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Mapping the intellectual landscape of VR-supported English learning: trends, gaps, and research frontiers

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Abstract: Despite the growing body of literature and the increasing interest in virtual reality-assisted English learning, a comprehensive understanding of the key research clusters, influential studies, and existing gaps within this field remains scarce. This study aims to map the scholarly landscape of VR-supported English learning through a bibliometric co-citation analysis of publications indexed in the Scopus database between 2020 and 2026. Using the PRISMA framework, 56 relevant studies were selected and analyzed with VOSviewer and Litmaps to identify influential authors, collaboration patterns, keyword co-occurrences, and thematic clusters. The results revealed major themes related to higher education, learner motivation, willingness to communicate, intercultural competence, vocabulary acquisition, and immersive experiences. However, there are insufficient longitudinal studies, limited research on the inclusive aspects of VR-assisted language learning, and underexplored new VR types, such as XR, the Metaverse, and AI-enhanced VR applications. The study provides a roadmap for researchers and English instructors seeking to integrate VR technology into teaching.

Keywords: virtual reality; language Learning; EFL; ESL; systematic literature review; co-citation analysis

1. Introduction

Over the past years, research in VR-supported language learning has expanded significantly, resulting in a growing body of literature. Despite the growing interest and substantial research volume in this field, a comprehensive understanding of the key research clusters, influential studies, and existing gaps remains limited. Bibliometric analyses of the VR-assisted English learning research are insufficient. There were a few papers published, but they were not specifically focused on VR - assisted English learning research. For instance, Xiong (2024) conducted a bibliometric analysis of 430 papers published between 2003 and 2023 and examined VR-based language learning in the general sense. Tamra et al. (2026) analyzed 386 Scopus-indexed documents, covering the years 2010 - 2025. However, along with VR, there were papers selected focusing on AR. Thus, the significance of this study lies in its attempt to provide a more precise and in-depth analysis of the VR-assisted English learning research field, assisting researchers in navigating the vast body of literature and identifying potential directions for future studies. *The purpose* of this study is to identify the main international trends and scientific knowledge in VR-assisted English learning research, through a bibliometric analysis of publications in the Scopus database from 2020 to 2026. To guide this study, the following research questions have been set:

RQ 1. Which studies and authors have had the most influence on the development of this field?
RQ 2. What are the major research clusters in VR-supported language learning based on Co-Citation Analysis?
RQ 3. What trends and gaps exist in the literature, and how can future research address these gaps?

2. Literature review

One of the problems with working in the digital technologies field is a dense thicket of terminology that may be confusing. Smart et al. (2007) described VR as a system designed to stimulate real-life experiences by providing topography, movement, and physics, which can create an illusion of "being there". A widely accepted classification of VR technology was proposed by Kaplan-Rakowski et al. (2023) based on discussions of other researchers (E. A.-L. Lee & Wong, 2014; Makransky et al., 2021). According to them, there are two main types of VR: Low immersion VR (LiVR) and High immersion VR (HiVR). The first one was defined as "a computer-generated three-dimensional virtual space experienced through standard audio-visual equipment, such as a desktop computer with a two-dimensional monitor" (Kaplan-Rakowski et al., 2023). Interactions in LiVR happen through keyboard and mouse manipulations, therefore providing lower levels of immersion. The second type of VR is defined as "a computer-generated 360-degree virtual space that can be perceived as being spatially realistic, due to the high immersion afforded by a head-mounted device" (Kaplan-Rakowski et al., 2023).

Virtual reality (VR) technology offers immersive and interactive experiences that engage students and focus on learning (Al-Ansi et al., 2023). VR is not just a digital technology; it is an artificial, immersive technology that creates a three-dimensional learning world or learning environment that users can experience in a variety of ways (Kassymova et al., 2019; Surwase et al., 2011; Urazaliyeva et al., 2024). In general, scholars/educators have identified three main types of VR: non-immersive, semi-immersive, and fully immersive (Lu et al., 2025). Non-immersive VR relies on input devices and computer consoles. Users remain conscious of their actual environment during non-immersive VR sessions. In semi-immersive VR, users experience a partially virtual environment where they can explore imaginary content while remaining aware of their surroundings. Fully immersive VR provides users with the most lifelike simulation experience, complete with vision and sound, which requires specialized hardware, such as a Head-Mounted Display (HMD) and haptic sensors. HMD can be described as a device with a small display optics integrated into eyeglasses or mounted on a helmet. They can be wired and wireless. The latest advancements in HMD offer high-resolution content.

One of the main features of VR that attracts researchers is immersion. It is associated with the feeling of being physically present in a non-physical, computer-generated environment and interacting with the world of imagination and exploration (Kassymova et al., 2019). There are three types of immersion: tactical, narrative, and strategic. Another attractive feature of VR is interactivity, which refers to the specific connections made between the users and the digital model. This means that the user can modify both the form and content of communication, which makes the medium interactive. Three levels of interactivity can be identified: with the lowest interactivity, users can only select information; the intermediate level allows the addition of content; and the highest interactivity can cause the VR environment to react properly to the user's input. This means that users can actively manipulate, influence, and engage with the virtual content.

To examine public interest in VR-supported language learning, we analyzed Google search trends related to "VR in education" over the past decade (2020–2026). See Figure 1 for search trends on VR in education (*Explore - Google Trends*, n.d.). The chart represents search interest relative to the highest point on the chart for the given time: a value of 100 is the peak popularity for the term; a value of 50

means that the term is half as popular; and a score of 0 means there was not enough data for this term. The data reveals a sharp increase in interest from the beginning of 2024 to 2025, reflecting growing awareness and adoption of VR technologies in educational settings.

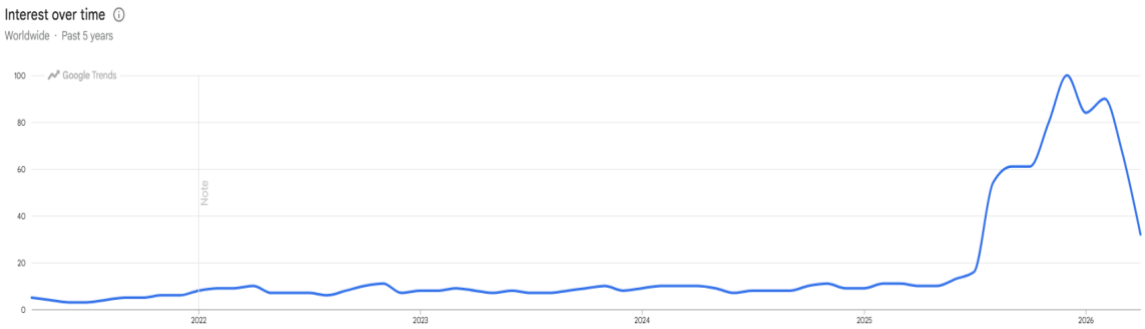

Figure 1. Google Search Trends for "VR in Education" (2020–2026). (*Explore - Google Trends*, n.d.)

The subsequent table and figure have been extracted from the Scopus database. As illustrated, there has been a significant increase in the volume of papers published concerning the subject of VR-assisted English learning over the past five years. In 2020, one article was published; however, this figure surged to three times that amount by 2026. This trend reflects the growing importance of this field.

Year	Documents
2026	7
2025	24
2024	13
2023	10
2022	7
2021	9
2020	1

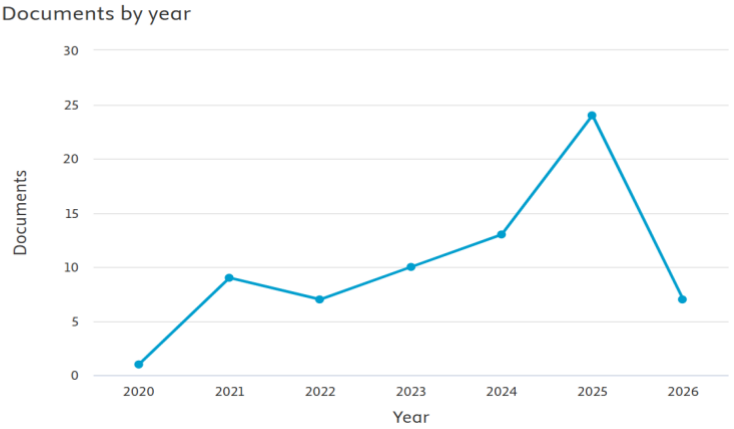

Figure 2. Number of publications on VR in English learning (2020–2026) based on Scopus data. Source: Scopus (2026). Retrieved from https://www.scopus.com

3. Methods

This study employs a co-citation analysis to examine the academic landscape of VR-supported language learning. Co-Citation Analysis is a bibliometric method that identifies relationships between frequently cited works, revealing the intellectual structure and key thematic areas within a research field (Surwase et al., 2011). By analyzing co-citation maps and networks, this study aims to uncover the major research clusters, highlight the most influential studies and authors, and identify existing research gaps.

The Scopus database was chosen for data collection, as it is considered more effective in covering publications in the field of education. The study period covers publications on the use of VR-assisted English learning and teaching from 2020 to 2026. A short time range for article selection is justified by the fact that previous studies Tamra et al. (2026) and Xiong (2024) found that there was a sharp increase in the number of publications, reflecting the global expansion of immersive technologies in

education. Publications included in the study were selected according to the PRISMA method. This selection process (Figure 1) and specific inclusion and exclusion criteria (Table 1) allowed only relevant and high-quality publications to be included in the study.

Table 1. Inclusion & exclusion criteria

Inclusion	Exclusion
Published between 2020 and 2026	Not in this period
Written in the English language	Non-English
VR-supported English instruction content	No VR and English language instruction-related content

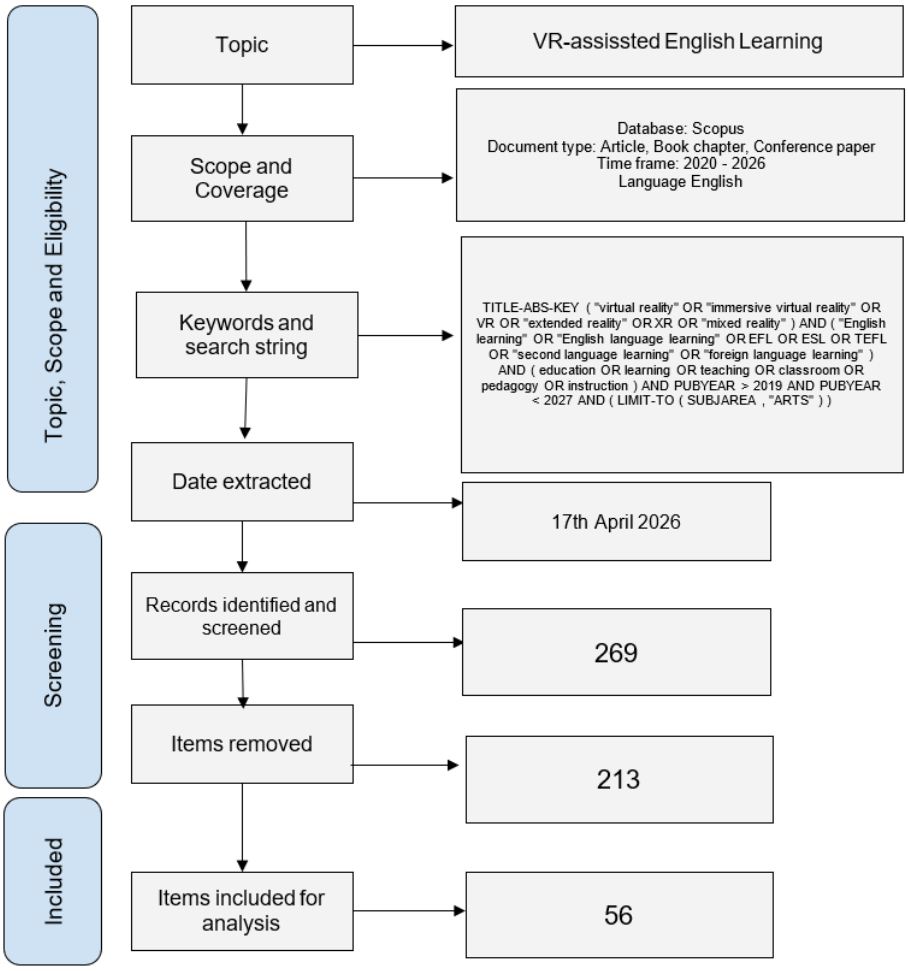

Figure 3. PRISMA 2020 flow diagram

A preliminary search in the Scopus database identified 269 publications. As a result of the initial screening of titles and abstracts, 198 publications were excluded from the research, as they were not related to the VR-assisted English learning. As a result, 56 publications were selected for the bibliometric analysis. In a bibliometric analysis, what is important is not just the sheer volume of material, but also identifying the structure of the research field and revealing scientific connections (Donthu et al., 2021), Thus, the relatively small number of publications selected for the study is not a hindrance to the quality of the research or the results of the analysis, as it aligns with the study's objective.

The final selected data was exported from the Scopus database in CSV format. Litmaps and VOSviewer software were used to construct bibliometric network maps and analyze scientific collaborations. The bibliometric analysis methods used enabled the identification of research areas, key topics, scientific collaboration networks, and connections among authors.

4. Results and discussion

RQ 1. Which studies and authors have had the most influence on the development of this field?

Analysis of publication activity by country revealed the geographic distribution of research focus and collaboration links between authors (Figure 4). As can be seen from the map, China is the leading country in terms of the highest number of publications being published (n = 7). Moreover, its central position on the map shows a high level of scientific connections with other countries. This finding is consistent with previous bibliometric analyses (Xiong, 2024), where China was identified as the leading contributor. However, the ranking of the remaining countries is different. The top countries mentioned were China, the United States, the United Kingdom, Singapore, Germany, Italy, and Canada. While in this study, Canada, Jordan, Pakistan, and Saudi Arabia hold the next positions after China. Overall, the results showed that research papers were mainly published in developed countries, and the total link strength between countries revealed that scientific collaboration has developed at uneven levels.

Figure 4. Co-Authorship country network in Virtual Reality-Assisted English Learning Research. Retrieved from VosViewer

In bibliometric analysis, the number of citations is one of the main features illustrating the relevance of the paper and its contribution to theoretical and practical knowledge. Thus, for a clearer and exact identification of mostly cited papers in the VR-assisted English learning research, a literature map has been created with the help of the LitMap platform. This allowed for in-depth screening of the articles, and all papers were tagged based on their content. Thus, two main tags emerged as a result: orange nodes represent studies that employed different types of literature review (n = 15), and green nodes refer to all empirical studies (n = 41). See the Table 2 for article details and the exact number of citations.

Table 2. Article details and citation number

No	Type of the research paper	Purpose	Participants	Citations	Ref.
1	Empirical	Examined the effect of VR via mobile-rendered HMDs on EFL learners' vocabulary learning.	Seven graders	230	(T.-Y. Tai et al., 2022)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
2	Empirical	Examines how the integration of VR technology into PBL contexts affects students' motivation for, problem-solving during, and vocabulary acquisition in learning English as a foreign language (EFL).	University students	182	(C. H. Chen et al., 2021)
3	Empirical	Investigate the effects of technology-enhanced learning on reducing EFL learners' Public Speaking Anxiety.	University students	140	(Y. chen Chen, 2024)
4	Mixed method, Independent and paired sample t-test	Investigation on the impact of a virtual reality (VR) tool on Iranian EFL learners' willingness to communicate (WTC) and oral proficiency.	University learners	115	(Ebadi & Ebadijalal, 2022)
5	Performance pretest, posttest, and delayed posttest; Questionnaire	Investigate the effects of virtual reality (VR) and personal computer (PC) gaming on language learners' vocabulary learning, as well as their affective perception.	High-school students	107	(Lai & Chen, 2023)
6	Mixed-methods explanatory sequential design	Examined the incorporation of Google Earth Virtual Reality (VR) into English Learners' (ELs) expository writing experiences from a Funds of Knowledge perspective.	Middle school learners	97	(Y. Chen et al., 2020)
7	Quantitative experimental study	Investigated the effect of VR on foreign language anxiety (FLA) in public speaking practice.	Intermediate English learners	63	(Kaplan-Rakowski & Gruber, 2023)
8	Pilot-study (3-month)	Examined how VR environments can be used effectively with kindergarten to grade 12 students.	10-11-year-old EFL students in Spain	43	(Dooly et al., 2023)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
9	Mixed-method study	Examined the impact of situated learning on learners' English-speaking performance, specifically in areas of fluency, vocabulary, pronunciation, and grammar, and explores learners' perception of the instruction based on the situated learning approach.	first-year English majors at a university	40	(Yan et al., 2024)
10	Conference plenary, Narrative review	How immersive virtual reality (IVR) could be used for second language learning by allowing learners to virtually travel around the globe via headset.	-	36	(Chun et al., 2022)
11	Narrative literature review	Paper looks at opportunities and challenges in the use of extended reality (XR) for second language learning.	-	33	(Godwin-Jones, 2023)
12	Qualitative, exploratory study	Unveils language teachers' perceptions of XR	Language teachers	27	(Kaplan-Rakowski et al., 2023)
13	Quantitaive	Investigated the potential use of HiVR for coping with FLSA(foreign language speaking anxiety)	University students	22	(Ding, 2024)
14	in-depth qualitative analysis.	The study examined how their different knowledge levels and teaching experiences influenced their integration of technology by analyzing their performance-based tasks in microteaching in an iVR environment.	Pre- and in-service teachers	22	(S. M. Lee & Wu, 2024)
15	Longitudinal case-study	Shows how university students can learn in a self-directed VR environment. It also describes the challenges facing teachers who wish to use VR in their teaching	Students and teachers	20	(Cowie & Alizadeh, 2022)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
16	Quasi-experimental study	This study combines CDBL and VR technology to motivate students to build VR projects and practice speaking English in rich contexts through learning by design	7th graders	19	(Zhao et al., 2024)
17	Mixed methods	Aimed at incorporating a virtual reality (VR) tool (i.e. Google Expeditions) into the writing process of Iranian English as a foreign language (EFL) learners, examining its impact on their writing motivation and performance.	University students	18	(Ebadijalal & Yousofi, 2024)
18	Systematic review	Analyzed 33 studies from 2012 to 2021, focusing on research designs, the role of immersive technologies in English learning, and the theoretical underpinnings of these studies	-	16	(Weng et al., 2024)
19	Experimental study, mixed methods	Investigates the impact of mobile VR on EFL learners' listening comprehension.	7th graders	15	(T. Y. Tai, 2022)
20	Behavioral and electrophysiological study	Tested whether inhibitory control and age of second language acquisition (L2 AoA) have modulating effects	adults	15	(Jiao et al., 2024)
21	Literature review	Provides an overview of the levels of immersion that immersive media educational tools provide in terms of interactivity and immersion	-	14	(Hayes et al., 2021)
22	Longitudinal case study	The study analyzes teachers' perspectives on planning and implementing a VR curriculum.	University lecturers	14	(Bonner et al., 2023)
23	Experiment, mixed methods	Explored the effects of evaluation and feedback in two different video learning environments, i.e. a traditional video technology-based (TVT) and 360VT-based, on learning outcomes.	University students	13	(Shadiev et al., 2025)
24	Quasi-experimental study	Investigated the effects of VR on EFL learners' vocabulary learning.	College students	13	(Luan et al., 2025)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
25	Quasi-experimental study	Explored the effects of VR on English oral proficiency, speaking anxiety, and emotions, as well as students' perceptions.	University students	13	(Hung et al., 2024)
26	Action research	Investigated the influence of story creation on young EFL learners' reading performance.	4-6 graders	10	(Guo & Lan, 2023)
27	Cross-sectional study	Examined the relationships between virtual reality (VR) exposure, communicative confidence, perceived fluency, and foreign language anxiety	University students	7	(Gu, 2025)
28	Comparative eye-tracking study	Identified the topics that are most suitable to be taught using VR in English as a foreign language (EFL) courses.	University students	7	(Bacca-Acosta et al., 2023)
29	Intervention, qualitative study	Examined the affordances of VR when integrated with language tasks to facilitate authentic learning for EFL learners	University students	6	(Hoang et al., 2023)
30	A quantitative true-experimental study	Established Mobile-Assisted Language Learning (MALL) in higher education institutions and enhanced English fluency and accuracy with minimal operation and low maintenance cost; methodologically shortlisted open-source mobile applications based on users' feedback on their user-friendliness, skill levels, content, and options that promote Learners' Autonomy.	University students	6	(Raj & Tomy, 2023)
31	Experimental study	Examined sleep-dependent consolidation effects by comparing learning in a virtual reality (VR) environment and in a traditional picture-word (PW) environment.	College students	5	(Liu et al., 2024)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
32	Qualitative study	Explored the acceptance and knowledge base of English language teaching (ELT) student teachers regarding the incorporation of virtual reality (VR) into oral tasks to promote learner engagement within the framework of task-based language teaching (TBLT).	Pre-service ELT teachers, undergraduate students	5	(Qiu et al., 2025)
33	Literature review	Reviewed the breakthroughs in VR technology, presents some widely used VR applications and their affordances for language education at each stage	-	4	(Yan & Lowell, 2025)
34	process-focused research approach	Revealed some of the ways virtual reality may be used specifically by researchers in writing and communication studies, especially in terms of invention and collaborative practices.	-	3	(Shivener & Caravella, 2025)
35	Literature review	employed a systematic review to delineate the trends in the latest decade (between 2011 and 2023), synthesizing research outcomes, methodologies, loci, participants, treatment duration, and research focuses.	-	3	(Lestiono & Lee, 2024)
36	Mixed methods	Investigated the use of immersive virtual reality (IVR) for language learning with young learners of English as a second language (ESL)	Young learners	3	(Couture-Matte, 2025)
37	Literature review	Discusses the application and rationale of applying virtual reality technology based on gamification thinking in English teaching in higher education contexts	-	2	(Cai et al., 2024)
38	Literature review	Introducing the VR Application	-	2	(Frazier et al., 2021)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
		Analysis Framework to assist educators in scaffolding existing commercial off-the-shelf (COTS) applications for use in classroom activities.			
39	A quasi-experimental, mixed methods	Explored the effectiveness of a VR tool on the development of L2 English learners' oral pragmatic abilities	University students	2	(Akay & Kessler, 2024)
40	Mixed methods	Investigated the use of immersive virtual environments, namely the metaverse, in teaching culture in English as a Foreign Language (EFL) context.	University students	2	(Hwang & Lee, 2024)
41	Sequential explanatory mixed-methods approach	Explored and compared the impact of VR, blended, and conventional listening instruction on EFL learners' listening comprehension and listening motivated behaviour.	Adult learners	2	(G. J. Hwang et al., 2025)
42	Mixed-methods research design	Offered a practical and scalable instructional approach to support the English-speaking development of low-SES learners and promote educational equity through immersive learning experiences.	Secondary school learners	1	(Wang et al., 2025)
43	Explanatory sequential mixed-methods study	Investigated the effects of a virtual reality (VR) application on the development of intercultural communicative competence (ICC) and willingness to communicate (WTC) among English as a foreign language (EFL) learner.	University students	1	(Fathi et al., 2025)
44	Systematic review	Synthesized research on VR in ESL/EFL vocabulary learning within higher education, focusing on demographic, software, and platform trends.	-	1	(Alhawsawi & Alzaid, 2025)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
45	Systematic review	Conducted a systematic review of 57 studies (2013–2025) mapping OCS types, communication contexts, and key variables, and introduced a conceptual model to guide future research and practice	-	0	(Krispin et al., 2026)
46	Mixed methods	Implemented a 16-week experiential learning (EL)-based SVVR intervention to examine its effects on FLCA that resides in four dimensions and on the speaking performance among Chinese EFL learners	University students	0	(Ye et al., 2026)
47	Systematic review	Examines the benefits and challenges of integrating Virtual Reality (VR) into English language instruction in higher education.	Higher education	0	(Rahmanu & Molnár, 2026)
48	Experimental quantitative study	examined how cognitive engagement differs between immersive virtual reality (IVR) and non-immersive virtual reality (NIVR) environments among English as a Foreign Language (EFL) learners in a Tourism English course.	Adult learners	0	(Hsu et al., 2026)
49	Mixed-methods study	Examined how Artificial Intelligence (AI) and Virtual Reality (VR) can be integrated to help encourage fair English language learning in a ssocially basedanalysis framework.	University students and teachers	0	(Talehati, 2025)
50	Literature review	Explored the potential of VR (Virtual Reality) games that incorporate drama education techniques to enhance English language learning for elementary school students in China.	-	0	(Y. Chen, 2024)

No	Type of the research paper	Purpose	Participants	Citations	Ref.
51	Literature review	Discussed the foundations of personalized adaptive learning, explaining its importance for language learners.	-	0	(Cha et al., 2025)
52	Literature review	Investigated the current state and past research on the dynamics of immersive learning technologies in enhancing second language learning competencies via distance learning	-	0	(Mustapha & Karim, 2025)
53	Quasi-experimental quantitative study	Proposed a percentage-based metric: Vocabulary Forgetting Percentage (VFP); evaluated metaverse-based vocabulary learning (VL) effectiveness and also to empirically validate the VFP	Middle school learners	0	(Zhang et al., 2025)
54	Systematic review	Synthesized 48 peer-reviewed studies published between 2019 and 2024 to examine AR/VR applications, implementation strategies, challenges, and learning outcomes within EFL contexts.	-	0	(Esfandiari & Mazharpour, 2025)
55	Quasi-experimental mixed-methods study	Examined the impact of virtual reality (VR) on the pragmatic production of 63 Iranian EFL learners in the realm of requests and apologies.	University students	0	(Morady Moghaddam & Mirfendereski, 2025)
56	An explanatory sequential design of mixed methods	Measured how iVR-based debate impacted PSA, the extent to which PSA and English debating performance differed between face-to-face and iVR-based debates, and the perceptions of two debate modes.	University students	0	(Lestiono & Lee, 2026)

The litmap helped to identify a citation timeline, which shows a developmental trajectory of the VR-assisted English learning. As can be seen on the map, papers published between 2020 and 2022 hold a higher position and are represented by the large sizes of nodes, indicating a strong impact on newer niche and emerging research topics. Recent studies published in 2024-2026 appear on the right side

and are represented by smaller nodes, meaning having fewer citations. This, in turn, reflects a continued development and increasing interest in this field, as more nodes are illustrated on the map.

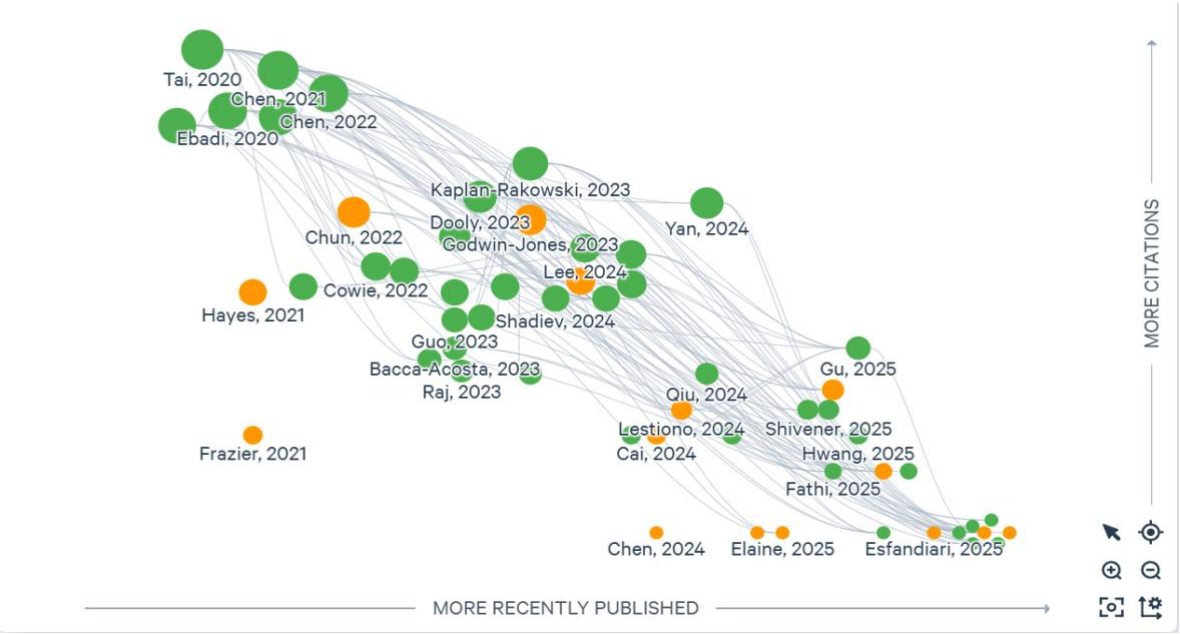

Figure 5. Citation timeline network of publications on VR-assisted English learning research. Retrieved from litmaps.com

An empirical paper by T.-Y. Tai et al. (2022) has the highest number of citations - 230, as identified by the LitMap platform. The authors tried to fill the gap in mobile-rendered HMDs for L2 learning. Specifically, they investigated the effect of VR on the vocabulary learning of forty-nine EFL seventh graders in Taiwan. The findings revealed that the VR players' vocabulary learning and retention were higher than those who watched videos only. Moreover, VR-players reported feeling motivated and engaged when using the VR App.

The second highly cited study is by C. H. Chen et al. (2021) (182 citations), which examined how the VR integration into PBL affects learners' motivation in EFL, namely for problem solving and vocabulary learning. Eighty-four engineering students enrolled in the ESP course were randomly assigned to experimental and control groups. The experimental group was exposed to VR-assisted PBL context, while the control group participated in a PBL context without VR. The results showed that participants from the experimental group significantly outperformed those in the control group in terms of vocabulary learning. Moreover, they were more motivated to learn English. However, no changes were identified in the problem-solving performance among students of the two groups.

Papers published by Y. chen Chen (2024); Ebadi & Ebadijalal (2022); Lai & Chen (2023) are in the top five of highly cited studies, with 140, 115, and 107 citations, respectively. All three studies collectively reported on the positive impact of VR on EFL learning outcomes. The first study revealed that the VR group achieved stronger gains and overall positive perceptions. The next study demonstrated that the use of Google Expeditions VR can enhance learners' willingness to communicate and oral proficiency compared to traditional instruction. The third study showed that VR-supported instruction helped to reduce students' public speaking anxiety. In general, these findings demonstrate a high potential of VR in vocabulary development, speaking performance, and learner confidence.

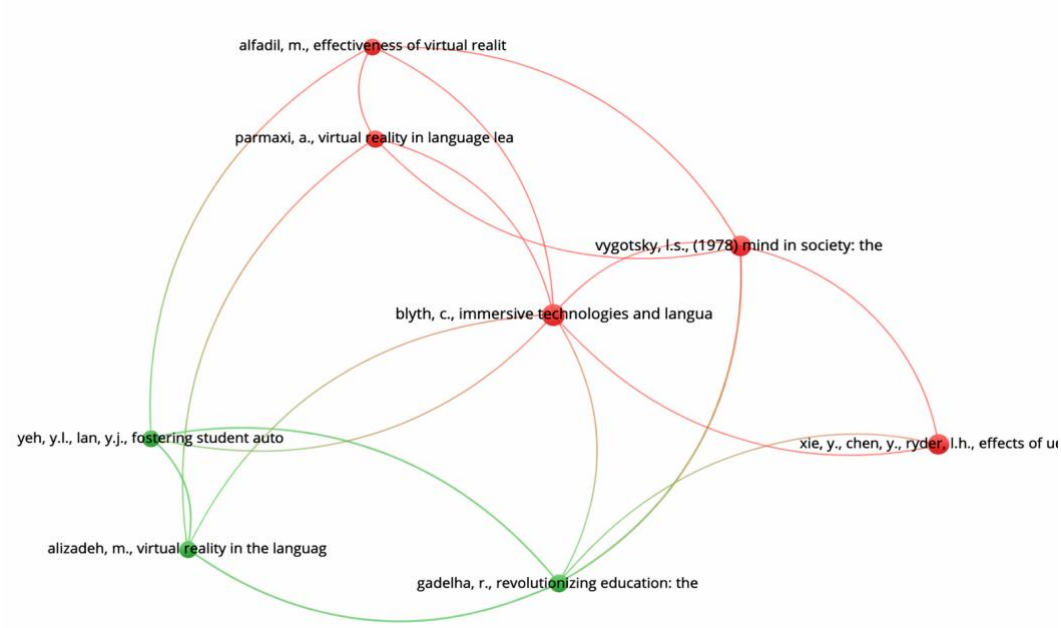

Figure 6. Network of cited references in Virtual Reality-assisted English learning research. Retrieved from VosViewer

Analysis of cited references helped to reveal intellectual foundations in VR-assisted English learning research. There were eight highly cited references identified: Alfadil (2020); Alizadeh (2019); Blyth (2018); Gadelha (2018); Guo & Lan (2021); Parmaxi (2023); Vygotsky & Luria, (1978); Xie et al., (2021). The presence of Vygotsky (1978) demonstrates that sociocultural theory and interaction strongly support VR-assisted English learning research. This indicates that this field is not just technology-driven - it is grounded in educational theory. A paper by Blyth (2018) holds a central position on the map and can be considered as a seminal work in this field, as it has one of the highest citations (289). The article tracked the historical conceptualization of linguistic and cultural immersion through technological applications and explored the challenges of immersive technologies for the field of foreign language education. Parmaxi (2023) systematic review (663 citations) serves as a major synthesis work and is important in consolidating the VR-assisted English learning research field. Another highly cited study (413 citations) is the empirical research by Alfadil (2020), which investigated the influence of VR games on the English vocabulary acquisition of intermediate school students. A quasi-experimental design was implemented to determine the impact of the VR intervention on the learning process over the traditional EFL vocabulary acquisition method.

RQ 2. What are the major research clusters in VR-supported language learning based on Co-Citation Analysis?

The co-occurrence analysis of the keywords helped to identify major trends and gaps in the field of VR-assisted English learning. There were 137 keywords identified from 56 articles used for this paper. This analysis helped to reveal the main research directions based on the frequency of keywords and their interrelationships in the VR-assisted English learning research. Only frequently mentioned keywords were selected for this analysis. The node sizes refer to keyword frequency; lines connecting the keywords mean the appearance of these keywords in the same articles; the distance between the nodes represents the conceptual relatedness. The keyword "virtual reality" (n = 33; TLS = 39) has the highest frequency, thus forming the core of the VR-assisted English learning research field, which is a positive and expected finding. Thus, there were four main clusters formed: green, red, yellow, and blue.

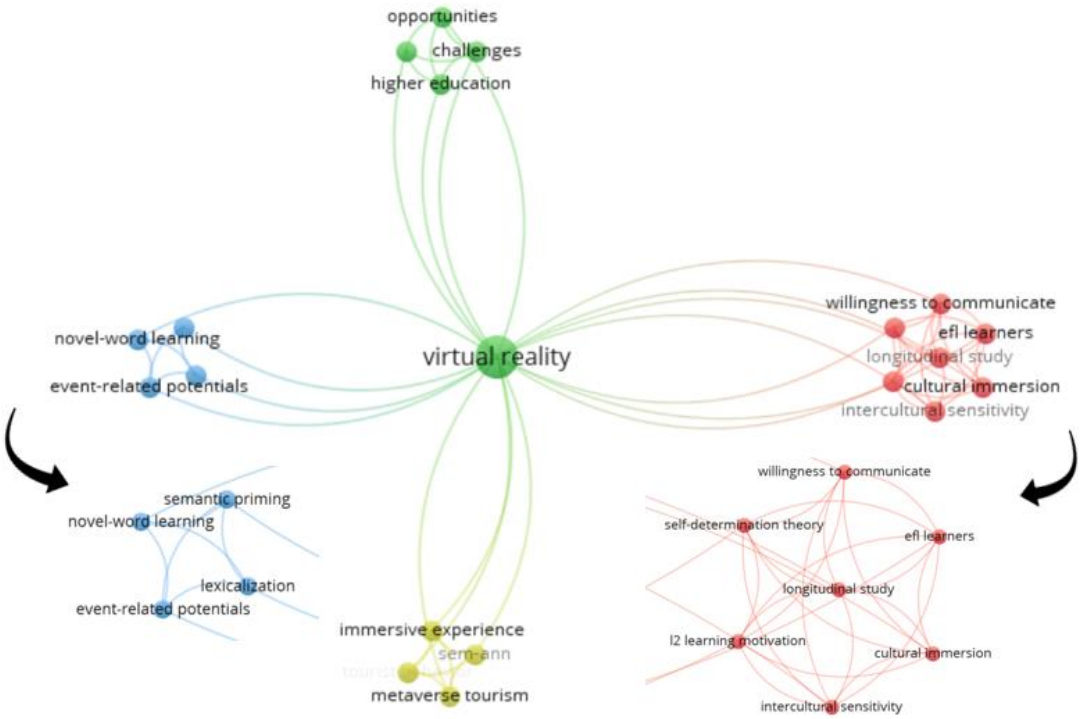

Figure 7. Network of co-occurrence of authors' keywords. Retrieved from VosViewer

The green cluster is formed by words such as higher education (n = 12; TLS = 19), opportunities (n = 7; TLS = 13), challenges (n = 6; TLS = 13), and the English language (n = 25; TLS = 34). This shows that research explores how VR can be integrated into higher education, emphasizing both opportunities and challenges. During the screening process, there were 28 empirical papers identified out of 41, with university students being recruited to participate. As a result, it reveals a gap in research oriented on VR-assisted English learning research in school settings.

The red cluster contains words such as willingness to communicate (n = 7; TLS = 12), EFL learners (n = 18; TLS = 25), cultural immersion (n =6; TLS = 10), intercultural sensitivity (n = 4; TLS = 9), self-determination theory (n = 3; TLS = 7), L2 learning motivation (n = 13; TLS = 21), and longitudinal study (n = 2; TLS = 5). The presence of self-determination theory and L2 learning motivation illustrates an increased focus on learner autonomy, engagement, and intrinsic motivation in VR-assisted English learning research. The keywords as cultural immersion and intercultural sensitivity, reflect the role of VR integration for authentic cultural experiences that improve intercultural competence. Lastly, the keyword longitudinal study refers to the growing focus on sustained VR effects on English learning over time.

The blue cluster illustrates studies focused on the cognitive and psycholinguistic dimensions of VR-assisted vocabulary learning. Appearance of words as novel-word learning (n = 5; TLS = 11) and lexicalization (n = 1; TLS = 4) implies a focus on how English learners acquire, store, and utilize new vocabulary in their lexicon. Semantic priming (n = 1; TLS = 4) is about investigations into how meaning associations and word recognition work during vocabulary learning. Furthermore, event-related potentials indicated the use of neuroscientific methods to measure learners' real-time cognitive responses during vocabulary acquisition tasks. Thus, this cluster shows that VR-assisted English learning research grows beyond classroom settings and focuses on in-depth examination of language processing and vocabulary acquisition mechanisms.

The yellow cluster is formed by the following keywords: immersive experience (n = 4; TLS = 9), metaverse tourism (n = 1; TLS = 3), tourist behaviour (n = 1; TLS = 3), and SEM-ANN (n = 1; TLS = 3) (Structural Equation Modelling - Artificial Neural Network - a hybrid method used in tourism, education, consumer behaviour, and technology adoption studies). This cluster represents emerging topics in VR-assisted English learning research, since words immersive experience and metaverse tourism indicate uses of VR beyond traditional classroom settings. Overall, the new trends can be observed towards interdisciplinary and metaverse-based applications.

RQ 3. What trends and gaps exist in the literature, and how can future research address these gaps?

There is a need for more rigorous work and cross-cultural comparative research to assess the long-term effects and relevance of VR-supported language learning outcomes. Furthermore, research should expand to underrepresented regions, including Central Asia and Africa, to provide a more comprehensive understanding of cultural and contextual influences on VR-supported language learning. Moreover, future studies should investigate the impact of varying levels of immersion and interaction on language acquisition, as well as explore adaptive learning systems using AI-enhanced VR, and the latest innovations, such as the Metaverse and XR.

The focus on students' and teachers' perceptions shows continuous efforts of researchers to understand user acceptance, usability, and learning experiences in virtual environments. This focus aligns with the need to design learner-cantered VR applications that are both pedagogically effective and technologically accessible Caspar (2021); Kaplan-Rakowski et al. (2023); Mahmoud et al. (2020). Moreover, research exploring teacher training, curriculum alignment, and instructional design frameworks is needed to provide valuable insights for the successful integration of VR.

Furthermore, accessibility and inclusivity are still largely overlooked in existing VR – supported language learning. Therefore, research is needed to assess the functionality of VR platforms for students with varying learning needs, including individuals with disabilities, and to create inclusive design guidelines that would promote fair educational experiences.

5. Conclusion

This study has provided a comprehensive analysis of the current state of research in VR-assisted English learning research. Through a co-citation analysis, there were key research clusters, trends, existing gaps, influential scholars, and papers identified within the last years from 2020, selected from Scopus database. The leading authors in this field have been identified to be from China with a collaboration with other researchers from Western and Eastern countries as well. This study offers a roadmap for future research and underscores the importance of emerging types of VR and new approaches in leveraging this technology for language instruction. Despite valuable insights into the evolving landscape of VR-supported language instruction, the study has its limitations. The co-citation analyses often overlook the influence of important qualitative factors. Because it is primarily based on the quantitative outputs, such as citation numbers, publication counts, collaboration patterns, and keywords appearances nevertheless these platforms can overlook the impact of significant factors. For instance, some papers gain high citations due to accessibility options. As scholars tend to refer to works that are publicly available. Moreover, this study could not capture the core meaning of theoretical contributions and educational effectiveness of individual papers. Since this study relied only on one database, some other relevant publications indexed in other databases may be excluded. Thus, the findings should be interpreted alongside qualitative reviews to provide a more in-depth understanding of the field.

Author's declaration

Author contribution

Ulzhan N. Urazaliyeva: Conceptualization, design of the study, data collection, data analysis, writing original draft, editing, grammar validation, and preparation of the final manuscript. **Gulzhaina K. Kassymova:** supervision and proofreading. **Meiramgul Yesbossyn**: editing-draft and proofreading.

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Data availability

The data underlying this study consists of a table with 124 articles retrieved from Scopus and WoS databases, which can be accessed upon request. No secondary data sources were utilized in this research.

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Conflict of interest

The authors declare that there are no conflicts of interest related to this study, including financial or non-financial interests, in the research process, data analysis, or publication of this article.

Ethical clearance

The research was conducted in full compliance with recognized ethical guidelines for research and academic integrity. Due to the specific type of this paper, which was based exclusively on previously published studies in recognized scientific databases, no human participants were involved. Thus, authors did not require ethical approval and informed consent.

AI statement

AI-based tools, including ChatGPT and Grammarly, were utilized to enhance the clarity, grammar, and readability of the manuscript. All suggestions generated by these tools were critically reviewed and verified by the authors to ensure accuracy, relevance, and consistency with the study's content and references. The authors take full responsibility for the final version of the manuscript.

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References

Akay, M., & Kessler, M. (2024). The impact of virtual reality (VR) pedagogy on L2 English learners' oral communication and pragmatic competence. *Language Learning and Technology*, *28*(1). https://doi.org/10.64152/10125/73568

Al-Ansi, A. M., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. In *Social Sciences and Humanities Open* (Vol. 8, Number 1). https://doi.org/10.1016/j.ssaho.2023.100532

Alfadil, M. (2020). Effectiveness of virtual reality game in foreign language vocabulary acquisition. *Computers and Education*, *153*. https://doi.org/10.1016/j.compedu.2020.103893

Alhawsawi, S., & Alzaid, F. (2025). Systematic review of virtual reality's uses on vocabulary learning in higher education. In *Smart Learning Environments* (Vol. 12, Number 1). https://doi.org/10.1186/s40561-025-00414-0

Alizadeh, M. (2019). Virtual Reality in the Language Classroom: Theory and Practice. *Computer-Assisted Language Learning Electronic Journal*, *20*(3).

Bacca-Acosta, J., Tejada, J., Lampropoulos, G., & Avila, C. (2023). A Comparative Eye-Tracking Study Between a Virtual Reality System and a Desktop Environment for Learning the Prepositions of Place in English. *CALICO Journal*, *40*(1). https://doi.org/10.1558/cj.22803

Blyth, C. (2018). Immersive technologies and language learning. *Foreign Language Annals*, *51*(1). https://doi.org/10.1111/flan.12327

Bonner, E., Lege, R., & Frazier, E. (2023). Teaching CLIL Courses Entirely in Virtual Reality: Educator Experiences. *CALICO Journal*, *40*(1). https://doi.org/10.1558/cj.22676

Cai, J., Wang, S., & Zhang, X. (2024). From English learning in classroom to living in the English-speaking country: The impact of virtual reality technology on learners in college English class. In *Addressing Global Challenges - Exploring Socio-Cultural Dynamics and Sustainable Solutions in a Changing World: Proceedings of International Symposium on Humanities*. https://doi.org/10.1201/9781032676043-32

Caspar, S. (2021). Insider spaces: Hands-on with XR in the global languages & cultures room. *CALICO Journal*, *38*(1). https://doi.org/10.1558/cj.41528

Cha, E. E., Ye, Y., Kaplan-Rakowski, R., & Choubey, P. (2025). *Personalized Adaptive Language Learning in AI–Powered High-Immersion Virtual Reality* (pp. 123–158). https://doi.org/10.4018/979-8-3693-5477-3.ch005

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). https://doi.org/10.1111/jcal.12528

Chen, Y. (2024). Chinese primary school students improve English through VR-based drama education games. In *Addressing Global Challenges - Exploring Socio-Cultural Dynamics and Sustainable Solutions in a Changing World: Proceedings of International Symposium on Humanities*. https://doi.org/10.1201/9781032676043-40

Chen, Y. chen. (2024). Effects of technology-enhanced language learning on reducing EFL learners' public speaking anxiety. *Computer Assisted Language Learning*, *37*(4). https://doi.org/10.1080/09588221.2022.2055083

Chen, Y., Smith, T. J., York, C. S., & Mayall, H. J. (2020). Google Earth Virtual Reality and expository writing for young English Learners from a Funds of Knowledge perspective. *Computer Assisted Language Learning*, *33*(1–2). https://doi.org/10.1080/09588221.2018.1544151

Chun, D. M., Karimi, H., & Sañosa, D. J. (2022). Traveling by Headset. *CALICO Journal*, *39*(2), 129–149. https://doi.org/10.1558/cj.21306

Couture-Matte, R. (2025). Immersive virtual reality and language learning: activity theory perspectives. *Computer Assisted Language Learning*. https://doi.org/10.1080/09588221.2025.2497494

Cowie, N., & Alizadeh, M. (2022). The Affordances and Challenges of Virtual Reality for Language Teaching. *International Journal of TESOL Studies*, *4*(3). https://doi.org/10.46451/ijts.2022.03.05

Ding, M. (2024). The impact of high-immersion virtual reality on EFL learners' foreign language speaking anxiety: A mixed-method approach. *ReCALL*, *36*(3). https://doi.org/10.1017/S0958344024000156

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*. https://doi.org/10.1016/j.jbusres.2021.04.070

Dooly, M., Thrasher, T., & Sadler, R. (2023). "Whoa! Incredible!:" Language Learning Experiences in Virtual Reality. *RELC Journal*, *54*(2). https://doi.org/10.1177/00336882231167610

Ebadi, S., & Ebadijalal, M. (2022). The effect of Google Expeditions virtual reality on EFL learners' willingness to communicate and oral proficiency. *Computer Assisted Language Learning*, *35*(8). https://doi.org/10.1080/09588221.2020.1854311

Ebadijalal, M., & Yousofi, N. (2024). 'Take me to a virtual trip if you want me to write better!': the impact of Google Expeditions on EFL learners' writing motivation and performance. *Computer Assisted Language Learning*, *37*(7). https://doi.org/10.1080/09588221.2022.2123001

Esfandiari, S., & Mazharpour, D. (2025). A Systematic Review of Augmented Reality and Virtual Reality Integration in English as a Foreign Language Education. *Applied Research on English Language*, *14*(4). https://doi.org/10.22108/are.2025.144750.2479

Explore - Google Trends. (n.d.). Retrieved April 17, 2026, from https://trends.google.com/explore?q=VR%20in%20Education%22%20%282020%E2%80%932026%29&date=now%201-d&geo=ID

Fathi, J., Zou, D., & Zhaleh, K. (2025). Promoting intercultural communicative competence and willingness to communicate in EFL learners through virtual reality: a mixed-methods examination. *Computer Assisted Language Learning*. https://doi.org/10.1080/09588221.2025.2496827

Frazier, E., Lege, R., & Bonner, E. (2021). Making virtual reality accessible for language learning: Applying the VR application analysis framework. *Teaching English with Technology*, *2021*(1).

Gadelha, R. (2018). Revolutionizing education: The promise of virtual reality. *Childhood Education*, *94*(1). https://doi.org/10.1080/00094056.2018.1420362

Godwin-Jones, R. (2023). Presence and agency in real and virtual spaces: The promise of extended reality for language learning. *Language Learning and Technology*, *27*(3). https://doi.org/10.64152/10125/73529

Gu, L. (2025). Beyond the classroom - exploring the impact of virtual reality exposure on foreign language anxiety with the mediating role of ESL Chinese learners' communicative confidence and fluency. *Humanities and Social Sciences Communications*, *12*(1). https://doi.org/10.1057/s41599-025-05030-4

Guo, S. C., & Lan, Y. J. (2021). Creating an Interactive Virtual Environment for Promoting Tourism English. In *Lecture Notes in Educational Technology*. https://doi.org/10.1007/978-981-15-7579-2_3

Guo, S. C., & Lan, Y. J. (2023). Virtual world-supported contextualized multimodal EFL learning at a library. *Language Learning and Technology*, *27*(2). https://doi.org/10.64152/10125/73508

Hayes, A. T., Dhimolea, T. K., Meng, N., & Tesh, G. (2021). Levels of Immersion for Language Learning from 2D to Highly Immersive Interactive VR. In *Chinese Language Learning Sciences*. https://doi.org/10.1007/978-981-16-3416-1_4

Hoang, D. T. N., Johnson, N. F., & McAlinden, M. (2023). Exploring the potential of VR in enhancing authentic learning for EFL tertiary students in Vietnam. *Teaching English with Technology*, *23*(1). https://doi.org/10.56297/BKAM1691/AMZJ7070

Hsu, L., Chen, Y., & Chuang, L. (2026). Eye-tracking insights into EFL learners' cognitive engagement in VR-based tourism English courses. *Computer Assisted Language Learning*, 1–31. https://doi.org/10.1080/09588221.2026.2631655

Hung, S.-T. A., Chen, W.-J., & Chien, S.-Y. (2024). Virtual reality is not always a cure-all: evidences from a quasi-experiment of EFL business speaking courses. *Interactive Learning Environments*, *32*(8), 4426–4442. https://doi.org/10.1080/10494820.2023.2200811

Hwang, G. J., Rahimi, M., & Fathi, J. (2025). How Virtual Reality Contributes to Enhancing Listening Comprehension and Listening Motivated Behaviour of EFL Learners: A Focus on the Hypothetical Model of Immersive Cognition. *International Journal of Human-Computer Interaction*. https://doi.org/10.1080/10447318.2025.2534067

Hwang, Y., & Lee, S. M. (2024). 'Can we go to Tower Bridge?': teaching British culture from text to immersive realities. *Innovation in Language Learning and Teaching*. https://doi.org/10.1080/17501229.2024.2439406

Jiao, L., Zhu, M., Xu, Z., Zhou, G., Schwieter, J. W., & Liu, C. (2024). An ERP study on novel word learning in an immersive virtual reality context. *Bilingualism*, *27*(1). https://doi.org/10.1017/S136672892300038X

Kaplan-Rakowski, R., & Gruber, A. (2023). The impact of high-immersion virtual reality on foreign language anxiety. *Smart Learning Environments*, *10*(1). https://doi.org/10.1186/s40561-023-00263-9

Kaplan-Rakowski, R., Papin, K., & Hartwick, P. (2023). Language Teachers' Perceptions and Use of Extended Reality. *CALICO Journal*, *40*(1). https://doi.org/10.1558/cj.22759

Kassymova, G. K., Duisenbayeva, S. S., Adilbayeva, U. B., Khalenova, A. R., Kosherbayeva, A. N., Triyono, M. B., & Sangilbayev, O. S. (2019). Cognitive competence based on the e-learning. *International Journal of Advanced Science and Technology*, *28*(18).

Krispin, A., Pluymaekers, M., & Mahr, D. (2026). Enhancing Oral Communication Skills Using VR? A Conceptual Model and Research Agenda. *Business and Professional Communication Quarterly*. https://doi.org/10.1177/23294906261424400

Lai, K. W. K., & Chen, H. J. H. (2023). A comparative study on the effects of a VR and PC visual novel game on vocabulary learning. *Computer Assisted Language Learning*, *36*(3). https://doi.org/10.1080/09588221.2021.1928226

Lee, E. A.-L., & Wong, K. W. (2014). Learning with desktop virtual reality: Low spatial ability learners are more positively affected. *Computers & Education*, *79*, 49–58. https://doi.org/10.1016/j.compedu.2014.07.010

Lee, S. M., & Wu, J. G. (2024). Preparing teachers for the future: Microteaching in the immersive VR environment. *ReCALL*, *36*(3). https://doi.org/10.1017/S0958344024000089

Lestiono, R., & Lee, S. M. (2024). Virtual reality exposure therapy for reducing students' public speaking anxiety: A systematic review. *JALT CALL Journal*, *20*(2). https://doi.org/10.29140/jaltcall.v20n2.1515

Lestiono, R., & Lee, S.-M. (2026). The impact of iVR-based debate on reducing college students' anxiety and improving English debating performance. *The JALT CALL Journal*, *22*, 102637. https://doi.org/10.29140/jaltcall.2026.102637

Liu, C., Mao, Y., Wang, X., Schwieter, J. W., & Jiao, L. (2024). Sleep-dependent consolidation effects on foreign language word acquisition in a virtual reality environment. *Memory and Cognition*, *52*(2). https://doi.org/10.3758/s13421-023-01461-z

Lu, Y., Mi, G., Lu, H., & Wang, Y. (2025). Immersive Technologies in Built Heritage Spaces: Understanding Tourists' Continuance Intention Toward Sustainable AR and VR Applications at

the Terracotta Warriors Museum. *Buildings*, *15*(19), 3481. https://doi.org/10.3390/buildings15193481

Luan, L., Hwang, G. J., Yi, Y., Lu, Z., & Jing, B. (2025). The effects of a self-developed virtual reality environment on college EFL learners' vocabulary learning. *Interactive Learning Environments*, *33*(1). https://doi.org/10.1080/10494820.2024.2344056

Mahmoud, K., Harris, I., Yassin, H., Hurkxkens, T. J., Matar, O. K., Bhatia, N., & Kalkanis, I. (2020). Does immersive vr increase learning gain when compared to a non-immersive vr learning experience? *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *12206 LNCS*. https://doi.org/10.1007/978-3-030-50506-6_33

Makransky, G., Andreasen, N. K., Baceviciute, S., & Mayer, R. E. (2021). Immersive virtual reality increases liking but not learning with a science simulation and generative learning strategies promote learning in immersive virtual reality. *Journal of Educational Psychology*, *113*(4), 719–735. https://doi.org/10.1037/edu0000473

Morady Moghaddam, M., & Mirfendereski, Y. (2025). Pragmatics in a virtual world: improved learning experiences and perceptions of language learners in immersive environments. *Computer Assisted Language Learning*. https://doi.org/10.1080/09588221.2025.2599151

Mustapha, R., & Karim, R. A. (2025). The Dynamics of Immersive Learning Technologies in Enhancing Second Language Learning Competencies via Distance Learning. In *Technology Driven Language Learning: Innovations and Applications* (pp. 221–252). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-77232-0_13

Parmaxi, A. (2023). Virtual reality in language learning: a systematic review and implications for research and practice. *Interactive Learning Environments*, *31*(1). https://doi.org/10.1080/10494820.2020.1765392

Qiu, X., Lopez-Ozieblo, R., & Yao, X. (2025). ELT Student Teachers' Acceptance and Knowledge Base of Integrating Virtual Reality into Task-Based Contexts. *RELC Journal*, *56*(3). https://doi.org/10.1177/00336882241292088

Rahmanu, I. W. E. D., & Molnár, G. (2026). Virtual reality in English language education: A systematic review of opportunities and challenges in higher education. *Acta Psychologica*, *264*, 106358. https://doi.org/10.1016/j.actpsy.2026.106358

Raj, A., & Tomy, P. (2023). Mobile technology as a dependable alternative to language labs and to improve listening skills. *International Journal of English Language and Literature Studies*, *12*(1). https://doi.org/10.55493/5019.v12i1.4702

Shadiev, R., Liu, J., & Yang, L. (2025). The effect of evaluation and feedback in 360-degree video-based VR environments on language learning outcomes. *Computer Assisted Language Learning*, *38*(7). https://doi.org/10.1080/09588221.2023.2300990

Shivener, R., & Caravella, E. (2025). Writing in Virtual Reality: Understanding Invention, Collaboration, and Friction in Hybrid Spaces. *Written Communication*, *42*(3). https://doi.org/10.1177/07410883251328315

Smart, J., Cascio, J., & Paffendorf, J. (2007). Metaverse Roadmap: Pathways to the 3D Web. *Metaverse: A Cross-Industry Public Foresight Project*.

Surwase, G., Sagar, A., Kademani, B. S., & Bhanumurthy, K. (2011). Co-citation Analysis: An Overview. *BOSLA National Conference Proceedings*.

Tai, T. Y. (2022). Impact of mobile virtual reality on EFL learners' listening comprehension. *Language Learning and Technology*, *26*(1). https://doi.org/10.64152/10125/73491

Tai, T.-Y., Chen, H. H.-J., & Todd, G. (2022). The impact of a virtual reality app on adolescent EFL learners' vocabulary learning. *Computer Assisted Language Learning*, *35*(4), 892–917. https://doi.org/10.1080/09588221.2020.1752735

Talehati. (2025). Bridging the Digital Divide: An Analysis of AI and VR Integration for Equitable English Language Education. *European Journal of Social Science Education and Research*, *12*(4). https://doi.org/10.26417/31v0hq49

Tamra, T., Wisda, W., H, M. R., Wanita, F., & Mursalim, M. (2026). Augmented Reality and Virtual Reality in English Learning: Bibliometric Analysis of Research Trends, Citation Patterns, and Future Directions. *Journal of System and Computer Engineering (JSCE)*, *7*(1), 89–100. https://doi.org/10.61628/jsce.v7i1.2472

Urazaliyeva, U., Bekalaeva, A., & Kassymova, G. (2024). Virtual reality-supported education: results of a pilot study on English language. *Bulletin of the Eurasian Humanities Institute, Philology Series*, (3). https://doi.org/10.55808/1999-4214.2024-3.22

Vygotsky, L., & Luria, A. (1978). Mind in society: the development of higher psychological processes. Cambridge, MA: Harvard University Press. *Mind in Society*.

Wang, H. J., Zou, D., Liu, C. C., Wang, Y., & Li, W. (2025). Prompts matter in virtual reality environments? A progressive prompt approach to enhance English-speaking performance in students from low socioeconomic status. *Innovation in Language Learning and Teaching*. https://doi.org/10.1080/17501229.2025.2569488

Weng, Y., Schmidt, M., Huang, W., & Hao, Y. (2024). The effectiveness of immersive learning technologies in K-12 English as second language learning: A systematic review. *ReCALL*, *36*(2). https://doi.org/10.1017/S0958344024000041

Xie, Y., Chen, Y., & Ryder, L. H. (2021). Effects of using mobile-based virtual reality on Chinese L2 students' oral proficiency. *Computer Assisted Language Learning*, *34*(3). https://doi.org/10.1080/09588221.2019.1604551

Xiong, Y. (2024). Virtual Reality in Language Learning: A Bibliometric Analysis from 2003 to 2023. *Journal of Education and Educational Research*, *9*(1). https://doi.org/10.54097/0kxw5h38

Yan, W., & Lowell, V. L. (2025). The Evolution of Virtual Reality in Foreign Language Education: From Text-Based MUDs to AI-Enhanced Immersive Environments. *TechTrends*, *69*(4). https://doi.org/10.1007/s11528-025-01086-w

Yan, W., Lowell, V. L., & Yang, L. (2024). Developing English language learners' speaking skills through applying a situated learning approach in VR-enhanced learning experiences. *Virtual Reality*, *28*(4). https://doi.org/10.1007/s10055-024-01061-5

Ye, Y., Shen, B., Jiang, M. Y.-C., & Jong, M. S.-Y. (2026). Beyond immersion: Investigating the impact of SVVR on FLCA in a Chinese EFL speaking class. *Acta Psychologica*, *264*, 106504. https://doi.org/10.1016/j.actpsy.2026.106504

Zhang, M. M., Hashim, H., & Yunus, M. M. (2025). Evaluating metaverse-based L2 vocabulary learning effectiveness using a proposed metric of vocabulary forgetting percentage. *Frontiers in Education*, *10*. https://doi.org/10.3389/feduc.2025.1641638

Zhao, J. H., Chen, Z. W., & Yang, Q. F. (2024). I do and I understand: A virtual reality-supported collaborative design-assessing activity for EFL students. *System*, *121*. https://doi.org/10.1016/j.system.2023.103213