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A systematic literature review on the use of 360-degree video-based virtual reality in English language education

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Abstract

This systematic review explores the use of immersive virtual reality (VR) based on 360-degree video technology in English language education, focusing on technological tools, pedagogical affordances, and their impact on language learning outcomes. Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework, 30 studies published between 2015 and December 2024 were analyzed. The findings indicate that 360-degree VR environments support vocabulary acquisition, reduce speaking anxiety, and foster learner engagement, especially in productive skills like speaking and writing, due to their interactive and contextual nature. However, results on listening skills were mixed, with some studies noting cognitive overload and distraction in immersive settings. Common tools included head-mounted displays, 360-degree cameras, and platforms like Google Tour Creator, which enabled realistic simulations. Despite these benefits, challenges such as high implementation costs, technical limitations, and the complexity of content creation were noted. Suggested solutions include the use of standardized assessment tools, clearer technical guidelines, and increased institutional collaboration. Overall, 360-degree VR holds considerable promise for enhancing English language learning, provided it is supported by effective pedagogical integration and adequate technical infrastructure.

Keywords: virtual reality; 360-degree video; English language education; immersive learning; language skills; systematic review



Introduction

Modern 360-degree video technologies are often referred to as spherical video-based virtual reality (SVVR) (Shen et al., 2024) that is used to view and create content through 360-degree technologies such as cameras or head-mounted displays (HMDs). These technologies provide an authentic environment that can effectively engage learners, reduce speaking and listening anxiety, and develop vocabulary. By being allowed to interact in different settings using panoramic images (Shadieff & Zhou, 2023; Shi et al., 2024), students can get a sense of presence through multimodal technology.

Scholars have reviewed existing research on the impact and educational applications of 360-degree video technology. For instance, Shadieff et al. (2022) conducted a systematic review of 52 studies published between 2015 and 2020, focusing on the use of 360-degree video in educational contexts. Their analysis examined (1) the tools employed in the reviewed studies, (2) the theoretical frameworks used, (3) the methodologies adopted for data collection, and (4) the reported findings. The review revealed that the most common application domain was medicine and healthcare ($n = 17$). Notably, only 5 of the 52 studies addressed language education, and even these did not provide specific details on how 360-degree video-based VR was implemented, nor did they explore aspects aligned with the scope of the present review.

Evens et al. (2023) examined 26 empirical studies on the design and use of 360-degree videos in educational contexts. Their review focused on common application areas, the reported benefits, and, most notably, the instructional design of 360-degree video-based lessons. The designs were categorized into three subgroups: environments (e.g., natural settings), situations (e.g., human behaviors in specific contexts), and demonstrations (e.g., skill instruction). The authors found that the most frequently represented domains were healthcare (34%) and teacher education (23%). Notably, none of the reviewed studies addressed the use of 360-degree videos in language education.

Rosendahl and Wagner (2024) systematically analyzed 44 studies on the interdisciplinary use of 360-degree videos to explore their potential in educational processes. The review focused on the purposes for which this technology has been applied, the pedagogical benefits it offers, and its technological affordances. The findings revealed three primary teaching and learning purposes: (1) presentation and observation of educational content, (2) immersive and interactive mediation between theory and practice, and (3) facilitation of both external and self-reflection. The most frequently represented disciplines using 360-degree video-based VR were medicine, with nine studies; language education, with eight studies; teacher education, with seven studies; and natural sciences, also with seven studies. However, the study did not provide further details on the use of 360-degree video-based VR in language education, particularly concerning the aspects addressed in the present review.

A review of related studies indicates that the existing literature has primarily focused on the general application of 360-degree video technology in education. However, there is a notable lack of research specifically examining its use in English language teaching and learning. Given the growing emphasis on immersive learning in language education, it is important to investigate how 360-degree video technology can support language acquisition and improve learning outcomes in English language contexts. This gap in the literature underscores the need for further scholarly attention. In response, the present study aimed to explore the application of 360-degree video-based VR in English language education.

To begin with, 360-degree video technology has always been noticed by scholars as a way to facilitate teaching and learning processes in language education. Numerous studies have highlighted the benefits of 360-degree technology. For instance, Rahimi and Aghabarari (2024) noted the significant impact of 360-degree videos as prelistening tasks, helping learners to

memorize new vocabulary and reduce stress during listening activities. Furthermore, it provides an immersive and authentic environment (Shi et al., 2024), real-life world settings, and unlike three-dimensional video, 360-degree videos can give a full sense of presence (Rahmanu & Molnár, 2024; Shadiev et al., 2024a; Shadiev & Zhou, 2023).

Despite these advancements, systematic reviews on 360-degree video-based VR in English language education are still limited. The literature on 360-degree video technology for language learning is expanding; however, there are no studies focusing on how 360-degree videos can be used in teaching foreign languages.

As discussed earlier, existing studies have predominantly focused on general educational contexts and frequently examine traditional VR. Traditional VR typically involves fully computer-generated environments (Rosendahl & Wagner, 2024; Shadiev et al., 2024a) which, while interactive, often lack the authenticity of real-world experiences. In contrast, SVVR leverages 360-degree video footage to depict real objects, people, situations, and scenarios, providing learners with immersive experiences that closely replicate real-life contexts (Shadiev et al., 2024b). This level of realism is especially valuable in language education, where authentic exposure enhances learners' cultural awareness and communicative competence. Although several reviews have addressed traditional VR, they did not account for the unique affordances, pedagogical implications, and practical challenges specific to SVVR. As a result, important gaps remain in our understanding of how 360-degree video technology can be effectively used for language teaching and learning. This systematic review seeks to address these gaps. Our study systematically investigated the application of 360-degree video-based VR in English language education, with a particular emphasis on the types of technologies and tools used, the targeted language skills, educational affordances, instructional approaches, learner activities, participant characteristics, data collection methods, and the challenges and solutions associated with VR's integration.

Investigating these dimensions is essential for understanding the pedagogical potential and practical implementation of 360-degree video-based VR in English language education. While previous research has examined the use of VR in general educational contexts, its specific applications, benefits, and challenges in language learning remain underexplored. Dimensions such as the types of technologies and tools, the language skills targeted, and instructional approaches provide insight into how SVVR is being integrated into real-world teaching practices. For example, tools designed for creating immersive environments or facilitating interaction may vary significantly in language education, where communicative engagement and contextual exposure are key.

Similarly, affordances like immersion, anxiety reduction, or cultural authenticity may influence language learning outcomes differently than in domains like science or healthcare. By focusing on English language education, this review identifies how VR supports skill development, particularly in speaking, listening, and vocabulary acquisition, offering pedagogical insights that may not emerge in broader educational reviews. Understanding the participants' experiences, usage patterns, and learning activities also allows for a more nuanced view of learner engagement and the design of effective VR-enhanced tasks. Moreover, examining the reported issues and solutions offers practical guidance for educators and researchers aiming to adopt VR in linguistically and culturally diverse settings. Although some previous studies have touched on similar dimensions, they did so without the specific lens of language education, thus making this focused analysis both timely and necessary for advancing the field.

In exploring the application of 360-degree video-based VR in English language education, this review places particular emphasis on several key aspects: The technological tools employed, the language skills targeted, the pedagogical affordances provided by immersive environments, and

the instructional approaches adopted across studies. Special attention is given to how 360-degree video technologies afford affective, cognitive, experiential, and interactional benefits for learners, supporting skills such as speaking, writing, and vocabulary acquisition. Additionally, this review critically examines the methodological characteristics of the studies, including sample sizes and assessment strategies, and identifies challenges related to implementation of the technology, instructional design, and learner engagement. By addressing these dimensions, the present review aimed to provide a comprehensive understanding of both the opportunities and limitations associated with integrating 360-degree video-based VR into English language teaching and learning.

Therefore, in the present study, the following research questions were addressed:

- (1) What tools of 360-degree technology were used in the reviewed articles?
- (2) What language skills were improved through the use of 360-degree videos in the reviewed articles?
- (3) What affordances were mentioned in the reviewed articles?
- (4) How did each technology support the mentioned affordances in the reviewed studies?
- (5) What domain was the 360-degree technology applied to?
- (6) What instructional approach was used in the reviewed articles?
- (7) Who were the participants in the reviewed articles?
- (8) What was the duration of the experiments in the reviewed articles?
- (9) What were the findings in the reviewed articles?
- (10) What problems did the researchers encounter in the reviewed articles?
- (11) What are the possible solutions for the reported problems?

Methodology

This review aimed to systematically evaluate the role of virtual reality (VR), specifically 360-degree videos, in teaching and learning English by analyzing relevant empirical studies.

Search Strategy and Data Sources

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework was used to ensure the transparency and replicability of the review process. Three academic databases, namely Google Scholar, Scopus, and Web of Science, were used to identify relevant studies. Guided by previous review studies, a set of search keywords was identified, including “VR,” “virtual reality,” “360-degree video,” “360° video,” “spherical video,” “omnidirectional video,” “SVVR,” “English,” “language,” “teaching,” “learning,” “instruction,” and “education.” These terms were applied across selected databases using Boolean operators (“AND” and “OR”) to retrieve relevant studies published in peer-reviewed journals and conference proceedings.

Study Selection and Inclusion Criteria

Studies were included in the review on the basis of the following criteria.

- (1) *Empirical studies*: Only empirical studies that adopted a scientific research method (e.g., experimental, quasi-experimental, qualitative, or mixed-method designs) and presenting original research data were considered. Therefore, opinion pieces, reviews, or theoretical discussions were excluded.
- (2) *Studies related to VR usage in English learning*: To be included, studies were required to explicitly investigate the use of VR, specifically 360-degree video technology, in the context of teaching or learning English. Relevance was determined according to whether the study focused on language learning outcomes (e.g., vocabulary acquisition,

speaking fluency, listening comprehension) facilitated through 360-degree video-based VR environments.

- (3) *Academic rigor*: The articles were required to be published in peer-reviewed journals or conference proceedings.
- (4) *The scope*: The selected studies had to provide sufficient details on how the technology was used in the learning process and to explore the specific opportunities or advantages provided by VR for English teaching and learning.
- (5) *Timeline*: Only studies published between 2015 and December 2024 were included, ensuring a focus on recent technological developments in immersive VR.

The systematic search process of the study is shown in Figure 1. In total, 1202 records were initially identified (Google Scholar: 251, Scopus: 54, Web of Science: 897). After removing duplicates, 1131 records were screened on the basis of the title and abstract. Exclusion criteria at this stage included: (1) Studies older than 10 years ($n = 315$), (2) review papers ($n = 105$), and (3) studies unrelated to usage of VR in learning English ($n = 711$). Full-text reviews were conducted for the remaining 71 studies. Of these, 41 were excluded for not meeting the inclusion criteria, resulting in a final set of 30 studies, which are listed in the Appendix.

Analytical Framework

To answer the research questions of the study, the researchers developed an analytical framework with the following dimensions.

- (1) *Tools used*: Specific devices such as cameras, smartphones, headsets, or other equipment utilized to implement VR (i.e., 360-degree technologies) in the lessons;

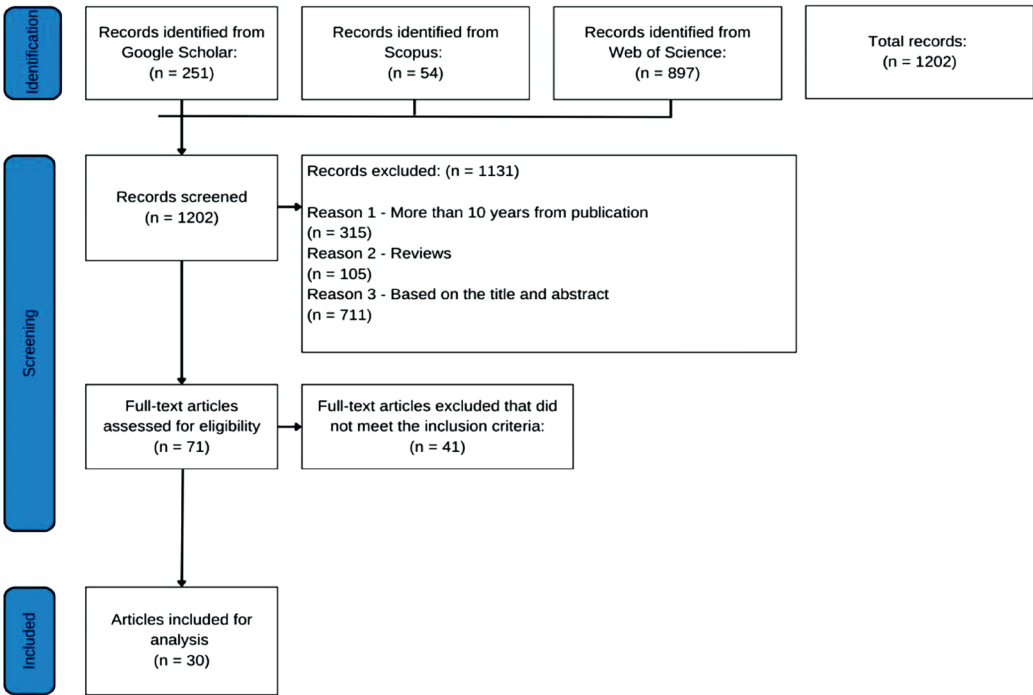


Figure 1. The article selection process.

- (2) Language skills improved: Speaking, reading, writing, listening or vocabulary acquisition;
- (3) Affordances mentioned: The opportunities and benefits provided by the technology, including but not limited to creating authentic content, providing immersive experiences, facilitating language learning, offering learning materials, promoting a sense of presence, enabling interaction with content, increasing motivation, reducing speaking anxiety, improving self-efficacy, or fostering creative tendencies;
- (4) Support for affordances: An analysis of how each technology supported the affordances mentioned in the reviewed studies;
- (5) Domain: The broader context in which the technology was applied, such as education, teacher preparation, or language acquisition;
- (6) Instructional approach: The pedagogical strategies used during the study, such as flipped classroom models, project-based learning, or others;
- (7) Participants: The demographic and contextual details of the study participants;
- (8) Implementation details: The specific methods by which students or teachers employed the technology to achieve the study's objectives;
- (9) Findings: The results reported in the reviewed studies; and
- (10) Limitations and solutions: Any reported challenges encountered in the studies and proposed solutions to overcome them.

Data Coding Procedures

After selecting the articles, the researchers analyzed their content using an open coding approach. This approach enabled them to segment information and identify categories related to the research focus. Two researchers independently read the selected articles, highlighting and coding content according to the predefined analytical framework. The resulting codes were organized into categories, with the properties of each category defined. To ensure consistency, the researchers revisited the reviewed articles to address codes or categories under question, discussing any disagreements until a consensus was achieved. This collaborative process ensured the reliability and accuracy of the analysis while maintaining alignment with the research objectives.

Results

Type of Technology and Tools

The findings revealed that the technologies and tools used for implementing 360-degree video-based VR in English language education can be categorized into four functional groups: (1) tools for creating or editing 360-degree videos/images, (2) tools for acquiring 360-degree content, (3) tools for viewing 360-degree materials, and (4) multifunctional platforms.

Tools for creating or editing 360-degree videos/images. Several studies reported the use of 360-degree cameras to produce immersive video content. Devices such as the Insta360 ($n = 3$), Ricoh® THETA V ($n = 1$), and LG 360 CAM ($n = 1$) were employed to capture panoramic imagery suitable for immersive learning activities. Additional tools included VR media ($n = 1$) and omnidirectional cameras ($n = 1$). Software platforms like EduVenture ($n = 7$) and Google Tour Creator ($n = 2$) were frequently used for editing and enhancing the created content. CASWISE VR ($n = 1$) was another example of a tool designed to support the development of virtual training content.

Tools for acquiring 360-degree content. Educators and learners also made use of existing 360-degree video resources available on public platforms. YouTube 360 ($n = 1$) and Aparat 360

($n = 1$) were the most frequently cited sources for accessing preproduced immersive videos that are relevant to language and cultural learning. These platforms enabled easy integration of authentic multimedia content into instructional settings without the need for original content creation.

Tools for viewing 360-degree materials. To experience immersive content, various viewing devices were reported. HMDs were most commonly used. Among them, Google Cardboard ($n = 2$) appeared most frequently due to its affordability and ease of use. Other devices included HTC Vive ($n = 2$), PICO G2 4K ($n = 1$), Oculus Quest 2 ($n = 1$), Samsung Gear VR ($n = 1$), and VRBOX 2.0 ($n = 1$). Additionally, generic VR headsets ($n = 1$), tablets ($n = 1$), and omnidirectional cameras ($n = 1$) were also reported as alternative viewing tools.

Multifunctional platforms. Some platforms served multiple functions across content creation, interaction, and immersive experience. Notably, EduVenture was identified as a multifunctional platform that supported the creation and editing of 360-degree videos, enabled interactive learning through navigation and multimedia tools, and delivered immersive experiences via various tools such as HMDs (Chen & Hwang, 2020; Chen et al., 2021; Chien et al., 2020). Such versatility makes these platforms particularly valuable for integrated instructional design.

Languages and Skills

According to the results, scholars exclusively targeted English ($n = 30$), focusing on various contexts such as English as a foreign language (EFL), English as a second language, business English, general English, and English for specific purposes. Oral communication ($n = 12$) was the most frequently addressed skill, following by vocabulary ($n = 7$), writing ($n = 6$), listening ($n = 5$), and reading comprehension ($n = 3$). Shi et al. (2024) and Xie et al. (2022) demonstrated significant improvements in oral fluency and practice through immersive VR-assisted learning environments and artificial intelligence-integrated tools. Rahmanu et al. (2023) reported enhanced fluency and articulation during object description tasks in 360-degree video VR. Shah et al. (2024) found that 360-degree videos helped learners develop professional communication skills. The studies by Chien et al. (2020) and Chen et al. (2024) highlighted improved speaking performance and reduced anxiety through peer assessments and VR simulations. Huang et al. (2023) observed that immersive VR boosted conversational engagement and contextual understanding. Yang et al. (2020) noted enhanced communicative ability through task-based VR learning. Smith and Townsend (2021) and Repetto et al. (2023) emphasized the role of collaborative VR tasks in improving speaking interaction. Lin and Wang (2021) fostered creative oral expression through VR-supported projects. Boudouaia et al. (2024) also reported self-directed speaking improvements using VR platforms.

Vocabulary acquisition was another prominent focus. The studies by Chen et al. (2021) and Repetto et al. (2023) demonstrated improved vocabulary recall and retention through the use of immersive 360-degree videos and VR-based problem-solving tasks. Ji et al. (2019) and Chen et al. (2021) highlighted vocabulary gains in listening and speaking tasks using VR. Shen et al. (2024) and Ziyatdinova et al. (2022) reported enhanced vocabulary use in writing and storytelling contexts. Yang et al. (2020) emphasized vocabulary learning during collaborative VR language tasks.

Writing skills ($n = 6$) were targeted by Luo et al. (2023) and Li et al. (2023), who demonstrated enriched writing content, improved organization, and motivation through the use of SVVR environments. Wang et al. (2022) showed that VR-integrated automated writing evaluation enhanced independent writing abilities. Shen et al. (2024) focused on higher engagement and improved cognitive effort in online VR-supported writing classes. Smith and Townsend (2021)

and Lin and Wang (2021) promoted better content clarity and creative expression through the use of VR-mediated writing projects.

Listening skills were studied in contexts such as VR prelistening tasks and immersive audiovisual environments. Rahimi and Aghabarari (2024) reported improved listening comprehension and reduced learner anxiety in VR-enabled prelistening phases. Huang et al. (2023) observed better retention and engagement in listening tasks using immersive VR. Smith and Townsend (2021) integrated listening into collaborative VR science projects. Ji et al. (2019) noted high engagement with 360-degree video-based listening tasks, though no significant skill improvement was reported.

Reading comprehension was less frequently addressed. Liu et al. (2024) demonstrated improved comprehension and metacognitive awareness in VR-mediated reading tasks. Smith and Townsend (2021) and Boudouaia et al. (2024) also reported improved reading fluency and motivation with science-based and self-directed VR modules.

In addition to language skills, other nonlanguage skills, both closely related as well as unrelated skills, were also considered in the reviewed studies. For example, intercultural competence ($n = 2$) was explored in the studies by Rahmanu et al. (2023) and Huang et al. (2023), demonstrating improved cultural interpretation and contextual understanding through VR-based cultural exchanges. Creative self-efficacy ($n = 1$) was targeted by Lin and Wang (2021), who found that VR-supported projects fostered creativity and intrinsic motivation.

Five studies did not focus on specific language skills but addressed related aspects such as users' engagement and motivation, and educational technology. For instance, Peixoto et al. (2023) compared VR and traditional listening methods, finding no skill improvement but increased learner satisfaction. Zhao and Yang (2023) investigated mind mapping-based VR for Chinese language learning, and their research examined effects on intercultural awareness through the use of 360-degree videos. Lobanova et al. (2024) studied the Immerse VR platform's effectiveness in learning efficiency, and Huang et al. (2020) focused on collaborative VR classrooms, emphasizing engagement over explicit skill development.

Affordances and their Support

We grouped the affordances of 360-degree video-based VR in English language education into four thematic categories: Affective and motivational affordances, cognitive and learning affordances, experiential and contextual affordances, and content and interaction affordances. Affective and motivational affordances include increased motivation ($n = 16$), reduced speaking anxiety ($n = 9$), improved self-efficacy ($n = 7$), reduced listening anxiety ($n = 2$), and personalized educational experiences ($n = 1$). Cognitive and learning affordances encompass the facilitation of language learning ($n = 13$), improvements in writing performance ($n = 2$), enhanced comprehension and retention of information ($n = 1$), and the promotion of creativity ($n = 2$). The experiential and contextual affordances consist of immersion ($n = 30$), the provision of authentic contexts ($n = 8$), opportunities for exploring real-world locations and scenarios ($n = 6$), a heightened sense of presence ($n = 4$), and support for cultural learning ($n = 2$). Finally, content and interaction affordances involve the provision of learning content ($n = 8$) and the ability to interact with that content ($n = 8$).

These affordances were supported through various design and implementation strategies. Most notably, immersive experiences and a heightened sense of presence played a central role in enhancing learner engagement. Real-life scenarios were employed to contextualize language use, while safe and low-pressure environments contributed to reducing speaking anxiety. Additional support mechanisms included the creation of student-generated videos, the use of rich multimedia content, interactive dialogues with avatars, vocabulary-focused visual materials, and the provision of personally relevant experiences to stimulate writing tasks.

Domain and Instructional Approach

According to the reviewed studies, various domains (defined as specific instructional or disciplinary areas in which immersive learning is applied) have been identified in the context of 360-degree video-based VR. Among these, the language learning domain was the most frequently addressed. For example, studies have explored the integration of immersive VR into project-based learning to enhance oral English proficiency among business majors (Shi et al., 2024), as well as the effects of passive and interactive immersive VR on knowledge retention and learner satisfaction among B1-level EFL students (Peixoto et al., 2023). Other domains, such as educational technology and cross-cultural communication, were also represented, though less frequently.

Various instructional approaches were employed across the reviewed studies and can be categorized into four thematic groups according to their pedagogical orientation: (1) Experiential and immersive learning, (2) task- and problem-oriented learning, (3) technology-supported and personalized learning, and (4) performance- and feedback-driven approaches. In experiential and immersive learning, several studies emphasized learning through real-world experiences and immersive environments. Experiential learning ($n = 2$) was used to support oral practice in foreign language teaching through immersive VR (Xie et al., 2022) and to enhance descriptive writing skills in SVVR contexts (Luo et al., 2023). Similarly, immersive learning with 360-degree videos ($n = 1$) was implemented to develop the students' oral communication skills (Shah et al., 2024), while SVVR-supported descriptive writing instruction ($n = 1$) enabled students to improve their writing's organization and content through vivid observation experiences (Li et al., 2023). Authentic materials for listening ($n = 1$), such as 360-degree journalism clips, were also used to create realistic listening environments (Ji et al., 2019).

Task- and problem-oriented learning includes approaches where learning occurs through meaningful tasks and real-life challenges. Task-based learning ($n = 2$) involved the use of high-immersion VR to enhance communicative competence among junior high school students (Yang et al., 2020). Project-based learning ($n = 1$) integrated immersive VR to improve oral English skills in business-related contexts (Shi et al., 2024). Problem-based learning ($n = 2$) focused on vocabulary development through VR-supported problem-solving tasks in both primary and elementary education (Chen et al., 2021; Chang et al., 2024). Collaborative learning ($n = 2$) was also featured, using 360-degree videos to support interaction and teamwork in EFL and communication-focused classrooms (Smith & Townsend, 2021; Huang et al., 2020).

Approaches classed as technology-supported and personalized learning leveraged digital tools and immersive media to enable flexible and student-centered learning. The flipped classroom model ($n = 2$) was applied to enhance prelecture preparation through immersive video-based instruction in teacher education and contextual learning environments (Huang et al., 2023; Jong, 2023). Self-directed learning ($n = 1$) utilized 360-degree videos to foster learners' autonomy and independent language acquisition (Boudouaia et al., 2024). Mind mapping-based learning ($n = 1$) combined SVVR with mind mapping strategies to improve language performance and conceptual understanding (Zhao & Yang, 2023).

Performance- and feedback-driven approaches focus on learning through reflection, evaluation, and self-improvement. Peer assessment with SVVR ($n = 1$) was employed to engage learners in evaluating each other's language output using immersive tools (Chien et al., 2020). Automatic writing evaluation with SVVR ($n = 1$) supported writing instruction by combining immersive observations with artificial intelligence-generated feedback to enhance students' writing outcomes (Wang et al., 2022).

It should be noted that while most studies explicitly identified their instructional approaches, three did not specify the pedagogical methods employed. The diverse integration of VR and

related technologies across various domains and instructional designs reflects a growing interest in innovative, immersive learning environments. This diversity highlights the adaptability of VR tools to support a wide range of learning objectives, from improving communication skills to fostering self-directed learning and promoting collaboration. Moreover, some instructional approaches show considerable overlap; for example, experiential learning often intersects with task-based and project-based learning when immersive environments are used to simulate real-life scenarios for problem-solving and language practice. Such overlaps underscore the multifaceted nature of VR-supported instruction, where approaches may blend to enhance learners' engagement, autonomy, and contextual understanding.

Methodological Details about the Studies and their Results

The data shows that scholars frequently recruited fewer than 50 ($n = 11$) participants. There were 11 studies with between 51 and 100 participants, and 6 studies with more than 100 participants. Additionally, two studies did not provide the number of participants.

During viewing 360-degree videos/images, the strategies that the students used included practicing English through interactive VR activities ($n = 4$), engaging in vocabulary recall tasks ($n = 3$), watching 360-degree videos ($n = 6$), and participating in immersive dialogue practice ($n = 3$). Additionally, students observed three-dimensional avatar narration ($n = 1$), completed tasks such as answering questions and recording observations ($n = 1$), and improved listening through vocabulary-focused content ($n = 1$).

In creating 360-degree videos/images, students followed several steps: creating dialogue scripts ($n = 2$), creating 360-degree videos ($n = 6$), producing problem-solving VR videos ($n = 1$), and recording VR-based oral training videos ($n = 3$). Furthermore, students practiced writing based on immersive video prompts ($n = 2$), developed virtual tours of their hometowns ($n = 1$), and created VR video content to enhance their oral skills ($n = 1$). They were also involved in activities like collaborating with peers ($n = 2$) and presenting 360-degree videos to others ($n = 1$). Additionally, students engaged in tasks such as making reservations, purchasing items, and asking for directions ($n = 1$), all of which required the use of VR for practical language use scenarios. VR was also employed to enhance students' creativity and problem-solving abilities ($n = 1$).

Data collection methods included a combination of both quantitative and qualitative approaches. The most frequently used data collection were questionnaires ($n = 19$), interviews ($n = 10$), pre-/post-test formats ($n = 10$), surveys ($n = 3$), reflections ($n = 1$), reflection journals ($n = 1$), quizzes ($n = 1$), and audio recordings ($n = 1$); one study did not provide the data collection methods.

The scholars reported findings such as improved speaking ($n = 7$), reduced speaking anxiety ($n = 4$), improved listening ($n = 3$), the development of creativity ($n = 3$), improved vocabulary acquisition ($n = 7$), improved writing ($n = 4$), improved grammar ($n = 3$), self-efficacy ($n = 1$), cultural competence ($n = 1$), motivation ($n = 7$), engagement ($n = 2$), active participation ($n = 1$), confidence ($n = 1$), comprehension accuracy ($n = 1$), reading ($n = 1$), improved pronunciation ($n = 2$), and improved spelling ($n = 1$).

Reported Issues and Possible Solutions

The reported problems in the reviewed studies can be grouped into three categories: methodology, the implementation of technology, and the learning process. Regarding the methodology, the three most commonly found problems were assessment problems ($n = 3$), short periods ($n = 2$), and a limited sample size ($n = 2$). Key issues within the technology implementation category included the high cost of VR ($n = 5$), technical limitations ($n = 6$), absence of technical

guidelines ($n = 4$), difficulty focusing and orienting ($n = 5$), physical or sensory discomfort ($n = 8$), the limited role of teachers in technology-based learning ($n = 2$), and issues with visual and audio quality ($n = 1$).

Problems related to the learning process were noted and they can be categorized into learner-, teacher-, and institutional-level challenges. Learner-level challenges included low language proficiency ($n = 1$), cognitive disengagement ($n = 3$), and limited skill improvement ($n = 4$), indicating that some students may face difficulties in effectively engaging with or benefiting from VR-enhanced instruction. Teacher-level challenges were reflected in the need for better narrative structures and more effective use of subtitles ($n = 2$), suggesting the importance of instructional design in facilitating comprehension and maintaining engagement. Institutional-level challenges involved the inability to integrate VR into conventional classroom structures ($n = 2$), highlighting systemic barriers related to curriculum alignment, classroom logistics, and administrative support for immersive learning technologies.

Several solutions were proposed in the reviewed studies to address the identified challenges; however, not all problems have been adequately resolved. To address methodological issues such as limited sample sizes and inadequate assessment practices, some studies recommended the use of pretests and baseline assessments ($n = 2$) to ensure more reliable data collection and meaningful comparisons. For challenges related to implementation of the technology, key strategies included the development of clear technical guidelines for using VR ($n = 4$), promotion of institutional collaboration and resource-sharing to reduce cost and access barriers ($n = 4$), and enhancements in ergonomics and comfort to mitigate physical or sensory discomfort during use of VR ($n = 5$). Improvements in technical and audiovisual features ($n = 1$), as well as ensuring compatibility and ease of use through application-level refinements ($n = 2$), were also suggested.

To better address teacher-level challenges, some studies emphasized the importance of educator training and thoughtful instructional design ($n = 2$). In response to learner-level concerns, several studies proposed the use of innovative task designs ($n = 3$) to promote engagement and active participation, along with research-informed recommendations ($n = 2$) to guide pedagogical planning.

However, certain issues, such as low learner proficiency, cognitive disengagement, and difficulties integrating VR into conventional classroom structures, were not sufficiently addressed in the proposed solutions. To bridge these gaps, we recommend differentiated instruction tailored to learners' language proficiency levels, the integration of motivational strategies such as gamification to reduce disengagement, and institutional support for curriculum redesign to accommodate immersive technologies. Furthermore, the development of lightweight, accessible VR platforms and clearer policies for pedagogical integration at the school or university level may further facilitate the sustainable adoption of VR in language education.

Discussion

This systematic review examined VR-supported English learning and teaching as documented in reviewed studies published over the past 10 years. This is in contrast to earlier reviews, which often focused on general educational contexts or traditional VR, leaving gaps in our understanding of the nuanced impact of 360-degree video technologies in language learning and teaching. This systematic review addressed these gaps by systematically analyzing empirical studies.

To provide a comprehensive and structured understanding of how VR technology supports English learning and teaching, this review analyzed 30 selected studies across the following key

dimensions: tools used, language skills involved, affordances and their support, domain and instructional approach, experimental details, data collection and results, and limitations and solutions. The following subsections discuss our key findings, drawing on evidence from the reviewed studies to support the analysis.

Type of Technology and Tools

The findings revealed that technologies and tools used for implementing 360-degree video-based VR in English language education can be classified into four functional categories: (1) tools for creating or editing 360-degree videos/images, (2) tools for acquiring 360-degree content, (3) tools for viewing 360-degree materials, and (4) multifunctional platforms.

In the category of content creation, 360-degree cameras were frequently used by both educators and learners. These cameras, equipped with multiple lenses, enable the capture of panoramic views from all directions, making them suitable for immersive language learning tasks. Their relative ease of use allowed instructors to generate instructional content and also allowed students to actively produce their own learning materials, thereby promoting learner agency and content relevance. For example, in Shi et al. (2024), the students created VR content by collaboratively scripting dialogues, building immersive settings using 360-degree images and videos, recording voiceovers, and producing complete VR videos, which they shared with their peers through QR codes or links for presentation and feedback.

For acquiring existing 360-degree videos and images, educators and learners often relied on publicly available platforms, which host a wide range of immersive videos suitable for language and culture learning. These resources provided convenient access to authentic content without the need for technical production. For example, in Rahimi and Aghabarari (2024), the students obtained 360-degree VR content from platforms like YouTube 360 and Aparat 360, and used the videos as prelistening tasks aligned with textbook themes, engaging in structured activities such as matching and question-answering to enhance their listening comprehension skills.

Regarding viewing tools, HMDs were more frequently employed by learners than mobile phones or tablets. This preference is likely due to HMDs' ability to deliver a more immersive experience at an accessible cost. Google Cardboard, for instance, is a widely used, affordable option. HMDs also allow learners to navigate immersive environments by physically rotating their heads, enhancing the sense of presence. In the study by Shadiev et al. (2021), for example, the learners used HMDs to explore 360-degree videos created by their international peers, gaining insights into their partners' cultural backgrounds and school environments.

Finally, multifunctional platforms such as EduVenture (Chen & Hwang, 2020; Chen et al., 2021; Chien et al., 2020) were commonly used for creating, editing, and enhancing 360-degree content. For example, Chen and Hwang (2020) adopted the EduVenture SVVR approach to provide realistic sociocultural contexts for speaking English among EFL learners. The EduVenture platform is multifunctional, enabling users to create and edit immersive content (e.g., adding 360-degree images, audio, and quizzes), interact with immersive environments (e.g., through navigation, narration, and responding to virtual prompts), and experience VR-based learning through devices like Google Cardboard, allowing both instructors and learners to engage in realistic, student-generated virtual tours for language learning.

Interestingly, the findings indicate that learners more often engaged in creating their own 360-degree content rather than passively consuming pre-existing materials. Although the creation of such content demands substantial planning, filming, and post-production work, it offers a highly contextualized and personally meaningful learning experience. This shift from content consumption to content creation reflects a growing emphasis on learner agency and participatory learning, which aligns with constructivist and experiential learning theories

(e.g., Kolb, 1984). From a pedagogical standpoint, involving students in the production of 360-degree video content fosters deeper engagement, encourages active meaning-making, and promotes the development of higher-order thinking skills such as analysis, synthesis, and creativity.

However, this practice also presents certain limitations. For example, the cognitive load associated with content creation, combined with technical and logistical demands, may detract from the language learning focus, especially for learners with limited digital literacy or lower language proficiency. Additionally, while platforms like EduVenture offer versatile functionality, their use requires significant instructional planning and support, which may not always be feasible in traditional classroom settings. The discontinuation of tools such as Google Tour Creator (Lin & Wang, 2021) further underscores the fragility of relying on commercial or third-party platforms, reinforcing the need for sustainable, educator-friendly alternatives that are pedagogically adaptable and technologically robust.

Furthermore, although this section outlines the functions and applications of various tools, it remains somewhat descriptive in nature. A deeper interpretation of the implications of these practices for instructional design and learning outcomes is needed. For instance, what are the comparative benefits of students creating versus viewing 360° content, and how do these different modes of engagement affect language development? How do immersive technologies support autonomy and self-regulated learning, and what are the risks of over-reliance on technology at the expense of pedagogical coherence? Addressing such questions can help advance the academic discourse beyond technical implementation toward a more theoretically grounded and pedagogically informed understanding of immersive technologies in language education. Therefore, future research should explore how these technologies can be integrated more effectively into pedagogical frameworks, particularly in terms of balancing technological affordances with learners' needs, instructional objectives, and sustainable teaching practices.

Languages and Skills

The reviewed studies demonstrated that 360-degree video-based VR has been widely applied in supporting various English language skills, particularly productive skills such as speaking and writing, which appeared most prominently across the dataset. Notably, oral communication was the most frequently addressed skill, followed by vocabulary acquisition, writing, listening, and reading comprehension. This distribution suggests a research preference for leveraging immersive environments to foster active language use, potentially due to the affordances of VR in simulating real-life communicative scenarios and enhancing learner engagement (Xie et al., 2022).

Among the productive skills, speaking received considerable attention, with multiple studies reporting improvements in fluency, articulation, and communicative competence (e.g., Huang et al., 2023; Shi et al., 2024; Xie et al., 2022). One key benefit consistently highlighted was the reduction of speaking anxiety (Chen & Hwang, 2020), which was attributed to the immersive and supportive nature of VR environments, which allow learners to practice in low-stakes simulated real-world settings. The sense of presence and contextual relevance provided by 360-degree videos appeared to enhance the learners' confidence and willingness to speak.

Writing skills were also positively influenced by the integration of 360-degree video. Studies reported that descriptive writing, in particular, benefitted from the visual richness and contextual cues offered by immersive content (Luo et al., 2023; Wang et al., 2022). Students who engaged in immersive prewriting tasks, such as viewing thematic scenes or participating in guided tours, demonstrated improved organization, creativity, and content relevance. However, not all findings were uniformly positive; for instance, Lobanova et al. (2024) found no significant improvement in writing skills through the use of VR, suggesting that the effectiveness of

360-degree videos may vary depending on the instructional design, task type, or the learners' characteristics.

In terms of vocabulary acquisition, studies found that the contextual immersion provided by 360-degree environments enhanced vocabulary retention and use (Chen et al., 2021; Rahmanu & Molnár, 2024). Unlike traditional methods such as flashcards, VR enables learners to engage with new vocabulary in situated scenarios, improving both recall and practical application. The integration of textual prompts and visual cues in the environment (e.g., Liu et al., 2024) further supported vocabulary learning, especially in professional or thematic domains.

The impact of 360-degree videos on listening skills was mixed. While some studies (e.g., Rahimi & Aghabarari, 2024) reported improved listening comprehension and reduced anxiety when 360-degree videos were used during prelistening phases, others (e.g., Ji et al., 2019) observed limited improvement in listening outcomes. This may be due to the increased cognitive load associated with immersive environments; learners without prior schema or experience using 360-degree videos presented through HMDs may struggle to process both the auditory and visual input, overwhelming their working memory and impeding comprehension (Ji et al., 2019). Moreover, the immersive nature of the content can divert learners' attention from the listening task itself, as cognitive resources are instead directed toward navigating and exploring the environment, leading to decreased task focus and reduced learning efficiency.

Reading comprehension was the least frequently addressed skill, with only a few studies (e.g., Liu et al., 2024; Boudouaia et al., 2024) highlighting improvements. When used effectively, 360-degree videos with embedded text or guiding narration helped the learners understand the textual content more deeply and increased motivation. However, the limited number of studies suggests that reading may be less suited for immersive environments, or that the potential of VR for reading instruction remains underexplored.

In addition to core language skills, several studies addressed closely related dimensions, such as intercultural competence (Shadiev et al., 2021; Ziyatdinova et al., 2022), creative self-efficacy (Lin & Wang, 2021), and learners' engagement and motivation (Huang et al., 2020; Peixoto et al., 2023). These studies suggest that immersive learning can foster linguistic development as well as sociocultural awareness and emotional investment in the learning process.

Despite the comprehensive application of 360-degree video-based VR across various language skills, the discussion in existing research often remains largely descriptive. Few studies offer theoretical explanations for why certain skills benefit more from immersive environments than others. For example, speaking and writing, which require contextual cues and expressive output, align naturally with experiential and situated learning theories, while receptive skills like reading and listening may require more controlled input and cognitive focus, which can be hindered by the sensory load of VR. Future research should explore these theoretical underpinnings more deeply to guide instructional design and maximize learning outcomes.

Affordances and their Support

Technological advancements, particularly in 360-degree video-based VR, have introduced a wide range of pedagogical affordances that enhance English language education. Our analysis categorized these affordances into four thematic groups: Affective and motivational, cognitive and learning, experiential and contextual, and content and interaction. Among these, experiential and contextual affordances, especially immersion, were the most frequently reported, underscoring the ability of VR to simulate authentic, real-world environments that heighten learners' sense of presence and engagement.

Studies such as Shadiev et al. (2021) emphasize how 360-degree videos enable learners to explore real-life scenarios, fostering both linguistic development and cross-cultural understanding. This

immersive exposure supports experiential learning by bridging abstract language instruction with practical, contextualized experiences. The motivational benefits are also well-documented. For instance, frameworks like the Attention, Relevance, Confidence, and Satisfaction model (Jong, 2023) suggest that visually rich and interactive environments enhance attention, relevance, confidence, and satisfaction, which are core components of learner motivation. This aligns with findings that show increased learner self-efficacy and motivation in learners engaging with 360-degree video content.

Affective affordances, such as reduced speaking and listening anxiety, are particularly notable in language learning contexts, where performance-related stress is common. VR provides a psychologically safe space where learners can practice speaking without fear of immediate evaluation, as supported by Chien et al. (2020) and Shi et al. (2024). These environments encourage learners to rehearse their oral communication skills, enhancing both fluency and confidence. Similarly, learners benefit from personalized educational experiences, such as creating their own VR content, which fosters emotional investment and engagement in learning tasks (Shadiev et al., 2021).

Cognitive and learning affordances were also prominent. VR supported language skill development, vocabulary retention, creative expression, and information retention through immersive and interactive experiences. For example, students reported improved writing performance when engaging with personally meaningful visual contexts, which enhanced their descriptive abilities and motivation. Technologies such as avatar-based dialogues, vocabulary-rich visual scenes, and multimedia scaffolding were found to support cognitive processing and retention.

Content and interaction affordances, although reported less frequently, play a critical supporting role. Technologies that allow learners to not only consume but also interact with and co-construct learning materials, such as creating 360-degree videos or participating in guided tasks, enable active learning and knowledge construction. These interactive features are not merely technological conveniences; they are essential in shifting learners from passive recipients of content to engaged participants in the learning process.

However, while the findings collectively highlight the pedagogical potential of 360-degree video technologies, there is a need for a deeper exploration of how these affordances translate into sustained learning outcomes. The literature often reports positive perceptions and short-term gains, but more research is needed on the long-term impact of these affordances on language acquisition. Additionally, instructors must consider the learners' prior experiences with immersive technologies; without proper orientation or scaffolding, the same tools that offer affordances may also introduce cognitive overload or distraction, particularly for novice users.

VR provides a versatile set of affordances that support the affective, cognitive, experiential, and interactive dimensions of language learning. However, the effective realization of these affordances requires thoughtful instructional design that considers learners' variability, pedagogical goals, and the balance between immersion and focus. Future work should aim to systematically map specific technological features to targeted learning outcomes, offering clearer guidance for educators seeking to implement immersive technologies in meaningful and sustainable ways.

Domain and Instructional Approach

This review identified key trends in the disciplinary domains and instructional approaches applied in the context of 360-degree video-based VR for language education. Among the reviewed studies, language learning emerged as the most frequently addressed domain, with

particular attention given to EFL, followed by less frequent but notable applications in cross-cultural communication, educational technology, and elementary education. These findings reflect the central role of immersive technologies in supporting communicative competence and contextual understanding, which are core challenges in language education.

To provide a clearer analytical lens, instructional approaches were categorized into four overarching themes: (1) experiential and immersive learning, (2) task- and problem-oriented learning, (3) technology-supported and personalized learning, and (4) performance- and feedback-driven approaches. This categorization not only reflects the diversity of pedagogical designs but also highlights the flexible integration of VR across educational settings.

Experiential and immersive learning was prominent, where learners engaged with real-world contexts through immersive media. For instance, Li et al. (2023) and Luo et al. (2023) demonstrated that experiential learning with SVVR significantly enhanced performance (oral practice and descriptive writing) through vivid observation and context-rich engagement. Similarly, in Shah et al. (2023), immersive learning supported the development of oral communication by situating learners within realistic conversational settings. These approaches are grounded in experiential learning theory, which emphasizes the role of contextualized experience in deep learning. However, while immersion improves authenticity and emotional engagement, it can also introduce challenges such as cognitive overload or reduced task focus, especially among novice users, which are issues that deserve further pedagogical consideration.

Task- and problem-oriented learning approaches such as task-based language teaching (Yang et al., 2020), project-based learning (Shi et al., 2024), and problem-based learning (Chen et al., 2021; Chang et al., 2024) were also widely adopted. These strategies leveraged the affordances of VR to simulate real-life challenges, foster collaboration, and strengthen problem-solving abilities. However, overlaps were frequently observed between task-based and experiential approaches, particularly when the learners were asked to co-construct projects in immersive settings. These overlaps underscore the hybrid nature of VR-enhanced instruction, where discrete pedagogical models blend to maximize engagement and learning outcomes.

Technology-supported and personalized learning reflected increasing efforts to tailor instruction to individual learner needs. Flipped classroom models using 360-degree videos (Huang et al., 2023; Jong, 2023) enhanced preclass preparation and contextual learning. Meanwhile, tools like SVVR-enabled self-directed learning (Boudouaia et al., 2024) and mind mapping (Zhao & Yang, 2023) promoted learners' autonomy and knowledge organization. These approaches illustrate the potential of immersive technologies to adapt to learners' variability and foster self-regulated learning, though more research is needed on the long-term development of these competencies.

Performance- and feedback-driven approaches, such as peer assessment using SVVR (Chien et al., 2020) and automatic writing evaluation (Wang et al., 2022), show promise in enhancing metacognition, reflection, and formative assessment practices. However, these studies remain limited in number, indicating a gap in the literature on how immersive tools can systematically support assessment for learning.

While previous reviews have often emphasized the motivational benefits of immersive technologies, this review extends the discussion by illustrating the adaptability of VR across a spectrum of instructional models. Still, several limitations emerged. First, some studies lacked clarity in identifying their instructional approaches, which complicates cross-study comparisons and theoretical generalization. Second, although increased learner engagement and satisfaction were commonly reported, findings on actual learning gains, particularly in areas like listening or writing, remained inconsistent. For example, while Peixoto et al. (2023) found no significant improvement in listening comprehension, Ji et al. (2019) reported notable

gains when authentic 360-degree materials were contextually aligned with learning objectives. These inconsistencies highlight the importance of task design, learners' readiness, and content relevance in determining the effectiveness of immersive instructional strategies.

Furthermore, although personalized and adaptive approaches such as self-directed learning and automatic writing evaluation are promising, they remain underexplored in the context of VR. Future research should investigate how immersive tools can be aligned with learners' profiles, instructional goals, and assessment frameworks to ensure more coherent and effective implementation. In addition, longitudinal studies are needed to examine the sustainability and scalability of immersive instructional approaches, especially in diverse educational contexts with varying technological infrastructures.

The domain-specific applications and instructional approaches reviewed here demonstrate the versatility and promise of 360-degree video-based VR in language education. However, to fully realize its potential, more research is needed on integrating pedagogical theory with immersive technology, designing learner-sensitive instructional models, and evaluating the long-term educational impact beyond short-term engagement or novelty effects.

Methodological Details about the Studies and their Results

The reviewed studies employed diverse methodologies and varied sample sizes, reflecting a wide range of experimental designs and instructional interventions. Most studies involved relatively small participant groups, with the majority recruiting fewer than 100 participants and only a few exceeding that number. This trend raises concerns about the generalizability of the findings and suggests the need for future research with larger, more representative samples.

Language learning tasks in VR environments were implemented through both viewing content and content creation. Students engaged in activities such as immersive dialogue practice, vocabulary recall, and interactive observation, while others created their own 360-degree video content, including scripting, filming, and editing, which proved to be especially effective in developing oral skills and promoting learner engagement. The practice of producing VR content fostered a higher degree of learner agency, contextualization, and creativity, though it required significant guidance and resources. These findings imply that the pedagogical value of VR extends beyond passive immersion into active, constructivist learning experiences.

In terms of the data collection methods, researchers predominantly employed mixed-method approaches, using tools such as questionnaires, interviews, and pre-/post-tests, supported by reflections, journals, and quizzes. This triangulation of data helped validate the findings on gains in speaking, vocabulary acquisition, writing, listening, grammar, motivation, and reduced anxiety. However, several studies relied heavily on self-reported data, which may have introduced subjectivity and bias. Furthermore, only a limited number of studies addressed long-term retention or conducted delayed post-tests, leaving gaps in our understanding of the sustainability of learning outcomes.

The findings demonstrated the recurring positive impacts of VR-based instruction, such as improved speaking proficiency, enhanced vocabulary acquisition, reduced speaking anxiety, and increased learner motivation. However, inconsistencies across studies, such as the limited improvement in listening or reading comprehension in some cases, point to the influence of instructional design, learner characteristics, and task complexity. For example, Ji et al. (2019) noted no improvement in listening skills due to cognitive overload, particularly among learners who were unfamiliar with VR tools.

Despite the general enthusiasm about immersive learning, several methodological limitations persist. These include small sample sizes, insufficient reporting of the participants' characteristics, the lack of control groups in some designs, and inconsistent descriptions of

the intervention's fidelity. Additionally, while many studies focused on immediate learning outcomes, few investigated the longitudinal effects or the transferability of skills to real-life communication settings. Future studies should prioritize rigorous designs, larger samples, and longitudinal analyses to provide stronger empirical foundations for integrating VR into mainstream language education.

Reported Issues and Possible Solutions

The reviewed studies identified a range of challenges in implementing 360-degree video-based VR for English language education, which can be classified into methodological, technological, and pedagogical issues. These were further delineated into learner-, teacher-, and institutional-level concerns. Despite the growing enthusiasm for immersive VR, these barriers reveal the need for more thoughtful design, implementation, and evaluation of such interventions.

Methodologically, several studies suffered from small sample sizes and lacked longitudinal scope, undermining the generalizability and reliability of their findings. As an example, some studies only had 20 individuals, which compromises the findings' capacity to be applied broadly (Shi et al., 2024). Conclusions that are applicable to a variety of learner populations and educational environments are limited by small sample sizes. The absence of pretests or baseline data in some studies made it difficult to attribute the learning outcomes directly to the VR interventions. For instance, Rahmanu et al. (2023) stated that the lack of such comparative benchmarks prevented their study from firmly attributing advances in language acquisition to the VR experience. Furthermore, inconsistencies in assessment tools across studies limited cross-study comparability and the robustness of the evidence. These methodological weaknesses point to a broader issue: The need for more rigorous research designs that integrate control groups, longitudinal data collection, and validated instruments tailored to VR-based learning environments.

Technological implementation issues were also prominent. The high costs of VR hardware (e.g., HMDs and 360-degree cameras), along with limited technical support and maintenance capabilities, present a significant obstacle, particularly in less-resourced institutions. According to Rahimi and Aghabarari (2024) and Ziyatdinova et al. (2022), these expenses not only restricted access but also led to inequalities among institutions with varying financial and material capacities. Physical discomfort, such as dizziness and sensory overload, and difficulty focusing within immersive environments were frequently reported. Some studies (Boudouaia et al., 2024) indicated that physical discomfort could happen during watching content such as VR videos with HMDs for a long period. Furthermore, the absence of clear technical guidelines and occasional compatibility issues created additional barriers for both learners and educators. According to Jong (2023), the participants frequently encountered difficulties caused by inadequate technological assistance, which hindered their capacity to completely interact with the VR setting. While some platforms offered user-friendly interfaces, few studies addressed the need for ergonomic design or lightweight, accessible alternatives, highlighting a critical area for future development.

Pedagogically, challenges arose at multiple levels. Learner-level issues included cognitive disengagement, limited skill improvement, and low language proficiency, suggesting that VR environments, while immersive, may overwhelm less-prepared learners or those lacking self-regulation strategies. At the teacher level, difficulties in instructional design, such as poorly structured narratives and ineffective use of subtitles, limited the educational value of the content. One problem was particularly evident in settings where the educators lacked training or familiarity with VR, further limiting the effectiveness of its integration (Ziyatdinova et al., 2022). At the institutional level, difficulties integrating VR into traditional classroom structures

were noted, pointing to a lack of alignment between VR-based innovations and curriculum or administrative frameworks (Rahmanu et al., 2023; Shi et al., 2024).

Several solutions were proposed across the reviewed studies. Methodological concerns were addressed by advocating for pretests and baseline assessments (Rahmanu et al., 2023), as well as the use of standardized evaluation tools to ensure comparability (Jong, 2023). For the technological barriers, the solutions included developing user-friendly guidelines (Jong, 2023), promoting inter-institutional collaboration to reduce costs (Shi et al., 2024; Yang et al., 2020), and improving ergonomics to minimize sensory discomfort. Importantly, training educators and promoting innovative task design were suggested as means to address both teacher-level and learner-level challenges (Shi et al., 2024; Ziyatdinova et al., 2022).

Nonetheless, some problems remain insufficiently addressed. For instance, while solutions targeted technical and instructional issues, few interventions directly supported learners with low proficiency or cognitive disengagement. Future efforts could include differentiated instruction tailored to the learner's needs, gamified task designs to sustain engagement, and adaptive VR systems that adjust according to the learners' input. At the institutional level, broader strategies, such as curriculum reform, administrative support for immersive technology, and investment in scalable infrastructure, are crucial for sustainable implementation of this technology.

While 360-degree VR holds promise for English language education, its effective adoption requires comprehensive attention to its design, pedagogy, and context. Addressing unresolved challenges through integrated solutions will be essential to harness the full pedagogical potential of immersive technologies.

Conclusion

This systematic review explored the use of 360-degree video-based VR, or SVVR, in English language education. By examining 30 empirical studies published over the past decade, the review provided a comprehensive understanding of the technologies used, language skills targeted, instructional approaches, pedagogical affordances, methodological characteristics, and implementation challenges. Unlike prior reviews that focused on broader applications or traditional VR, this study offers a focused analysis of SVVR within the specific context of English language teaching and learning.

The findings underscore the considerable potential of 360-degree video technologies to enhance language learning through increased immersion, contextual authenticity, and learner engagement. SVVR has been shown to support a range of language skills, particularly speaking and vocabulary acquisition, by enabling learners to practice language in authentic, low-stress environments. Writing skills also benefitted from immersive prewriting tasks, while listening and reading showed mixed outcomes, largely dependent on the instructional design and learners' experience. Beyond the core skills, SVVR also contributed to the development of intercultural competence, creative self-efficacy, and learner motivation.

Technological tools used in SVVR environments were grouped into four categories: content creation, content acquisition, viewing tools, and multifunctional platforms. Learners were not only consumers of immersive content but also active creators, aligning with constructivist and experiential learning theories. The review highlighted the value of task-based, project-based, and experiential learning approaches, which leverage immersive media to simulate real-life communication scenarios. However, it also emphasized that such benefits depend heavily on pedagogical alignment, the learners' readiness, and contextual support.

Despite its promise, the integration of SVVR in English language education is not without challenges. Methodological issues such as small sample sizes, limited longitudinal data, and

inconsistent assessment methods restrict the generalizability of the findings. Technological barriers including cost, physical discomfort, and limited technical support impose practical constraints. Pedagogically, some learners struggle with cognitive overload or disengagement, particularly when instructional designs fail to scaffold the immersive experience effectively.

To address these issues, the review identifies several strategies: (1) designing differentiated and scaffolded tasks to accommodate learners with varying needs and proficiencies, (2) providing professional development for teachers to effectively integrate immersive technologies, (3) investing in accessible and sustainable platforms and infrastructure, and (4) promoting inter-institutional collaboration to share resources and expertise. Importantly, future research should incorporate larger samples, longitudinal designs, and standardized instruments to strengthen the evidence base. Theoretical frameworks such as cognitive load theory, experiential learning, and learner autonomy should be more explicitly employed to deepen pedagogical insights.

In conclusion, 360-degree video-based VR offers substantial pedagogical potential for English language education, especially when used to foster immersive, contextualized, and learner-centered experiences. However, its effective adoption requires a careful balance between technological innovation and sound instructional design. With continued research and thoughtful implementation, SVVR can serve as a powerful tool to enrich language learning in diverse educational contexts.

Despite the comprehensive scope of this review, several limitations should be acknowledged. First, the inclusion criteria were limited to studies published in English and accessible through selected academic databases, which may have excluded relevant works in other languages or grey literature not indexed in mainstream repositories. Second, the search strategy, while systematic, may not have captured all the variations in terminology related to 360-degree video-based VR, potentially omitting studies using alternate descriptors or domain-specific language. Third, the majority of reviewed studies were conducted with small sample sizes and over relatively short durations, which limits the generalizability of findings and precludes robust conclusions about the long-term learning outcomes. Additionally, the heterogeneity in the study designs, participant profiles, instructional contexts, and assessment measures posed challenges for a direct comparison and synthesis, which may have affected the consistency of the interpretations. Finally, this review primarily relied on the reported findings and methodological details as presented in the original studies. In some cases, limited transparency in reporting, particularly concerning the intervention's fidelity, the learners' backgrounds, and the instructors' roles, restricted a deeper analysis of the contextual factors influencing the outcomes. These limitations point to the need for more rigorous, longitudinal, and transparent empirical work in future research on immersive 360-degree VR technologies in language education.

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Appendix

Reviewed studies on the use of 360-degree video-based virtual reality in English language education.

Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Boudouaia et al. (2024)	VR	360-degree videos	Providing an immersive environment Facilitate language learning	Students enter the virtual scene through the spherical view	EFL	Self-directed learning	457	NA	Questionnaire	Attitudes and self-efficacy positively influenced behavioral intention Students demonstrated a preference for using 360-degree videos to improve spelling and general language skills	A need for structured guide for the usage of VR No use of VR for speaking or writing practice	Support for VR integration into formal curricula and ensure access to resources Development of platforms for sharing instructional materials and methodologies tailored to VR
Chang et al. (2024)	VR	5000-lm projectors, a 360-degree stereoscopic screen, VIVE pro controllers, VIVE MAG P90 Guns	Immersive, interactive, and personalized educational experiences	VR enables students to learn in language-immersive environments using a variety of informational modalities	EFL	VR-based teaching	420	4 weeks	Tests, surveys	VR had a better educational effect A significant positive effect of VR-assisted English education on elementary school students	Some students felt uneasy or nervous using VR technology High cost of VR equipment and limited infrastructure Prolonged use of VR could lead to issues like motion sickness and eye strain	Designing user-friendly and less intimidating VR interfaces Developing cost-effective VR solutions Incorporating breaks and ensuring ergonomic design Encouraging to explore VR's applicability across diverse socioeconomic and cultural settings

Chen & Hwang (2020)	iSVVR	Smartphones, VR headsets, EduVenture, Tour Creator	Providing immersive experiences Facilitating language learning Reduced anxiety Increased motivation Improved self-efficacy	iSVVR places learners in near-realistic sociocultural contexts Interactive virtual tours minic real-life English-speaking scenarios for tourism and restaurants Learners interact individually in VR Authentic and contextually rich virtual tours engage learners more effectively Students practice speaking in realistic settings, enhancing confidence in their abilities	EFL	NA	93	8 weeks	Oral presentations, surveys, questionnaires	Effective in enhancing students' oral presentation skills, reducing speaking anxiety, and increasing learning motivation	Navigation difficulties and occasional physical discomfort with VR applications Distraction for field-dependent learners in visually complex VR settings	Enhance VR design to accommodate varying cognitive styles and reduce complexity for field-dependent learners
Chen et al. (2021)	VR	EduVenture, Google Cardboard	Providing a language-immersive environment	Creates an authentic environment	EFL	Problem-based learning	84	NA	Tests, questionnaires, interviews	The students in the experimental group significantly outperformed those in the control group in terms of vocabulary acquisition, and were more motivated to learn English There was no significant difference in the problem-solving performance of the two groups	Small sample English vocabulary acquisition was assessed with multiple-choice items	Recruit more participants Evaluate EFL learners' vocabulary development with production assessments

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Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Chien et al. (2020)	SVVR	EduVenture	Providing realistic environments for practicing English	Scenes that mimic real-life situations	EFL	Self-regulated learning	69	4 weeks	Tests, questionnaires	Enhanced English-speaking performance, motivation, critical thinking, reduced anxiety	Some smartphones cannot run the application Volume levels vary across devices Different devices have different volume levels Learning films are considered too long by some students Students found it challenging to accurately identify and provide feedback Some students did not take the evaluation process seriously	Ensure SVVR applications are compatible with more devices Standardize volume levels for better audio clarity Shorten the length of learning films Provide better scaffolding and support for peer assessment activities
Huang et al. (2020)	VR	HTC VIVE, tablets	Providing a realistic linguistic environment for English learning. Encouraging group tasks with designated roles. Making the learning process interactive and entertaining.	VR headsets immerse students in a 360-degree environment, simulating real-world scenarios. Tablets provide a collaborative interface where teammates exchange information. The VR system uses gamified elements and role-playing to sustain interest.	EFL	Collaborative learning strategy	45	150 minutes	Tests, semi-structured interviews, tasks	Improved grammar test scores Demonstrated enhanced use of language learning strategies Weaker and quieter students became more engaged due to reduced anxiety and role-specific responsibilities	Issues with the VR system Feedback provided by the system lacked the depth of teachers' explanations High-achieving students found the VR tasks too easy and desired more challenging activities	Addressing system bugs Combining VR feedback with teacher-led explanations for complex concepts Designing tasks with varying difficulty levels

Huang et al. (2023)	VR	HMDs, 360-degree videos	Providing immersive experiences Facilitating language learning Providing learning material/content Increased motivation Giving a sense of presence	Experience of realistic virtual environments VR enables contextualized learning Fosters engagement VR introduces authentic and visually-rich learning scenarios Engaging and novel, VR allows users to feel physical presence	EFL	Flipped classroom approach	28	6 weeks	Reflections, semi-structured interviews	Overwhelmingly positive feedback The approach improved engagement, motivation, and learning retention Users appreciated the realistic, immersive experience and its benefits for contextual learning	Motion sickness, unclear video quality Reduced teacher-student interaction during VR sessions for a more immersive experience Increasing video duration and variety Providing a buffer time for students to adjust the devices before starting the session	Using higher-quality VR devices and adding headphones
Ji et al. (2019)	SVVR	360-degree videos, Samsung Gear VR, VICE NEWS VR, Samsung Galaxy Note 5	Offering a highly realistic and engaging listening environment Providing learners with real-life, context-rich audiovisual materials, bridging textbook language and authentic use	360-degree videos create a sense of presence and realism Genuine language input produced by native speakers	EFL	Authentic material-based listening approach	61	20 minutes	Tests, scale	No positive effect on listening skills Higher cognitive load	The immersive nature of VR distracted learners, reducing cognitive resources available for comprehension tasks Some participants terminated the experiment due to discomfort Some students forgot the listening comprehension tasks to build schema deep immersion and reduce overload Use lightweight, ergonomically designed HMDs to reduce discomfort	Provide pre-exposure training to familiarize learners with VR tools and reduce initial cognitive load Design focused tasks to minimize distraction from immersive elements Start with shorter and simpler VR tasks to build schema deep immersion and reduce overload Use lightweight, ergonomically designed HMDs to reduce discomfort

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Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Jong (2023)	SV-IVR	Ricoh® THE1A V, EduVenture	Fostering motivation Providing an immersive experience Authentic context	Enhances motivation	EFL	Flipped classroom	188	10 weeks	Questionnaires, semi-structured interviews	Participants significantly perceived SV-IVR had desirable motivational affordances	Lack of technical guidance and assistance sensory or physical discomfort	Develop guidelines and further directions
Li et al. (2023)	SVVR	PICO 2, Insta360 Pro camera	Providing an immersive experience Facilitating language learning Enabling interaction with the learning content Increased motivation Improved self-efficacy	SVVR created virtual scenes immerse users in real-world scenarios The SVVR environment provides authentic and interactive contexts for descriptive writing Students explored and interacted with scenes Increased motivation and self-efficacy	Chinese descriptive article writing	Reflective observations, conceptualization, and active participation	28	3 weeks	Writing motivation scale, writing assessment	Experimental students performed better in organization and content dimensions, but overall no significant difference between two groups Both groups improved in writing motivation	Students were sometimes distracted by the immersive scenes Writing and observing using scenes SVVR could not happen simultaneously, which hinders note-taking Optimize SVVR devices for usability	Add a communication stage to help students organize ideas after observing immersive scenes Use activity clues in SVVR scenes to guide focus Optimize SVVR devices for usability
Lin & Wang (2021)	VR	Google Tour Creator, Google Cardboard	Providing realistic and immersive environments Allowing students to design personalized virtual tours Encouraging creativity and active participation	Using real-world images and street-view technology students upload their own 360-degree images or use existing Google Street View images to create personalized scenes Immerses students in interactive tasks and motivates them to explore language use creatively	ESL	Project-based learning	39	17 weeks	Scale, inventory, open-ended surveys	Significant improvement in students' creative self-efficacy Increased confidence in producing creative solutions and using English in authentic contexts Less pressure and greater intrinsic motivation	Difficulties using VR technology due to limited technical familiarity Limited skill improvement Tool discontinuation	Provide more comprehensive technical training Incorporate creative training programs Use alternative VR platforms

Liu et al. (2024)	SVVR	HMDs, EduVenture	Providing a realistic and engaging context Combining reading strategies with interactive SVVR scenarios Offering authentic settings to facilitate meaningful comprehension and retention of information	SVVR simulates real-world landscapes SVVR integrates interactive questions and annotations for learning support Text structures are matched with visual environments to reinforce learning relevance	EFL	Article-structure based learning approach	63	3 weeks	Tests, scales, questionnaires	Improved reading comprehension skills Enhanced global reading strategies and support strategies Extrinsic motivation was significantly high	SVVR tools required high cognitive capacity and longer processing times Mild discomfort with HMDs Limited study duration	Use lighter or more ergonomic HMDs to minimize discomfort Conduct longer studies with more participants
Lobanova et al. (2024)	VR	iVR platform	Providing immersive experience Reduced speaking anxiety	Reduced speaking anxiety	EFL	-	120	12 weeks	Questionnaires	Enhanced motivation, engagement	High cost of technologies	NA
Luo et al. (2023)	SVVR	NA	Providing a language-immersive environment	Provides a cost-effective, immersive learning environment where students experience realistic virtual settings	English	SVVR-based English writing instruction	77	4 weeks	Questionnaires, interviews	Students scored higher in post-tests	Technological proficiency from educators and effective activity design is required	Actively learn technologies and improve information literacy Design engaging and well-structured teaching activities
Peixoto et al. (2023)	iVR	HMD Oculus Quest / controllers	Immersive experience Sense of presence	Provides an immersive experience and a sense of presence through created dialogues in an office setting, surrounded by avatars	EFL	NA	27	25 min	Questionnaires, test	Enhanced learning motivation, satisfaction, and preference for using this technology for learning	Cybersickness Novelty of the technology	NA

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Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Rahimi & Aghabarari (2024)	VR	360-degree videos from YouTube and Aparat	Providing an immersive experience Facilitating language learning Providing learning material Increased Motivation	Learners explore environments as if they are physically present Learners improve listening comprehension by associating audio with visual contexts VR provides additional content VR lowers students' listening anxiety and increases engagement	EFL	Comprehension-based listening instruction	60	20 weeks	Tests, structured interviews	Improved listening comprehension Participants expressed positive the immersive 360-degree perceptions	Challenging to concentrate on the narration while navigating the immersive videos. Limited technical and financial resources for creating custom 360-degree videos	Encourage the production of dialogic and interactive 360-degree videos. Compare curated versus created 360-degree content
Rahmanu & Molnár (2024)	SV-IVR	SV-IVR media	Facilitating language learning Giving a sense of presence Increased motivation	Learners explore environments and associate words with visual and functional characteristics Provides a realistic context Increases learners' enthusiasm and interest	EFL	Progressive question prompt-based peer-tutoring approach	30	NA	Observations, vocabulary recall tasks	Learners integrated more specialized and context-specific terminology Their use of less common vocabulary remained limited	Use of high-frequency vocabulary Lack of pre-, post-, and delayed testing	NA
Rahmanu et al. (2023)	SV-IVR	360-degree video	Providing a immersive and authentic experience	Enables situational learning Immersing the learners facilitates experiential learning	Indonesian language for foreign speakers	Multimodality	20	2 weeks	Questionnaire	Increase in motivation to learn the Indonesian language	NA	NA

Repetto et al. (2023)	iVR	360-degree videos, smartphone, cardboard HMD	Providing a immersive experience Facilitating language learning Increased motivation Improved self-efficacy	Videos allow students to navigate and explore the environment Videos include vocabulary-focused descriptions aligned with images, supporting L2 learning Engages students effectively Builds confidence and encourages mastery	ESL	Self-regulated learning	104	4 weeks	Surveys, tests, self-reports	Students outperformed the control group in vocabulary learning Greater immersion correlated with improved learning before the study outcomes	Limited cybersickness No baseline formal assessment of students' English proficiency before the study	Conduct formal prestudy assessments encourage more student participation in feedback surveys
Shadiev et al. (2021)	360-degree video	Insta 360 one x/r, MI and Oculus VR glasses, Adobe Premiere CC 2020, Google Drive	Providing an immersive experience	Students experience and understand different cultures through authentic peer-created content VR facilitates knowledge sharing and reflection	EFL	Task-based learning	42	8 weeks	Questionnaires, one-on-one interviews, tests, created content	Improved language skills ICC and KS students were satisfied	Lack of a control group Too long videos cause user fatigue	Involve a control group Control the length of the video
Shah et al. (2024)	iVR	360-degree videos	Providing a immersive experience Facilitating language learning Giving a sense of presence Enabling interaction with the learning content Increased motivation Reduced speaking anxiety	Offers a view that makes learners feel present Exposes to professional meeting contexts Creates an environment that mimics real-life settings Students observe body language and communication techniques Provides a controlled and low-pressure environment	Applied language (Arabic communication and workplace professionals) simulations	Collaborative learning, role-playing, communication and workplace simulations	25	16 weeks	Questionnaires, thematic analysis	Improved oral communication skills Increased confidence Better comprehension of professional meeting dynamics Enhanced vocabulary and grammar	Visual and audio quality concerns the video's resolution and subtitles and better narrative structures Include enhanced understanding Expand content variety to maintain engagement	

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Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Shen et al. (2024)	SVVR	SVVR, EduVenture, VR cardboard, smartphones	Behavioral engagement with content Interaction with content Motivation Authentic learning experience	SVVR encourages active participation and responsibility Motivates students to stay focused and engaged	EFL	Student-centered strategy	30	16 weeks	Focus group interviews, in-depth interviews	Significantly enhanced students' engagement in the behavioral, emotional, and cognitive dimensions Students focused more, felt emotionally connected to the learning material, and engaged more deeply in critical thinking and writing tasks	Behavioral disengagement Lack of emotional engagement Cognitive disengagement Teacher's limited role in technology-based learning	Combine qualitative insights with quantitative methods to identify factors influencing engagement Explore how teachers can better scaffold engagement
Shi et al. (2024)	iVR	CASWISE, phones, PCs	Providing an immersive experience Facilitating language learning Increased motivation Enhanced engagement Reduced speaking anxiety Improved self-efficacy	Students practice oral English skills in realistic scenarios	Business English	Project-based learning	80	8 weeks	Test, questionnaires	Improvement in oral English skills, grammar, vocabulary, discourse management, pronunciation, interactive communication, and behavioral, affective, cognitive, and social engagement	Small sample size	Increase the sample size Broaden the scope of the research objects
Smith & Townsend (2021)	360-degree video	LG 360 Cam, viewers, Apple iMovie	Creating authentic learning experiences	The 360-degree video production required students to work independently, especially regarding technical aspects like filming and editing	EFL	Collaborative learning	NA	16-weeks	Teacher reflections, content	Active student participation and flexibility were promoted Technology enhanced engagement and contextual learning	Lack of time and cameras Rubrics included irrelevant criteria One stage had not enough practice	Create rubrics through class discussion and model them with examples Introduce a draft stage for better practice and feedback

Sun Joo & Lee Jin (2024)	SVVR	Insta360 ONE X2, Insta360 app	Providing an authentic context helps motivation	Improves creativity and curiosity	English language and literature	Project-based language learning	27	4 weeks	Reflective journals, questionnaires	Creativity significantly improved	Lack of competence in using SVVR Absence of a control group Small sample	Recruit bigger samples
Wang et al. (2022)	SVVR	SVVR, UPTALE, AWE	The immersive environment provided an authentic context for writing	SVVR provides a low-pressure, motivation and immersive setting, engagement and making it easier for EFL learners to write	EFL	SVVR-AWE approach	76	4 weeks	Tests, questionnaires	Significant improvements in EFL writing performance, motivation for learning, writing self-efficacy, and reduced anxiety	Short experimental duration Small sample size Potential discomfort Unorganized SVVR content	Pay attention to the SVVR content's organization and appropriate integration of AWE into the learning process Use other learning strategies to support AWE to help students learn more effectively
Xie et al. (2022)	VR	Classroom system, PCs	Immersive experience Facilitating language learning Increased motivation Reduced speaking anxiety Improved self-efficacy Promoting creative self-efficacy Providing practice offers learning content Enabling interaction with the learning content	Students interact with multiple modalities of information in contextually rich and meaningful situations Practical, task-based language use introduces elements of fun and curiosity Provides a safe and private space for learners to practice offers open-ended and interactive tasks Delivers rich multimedia content	EFL	Immersion-based teaching	106	16 weeks	Questionnaire surveys, test	Significantly positive correlations between VR and immersion-based language teaching, between immersion-based language teaching and academic achievement, and between VR and learning outcomes Students' learning effect was greatly improved compared with other state-of-the-art research methods	NA	NA

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Authors	Technology	Tool	Affordances	Supporting an affordance	Domain	Instructional approach	Participants	Duration	Data collection	Results	Issues	Solutions
Yang et al. (2020)	iVR	HTC VIVE, Kinect	Providing an immersive experience Facilitating language learning Increased motivation Giving a sense of presence Reduced speaking anxiety	Realistic graphics, sound effects, motion capture, and room-scale interaction Tasks with real-life scenarios Interactive and engaging design Real-person dubbing, motion tracking, and physical interaction Trial and error learning with no social repercussions	EFL	Task-based language teaching with constructivist learning principles	72	4 weeks	Tests, questionnaires, semi-structured interviews	Significant improvement in communicative ability High levels of perceived presence and positive feedback from students	Accessibility challenges due to the high cost of equipment Some students experienced dizziness and disorientation Caption-on mode distracted certain students, minimize reducing realism discomfort	Incorporate VR-compatible applications to reduce costs Provide more practice time and adjust the system's design to minimize discomfort
Zhao & Yang (2023)	SVVR	EduVenture, VRBOX 2.0	Creating authentic content Providing an immersive experience Enabling interaction with the learning content Simulation of real-life scenarios Reduced speaking anxiety Improved self-efficacy	Fully immersive, authentic environment Students experience real-world language use Interactive mind mapping tools enable learners to actively organize knowledge Linking prior knowledge with new vocabulary and sentence structures	Chinese as a foreign language	SVVR-supported mind mapping	66	2 weeks	Tests, questionnaires, semi-structured interviews	Enhanced vocabulary and sentence construction, higher motivation, problem-solving ability, and self-efficacy	Discomfort and dizziness Technology limitations Insufficient practice Different from real-world communication Use of avatars facing device compatibility issues	Use VR hardware with better user experience to reduce discomfort. Provide technical support to students facing device compatibility issues

Ziyatdinova et al. (2022)	Google Earth VR, HMD, HTC Vive platform	Immersive learning experiences Exploration of real-world locations Development of language skills Motivating students Enhanced participation, cultural learning, and cross-cultural competence	Students virtually visit and explore places VR helps visualize theoretical content Language practice in contextual scenarios Increased motivation supports collaborative projects	English for specific academic purposes	Student-centered learning, project-based learning	NA	5–6 weeks	Observations, quizzes, writing tasks, audio recordings, tests	Students showed increased motivation and engagement Enhanced professional language skills Improved cultural competence and awareness Positive feedback on the immersive learning experience	High cost of VR Need for advanced technical knowledge Limited availability of VR tools Challenges in incorporating VR into traditional classroom structures	Collaboration with organizations Gradual integration of VR into the curriculum Creation of VR content tailored to students' learning objectives and resources Provide training to educators
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VR, virtual reality; EFL, English as a foreign language; SVVR, spherical video-based virtual reality; iSVVR, immersive spherical video-based virtual reality; NA, not applicable; HTC, high-tech computer; HMD, head-mounted device; SV-IVR, spherical video-based immersive virtual reality; AWE, Automatic writing evaluation; iVR, immersive virtual reality; ESL, English as a second language; L2, second language; PC, personal computer; ICC, intercultural communicative competence; KS, knowledge sharing.