2015).

Group 1. Publication identification	Group 2. Activities reported in the publication
IE1. Publication title IE2. Publication ID IE3. Year of publication IE4. Authors' name IE5. Students' educational institution IE6. Publication objective IE7. Publication source	IE8. Duration of Virtual Reality activities IE9. Virtual Reality used IE10. Knowledge areas/subjects taught through Virtual Reality IE11. Skills taught through Virtual Reality
Group 3. Educational basis of the publication	Group 4. Evaluation described in the publication
IE12. Learning theory used IE13. Justification for using the learning theory	IE14. Major findings IE15. Future directions

Figure 4 Data Collected (Lin and Lan, 2015)

Several major factors contributed to the decision to evaluate solely 2015–2018 studies. This period saw a rise in interest in VR's educational possibilities, particularly in language learning. Due to broad availability of VR hardware and software advances, empirical study on VR learning aids' pedagogical potential increased. Since virtual reality technology was most advanced in this age, it was great for schools.

Virtual reality had advanced beyond its experimental phase and could deliver rigorous, peer-reviewed research, therefore articles created at this period were more likely to meet high academic standards. Early research was inadequate for evaluating real-world applications due to its lack of empirical validation or conceptualisation. Validity and reliability were ensured by strong exclusion criteria for the selected studies. Exclusion criteria included not publishing in peer-reviewed journals or high-impact conference proceedings, lacking empirical data, or using bad methods. Anecdotal or self-reported evidence without quantitative results is bad technique. By using a strict technique, the reviewers selected only high-quality research. Keeping the research constrained and constant to these years prevents a flood of information that may wash down the findings. This study gives a framework for evaluating virtual reality technology's early effects on language learning. Future research is needed to evaluate development beyond 2018.

Findings

Virtual Reality Applications

Of the 26 articles, 15 used Second Life, while others utilized Open Simulator or customized virtual worlds. Several studies explored VR's use in various educational settings, from universities to elementary schools. English was the most common target language, although other languages such as Spanish, Chinese, and Japanese were also represented.

The duration of VR-based learning activities varied, with most studies employing VR for 1-10 tasks or sessions. Only a few studies used VR for more than 16 weeks.

The Environments in Which Language is Learned

Various educational settings have utilized Virtual Reality (VR) to enhance language learning. The majority of studies (12 out of 26 manuscripts) involved university students, followed by elementary school students (6 out of 26 manuscripts) and vocational training students (5 out of 26 manuscripts). Research focusing on secondary school students (1 out of 26) and early childhood education (1 out of 26) was limited. One study did not specify the educational context in which it was conducted. As VR continues to foster innovation across educational sectors, further research on its application in elementary and secondary schools is necessary to generate findings that are more transferable within the academic community (Schwienhorst, 2019).

Languages Under Investigation

English was the primary target language in the majority of studies (16 out of 26 manuscripts), followed by EFL (12 out of 26 manuscripts), academic English (1 out of 26 manuscripts), and ESL teacher training (1 out of 26 manuscripts). Additionally, the research corpus included an interest in virtual interactions, with four of the twenty-six papers investigating bilingual contexts. A smaller portion of the manuscripts focused on target languages such as Spanish (2 out of 26), Chinese (2 out of 26), Japanese (1 out of 26), and French (1 out of 26).

The Duration of Educational Activities

Regarding instructional virtual reality (VR) activities, most publications employed VR for 1-10 tasks or sessions (IE8). The majority of studies utilized VR for 6-10 activities or sessions (6 out of 26 articles), while 8 out of 26 manuscripts applied VR for up to 5 tasks or sessions. VR was employed for 11-15 weeks in five studies (5 out of 26 papers) and for 6-10 weeks in four studies (4 out of 26 manuscripts). Only two studies (2 out of 26) used VR for more than 16 weeks, while one study (1 out of 26) used it for fewer than 5 weeks. It is important to note that in this research, the total duration of the VR project was considered rather than the specific tasks or sessions within the VR project (Symonenko et al., 2020).
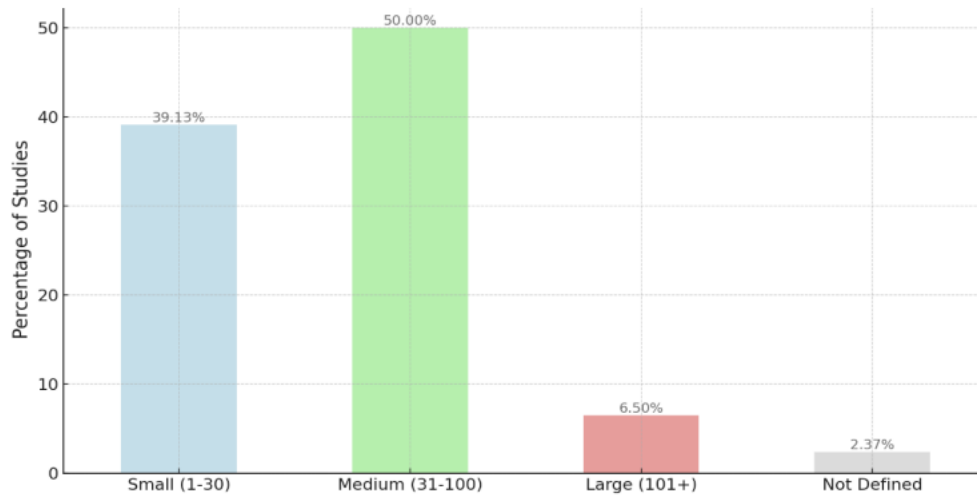
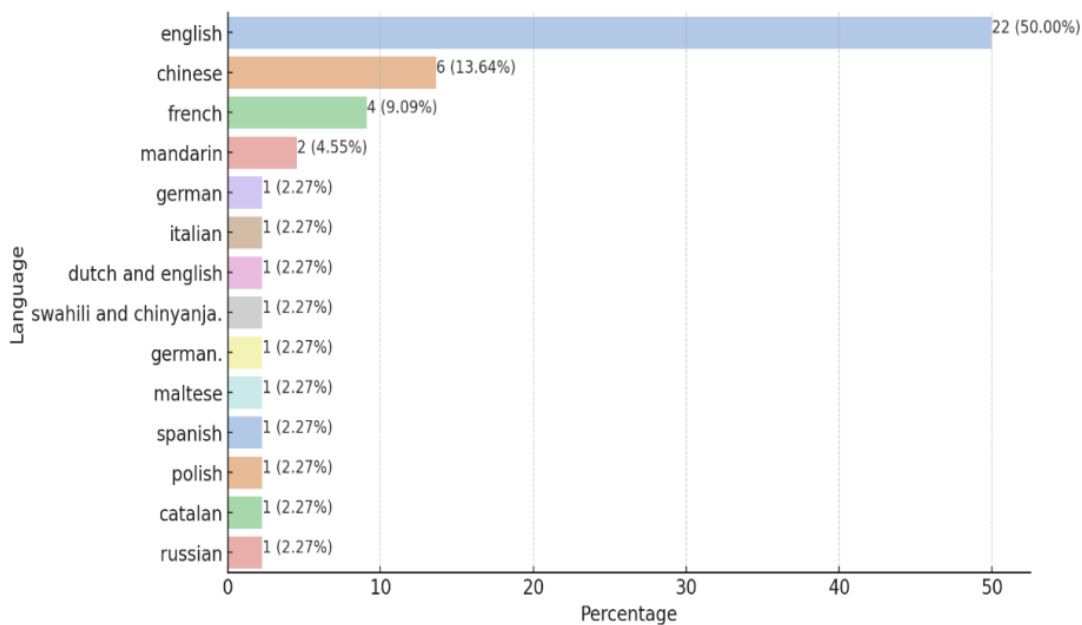*Figure 5 Virtual Reality Applications (Symonenko et al., 2020).*

Figure 6 Languages (Symonenko et al., 2020).

Advantages of Using Virtual Reality in Language Instruction

Virtual reality (VR) offers both positive and negative applications in language education. Many in academic and professional sectors anticipate VR as a technology that could significantly transform teaching and learning. However, it is essential for academics and practitioners to understand the capabilities, constraints, and limitations of VR before fully integrating it into educational programs.

The existing VR research corpus highlights various instances where students' learning and 21st-century skills have been substantially enhanced through the use of VR. For example, Mroz (2015)

found that students improved their critical thinking and language skills by collaborating in a virtual learning environment to solve problems using the target language. Additionally, VR's ability to transport learners to environments and scenarios that are difficult to replicate in traditional classroom settings has been explored. Park (2018), for instance, examined VR as a tool for assessing pilots' English language proficiency. The study demonstrated that participants employed diverse strategies in completing interactive tasks within the virtual environment, and that increased use of cognitive and metacognitive strategies was associated with higher test scores.

Nevertheless, some studies show that VR does not always significantly enhance student learning outcomes. For instance, Tan, O'Halloran, and Wignell (2016) questioned the effectiveness of 3D VR in language instruction, emphasizing the need to address challenges related to computer-assisted language learning (CALL) and the complexity of multimodal learning environments.

Table 4 summarizes the advantages of VR in language education. For example, the virtual world Second Life has been shown to positively impact language learning by reducing foreign language anxiety, enhancing vocabulary, increasing motivation, promoting task engagement, and providing more authentic language evaluation. It also facilitates cultural learning while lowering anxiety levels. Similarly, other virtual environments (such as those created in Open Simulator) can foster student independence and communication skills, enhance the sense of immersion and presence, and promote collaborative project work. However, VR also presents certain challenges, including unreliable technology and a lack of multimodal resources (Berns and Reyes Sánchez, 2020).

VR offers numerous potential advantages, but it must overcome many challenges before it can be widely employed in language training. Complex multimodal learning environments may cause cognitive overload, which is a major concern. Virtual reality language training users must navigate a virtual space, interact with digital items, and do language-based tasks. Language and technological obstacles may make this harder for beginners (Tan, O'Halloran, & Wignell, 2016).

Long-term VR effectiveness studies in language courses are few. Short-term studies demonstrate benefits, while long-term data is limited. Since learning a new language is a continuous process, it is unclear how effectively virtual reality (VR) improves memory, fluency, and real-world application. Without longitudinal studies, it is unclear whether virtual reality (VR) provides long-term benefits for education or if the novelty effect simply a short-term engagement boost. Virtual reality raises ethical and accessibility issues. Inequitable access to high-quality virtual reality technology may limit certain youngsters' educational opportunities. Virtual reality technology, software, and maintenance are too expensive for many schools, particularly low-income ones. Too much time in virtual worlds and on screens might cause digital tiredness and fewer face-to-face social contacts, which are necessary for language learning. Many VR systems record users' voice and interaction patterns, which might be misused if not properly monitored.

Future Directions

A review of the research on VR for language acquisition allows us to draw conclusions and provide suggestions for the future. What follows is an overview of proposed avenues for further study: Task design in the real world: many have pointed out that this is an area that needs further research because of how well it fits with educational theory and practice. For instance, instead of doing mechanical, fill-in-the-gap exercises, students of a language might practice producing real-life output by creating tasks inside a virtual environment that need them to utilize the language.

Additionally, greater focus should be on language usage when teaching a language for specialized academic goals, such as aviation English. Park (2018) has opined that real-life projects in Virtual Worlds (VW) could be developed by way of providing important incentives and motivation to the researchers, language testers, and practitioners of computer-assisted language learning.

The degree to which features of virtual reality (VR) are compatible with the strategies, mental processes, and practices of learners: The need to do more research on the effects of virtual reality's multimodal features, as well as the strategies and language used by students when they are immersed in these settings, has been brought to the attention of researchers. The development of a linguistic meta-cognitive planning tool is still another option. This tool might assist students in selecting the most appropriate online resources for their educational requirements, taking into account their actual skills. Zheng, Schmidt, Hu, Liu, and Hsu (2017) advocate for additional research to be conducted on the cognitive processes that are taking place in a VW to gain a better understanding of how individuals behave in virtual spaces. Furthermore, they encourage researchers to investigate how participants participate in bi-directional exchange in 3D spaces and locations (Familoni and Onyebuchi, 2024).

Ethics are becoming increasingly crucial in virtual reality research, especially in second language learning. As immersive technologies like VR and AR become more widespread in schools, their moral effects must be examined. Informed consent is crucial to ethics. Researchers should recognise the risks and discomforts of virtual reality before testing someone. VR users may encounter extreme sentiments they weren't anticipating, thus this is crucial. The study's aims, duration of VR exposure, and activities must be detailed.

Another important issue is participants' mental health. Due of its lifelike perceptions, virtual reality (VR) may trigger anxiety or cognitive overload among newcomers. Researchers must assure participants' comfort and provide them opportunities to quit if they feel uncomfortable. Privacy and secrecy are also ethical issues in virtual reality research. Participants' eye movements, body responses, and other sensitive data are recorded by the gadget, requiring strong privacy standards. To reduce sensitive data leaks, develop appropriate data management practices. Finally, ethical discussions should include virtual reality's long-term implications on language development. As virtual reality technology grows, ethical debates must continue to enhance benefits and minimise harm. Field study findings are more trustworthy and dependable when researchers follow ethical norms that protect participants.

Conclusion

Between 2015 and 2018, this study investigated the role of virtual reality (VR) in language acquisition. After extensive review, 26 papers were selected to form the VR corpus. This synthesis highlights the potential of VR to enhance language learning and instruction, as well as to support non-linguistic skills such as autonomy, cultural awareness, and collaboration, which are essential for contemporary students. The findings reveal that immersive VR is rarely utilized in language acquisition, underscoring the need to advance beyond technologies that do not offer complete immersion. To optimize the use of these technologies in educational settings, it is crucial to align their capabilities with established learning and pedagogical theories.

The advancement of VR technology promises increasingly engaging educational experiences. For example, head-mounted displays enable users to engage with virtual worlds through spherical

video-based virtual reality (SVVR) applications, which utilize 360-degree videos or photographs. Chien, Hwang, and Jong (2020) found that integrating SVVR systems with peer assessment methods led to improvements in students' English performance, motivation, and critical thinking skills. Similarly, Sun, Pan, Wan, Li, and Wu (2018) reported enhancements in students' critical thinking abilities when exposed to SVVR environments.

The evolving capabilities of VR present numerous opportunities for language educators to explore. This study contributes to the body of knowledge by demonstrating VR's growing potential in language instruction. Future research and practice should focus on ensuring that VR features are grounded in sound pedagogical principles, align with learners' strategies and cognitive processes, explore under-researched areas such as writing, reading, cultural awareness, and critical thinking, and employ both affordable and fully immersive virtual technologies.

Recommendations

Virtual reality (VR) may increase language learning when incorporated into existing curricula, but educators and lawmakers should consider many critical factors before using VR in real-world classrooms.

First, teachers need professional development to utilize VR technology in the classroom. Professional development programs that highlight VR-integrated teaching techniques and VR's technological components could help educators get comfortable with VR headsets and software. Second, the program should match language education standards and curricula. Policymakers should make creating VR content that meets this bill simpler. VR content suppliers and curriculum makers may collaborate to improve teaching methods and meet learning objectives. Test Runs: Schools should conduct VR language education tests to verify its efficacy. Starting with little projects and getting feedback may help teachers improve their approaches before implementing them. Practical classroom experiences influence this deliberate approach to changes and improvements. Include group projects and other student-teacher collaboration in virtual reality (VR) classes to encourage collaborative learning. These interactions may mimic actual conversations and cultural exchanges, which are crucial for language acquisition. Embracing Contrast in VR: Schools should find VR programs that teach all four language skills. Immersive narrative, virtual language exchange partners, and interactive settings may meet various learning needs.

Evaluation and Criticism Processes: Virtual reality tools must be evaluated for language proficiency improvement. Teachers should give feedback in virtual reality to assist students study. Include Parents and the Community: Ask parents and community members about VR in the classroom and seek their support. Open houses or demonstrations may help stakeholders comprehend the technology's benefits and create a learning environment. These proposals may help educators and policymakers integrate VR into curricula to improve language learning for a globalized culture.

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