

# Emerging Trends, Opportunities, and Challenges of Virtual Reality (VR) and Augmented Reality (AR) in Language Instruction: A Critical Literature Review

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| ARTICLE INFORMATION                                                                                                                                                                                                                                                                                                                       | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <b>Article history:</b><br>Published: October 2026                                                                                                                                                                                                                                                                                        | The integration of Virtual Reality (VR) and Augmented Reality (AR) into language education has gained increasing scholarly attention due to their potential to create immersive, authentic, and interactive learning environments. This systematic literature review critically synthesizes existing research on the emerging trends, opportunities, and challenges associated with the application of VR and AR in language instruction. The review examined empirical and conceptual studies to identify patterns in technological adoption, pedagogical applications, reported learning outcomes, implementation barriers, and areas requiring further investigation. The findings reveal that immersive technologies are increasingly being employed to facilitate experiential learning, contextualized language practice, intercultural competence, and learner-centered instruction. Evidence from the reviewed literature indicates that VR and AR can enhance learners' communicative competence, vocabulary acquisition, pronunciation, listening comprehension, motivation, engagement, and confidence by providing opportunities for authentic interaction and simulated real-world experiences. However, the review also identifies persistent challenges, including technological affordability, limited infrastructure, accessibility issues, inadequate teacher digital competence, ethical considerations, and the absence of standardized pedagogical frameworks for effective integration. Furthermore, the literature reveals gaps regarding longitudinal evaluation, scalability, inclusivity, and the transferability of immersive learning outcomes across diverse educational contexts. The study concludes that VR and AR represent valuable complementary tools for advancing language education, but their sustainable adoption requires alignment among technological development, instructional design, teacher preparedness, and institutional support. Future research should prioritize evidence-based implementation models, equity-focused approaches, and longitudinal studies to establish the long-term educational impact of immersive technologies in language learning. |
| <b>Keywords:</b><br>Virtual Reality (VR)<br>Augmented Reality (AR)<br>Systematic Literature Review<br>Language Education<br>Immersive Learning Technologies<br>Computer-Assisted Language Learning (CALL)<br>Educational Technology<br>Integration<br>Digital Pedagogy<br>Language Learning Outcomes<br>Emerging Educational Technologies |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## 1. Introduction

### 1.1 Background of the Study

Research has increasingly focused on the integration of digital technologies into education, particularly in language instruction, where technological innovations have transformed conventional teaching and learning practices. The evolution of educational technology has progressed from Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) to immersive technologies that support experiential, interactive, and learner-centered approaches. These developments have enabled language educators to create authentic learning environments that foster communication, collaboration, learner autonomy, and intercultural competence while improving learners' motivation and engagement (Sakr & Abdullah, 2024) and (Langat A.C,2025). Among the most transformative innovations in educational technology are Virtual Reality (VR) and Augmented Reality (AR). Virtual Reality creates fully immersive digital environments that enable learners to interact with simulated real-life situations, whereas Augmented Reality enhances the physical environment by overlaying digital information such as images, videos, and three-dimensional objects onto the real world. These technologies provide authentic contexts for language practice, allowing learners to develop vocabulary, pronunciation, listening, speaking, and cultural competence through meaningful and experiential interactions (Schorr et al., 2024).

The adoption of VR and AR in second language (L2) and foreign language education has grown considerably over the past few years due to rapid technological advancements, improved accessibility of immersive devices, and increasing recognition of learner-centered pedagogies. Recent systematic reviews indicate that VR and AR improve learner engagement, motivation, confidence, and language performance by providing realistic communicative environments that are difficult to replicate in conventional classrooms. Furthermore, immersive learning environments encourage active participation and reduce language anxiety, thereby enhancing learners' willingness to communicate in the target language (Yu & Duan, 2024; Ma et al., 2025).

Despite these promising outcomes, the effective implementation of VR and AR in language instruction remains constrained by several challenges. Studies consistently identify high implementation costs, inadequate technological infrastructure, limited teacher preparedness, technical complexity, accessibility concerns, and insufficient pedagogical integration as major barriers to successful adoption. Additionally, evidence regarding the effectiveness of VR and AR varies across language skills, educational contexts, learner characteristics, and instructional designs, suggesting that the educational value of immersive technologies depends largely

on how they are integrated into teaching practices rather than on the technologies themselves (Christou, Parmaxi, & Christoforou, 2025; Schorr et al., 2024).

Recent literature demonstrates that research on immersive technologies in language education is expanding rapidly, with increasing attention being given to Extended Reality (XR), artificial intelligence (AI), adaptive learning systems, and intelligent virtual agents. These emerging developments are reshaping language instruction by creating more personalized, interactive, and context-aware learning experiences. However, the rapid evolution of the field has also resulted in fragmented findings and varying conclusions regarding the pedagogical effectiveness, opportunities, and limitations of VR and AR. Consequently, there is a need for a comprehensive and critical review of recent literature to synthesize current evidence, identify emerging trends, examine opportunities and challenges, and provide recommendations for future research and practice in language instruction.

### *1.2 Statement of the Problem*

Traditional language teaching approaches often provide limited opportunities for authentic communication, real-world interaction, and meaningful cultural immersion, which may hinder learners' ability to develop practical language skills. Although advancements in Virtual Reality (VR) and Augmented Reality (AR) have introduced new possibilities for creating immersive and interactive language learning environments, existing research on their educational effectiveness remains fragmented. Key issues related to implementation challenges, pedagogical integration, accessibility, and long-term impact require further investigation. Therefore, a comprehensive synthesis of current literature is needed to identify emerging trends, explore opportunities, highlight research gaps, and examine the challenges associated with the adoption of VR and AR technologies in language education.

### *1.3 Purpose of the Study*

The purpose of this study was to critically review existing literature on the emerging trends, opportunities, and challenges associated with the use of Virtual Reality (VR) and Augmented Reality (AR) in language instruction. The study examined how these technologies have been integrated into language learning, evaluated their effectiveness in enhancing teaching and learning outcomes, and identified the key benefits and limitations reported in previous research. Furthermore, the review synthesized current knowledge to highlight research gaps and provide recommendations for future studies and the effective implementation of VR and AR in language education.

### *1.4 Research Objectives*

The study sought to achieve the following objectives:

- To examine the emerging trends in the application of Virtual Reality (VR) and Augmented Reality (AR) in language instruction.
- To identify the opportunities that VR and AR provide for enhancing language learning and teaching experiences.
- To analyze the major challenges influencing the implementation and integration of VR and AR technologies in language education.
- To identify existing research gaps in the literature and propose recommendations for future research on the use of VR and AR in language education.

### *1.5 Research Question*

- What emerging trends were identified in the application of Virtual Reality (VR) and Augmented Reality (AR) in language instruction?
- What opportunities did the reviewed literature reveal regarding the use of VR and AR for enhancing language teaching and learning?
- What challenges were reported as hindering the effective implementation of VR and AR in language instruction?
- What research gaps were identified in the existing literature, and what areas require further investigation?

### *1.6 Significance of the Study*

The significance of this study lies in its potential to support language educators by providing a comprehensive understanding of how educational technologies can enhance language teaching and learning. The findings will offer insights into effective instructional strategies, technology integration, and best practices that can improve learner engagement, language proficiency, and overall educational outcomes.

The review will also be valuable to curriculum developers, educational technology researchers, and software developers. Curriculum developers can use the findings to design technology-integrated language programs that align with modern educational needs. Researchers will gain a synthesized body of knowledge that highlights current trends, gaps, and opportunities for further investigation, while software developers can use the insights to design and improve digital language learning tools that better address the needs of learners and educators.

Furthermore, the study will inform policymakers by providing evidence to guide decisions on technology adoption, digital infrastructure, and educational policies that support language education. It will also serve as a useful reference for future researchers by identifying areas that require further exploration and contributing to the growing body of knowledge on the integration of educational technology in language learning and teaching.

### *1.7 Scope of the Study*

The scope of this study is limited to peer-reviewed literature published primarily between 2018 and 2026, ensuring that the review captures the most recent developments and evidence on the use of immersive technologies in language education. This timeframe reflects the period during which Virtual Reality (VR) and Augmented Reality (AR) experienced significant growth in educational research, particularly following advancements in affordable immersive technologies and increased adoption in digital learning environments.

The review focuses specifically on studies that examine the application of VR and AR in second language (L2), foreign language (FL), and multilingual instruction across various educational settings. Eligible studies include those investigating the effectiveness of immersive technologies in enhancing language skills such as speaking, listening, reading, writing, vocabulary acquisition, pronunciation, learner motivation, engagement, and intercultural competence. This broad focus allows for a comprehensive understanding of how VR and AR support language teaching and learning across diverse linguistic and educational contexts.

To maintain the relevance and educational focus of the review, studies unrelated to language education are excluded. Likewise, research that concentrates solely on the technical development of VR or AR systems without evaluating their pedagogical application or educational outcomes is omitted. By applying these inclusion and exclusion criteria, the study ensures that the reviewed literature provides meaningful insights into the educational value, effectiveness, and practical implementation of immersive technologies in language learning.

## 2. Literature Review

### 2.1 Introduction

This chapter reviews relevant literature related to the study. It examines existing theories, concepts, and empirical studies that provide a foundation for the research. The chapter is organized into the conceptual review, theoretical review, empirical review, and a summary of the literature. The purpose was to identify key issues, establish the knowledge base for the study, and highlight gaps in the existing literature that justify the need for the present research.

### 2.2 Conceptual Review

This section presents a review of the major concepts relevant to the study. It defines and explains the key variables, discusses their dimensions and characteristics, and examines the relationships among them as reported in existing literature. The conceptual review provides a clear understanding of the core concepts that underpin the research and serves as the basis for the subsequent theoretical and empirical discussions.

#### 2.2.1 Virtual Reality (VR)

**Definition and Types Virtual Reality (VR):** Definition Virtual Reality (VR) is a computer-generated, three-dimensional environment that enables users to interact with simulated objects and spaces in real time, creating a strong sense of presence and immersion. Modern VR systems typically combine head-mounted displays (HMDs), motion tracking, spatial audio, and interactive controllers to allow users to experience environments that closely resemble or intentionally differ from the physical world. Although VR has traditionally been associated with entertainment, its applications have expanded significantly into education, healthcare, engineering, military training, tourism, and architecture due to its ability to provide realistic, safe, and repeatable learning experiences.

Recent literature indicates that there is no universally accepted definition of VR because researchers emphasize different characteristics such as immersion, interaction, presence, and sensory feedback. Abbas et al. (2023), after conducting a systematic review of healthcare-related VR definitions, argue that modern definitions increasingly emphasize the use of head-mounted displays and real-time interaction rather than merely describing VR as a computer-generated environment. This reflects the evolution of VR technology from simple desktop simulations to highly immersive systems capable of producing realistic user experiences.

However, scholars also argue that defining VR solely by the use of head-mounted displays is limiting. Walker et al. (2023) contend that VR should instead be viewed as part of the broader Extended Reality (XR) ecosystem, where immersion, interaction, and user perception are more important than the hardware itself. Similarly, Dudley et al. (2023) emphasize that accessibility, usability, and user inclusiveness are increasingly important dimensions of VR, suggesting that technological sophistication alone does not determine the effectiveness of virtual experiences.

Critically, while VR provides highly engaging learning environments, its adoption remains constrained by high equipment costs, motion sickness, technical complexity, and accessibility challenges. These limitations suggest that although VR offers significant educational and professional benefits, its effectiveness depends on appropriate technological design, user readiness, and institutional support rather than the technology alone.

#### 2.2.1.1 Types of Virtual Reality

The literature commonly classifies VR into three major categories based on the degree of immersion experienced by users: fully immersive, semi-immersive, and non-immersive VR.

**Fully Immersive Virtual Reality:** Fully immersive VR represents the highest level of virtual interaction, where users become completely surrounded by a computer-generated environment using specialized equipment such as head-mounted displays, motion sensors, handheld controllers, haptic devices, and spatial audio systems. These technologies minimize awareness of the physical environment while maximizing the user's sense of presence within the virtual world.

According to Maroungkas et al. (2023), fully immersive VR has demonstrated significant educational benefits by improving learner engagement, knowledge retention, practical skill acquisition, and motivation. It is particularly effective in medical simulation, engineering education, military training, and hazardous workplace training where real-world practice may be expensive or risky.

Despite these advantages, researchers note several challenges. Fully immersive systems require expensive hardware, substantial computing resources, and technical expertise. Users may also experience cybersickness, visual fatigue, and discomfort during prolonged use. Furthermore, Dudley et al. (2023) argue that current immersive systems still face accessibility barriers for users with disabilities, limiting widespread adoption despite technological advances.

From a critical perspective, while fully immersive VR provides the richest learning experience, it is not always the most practical solution, particularly in institutions with limited financial and technical resources.

**Semi-Immersive Virtual Reality:** Semi-immersive VR provides users with a partial sense of immersion while allowing them to remain aware of their physical surroundings. It typically utilizes large projection screens, multi-monitor systems, power walls, or simulation rooms rather than fully enclosing users within a virtual environment.

Researchers argue that semi-immersive VR offers a practical compromise between cost and realism. It provides improved visualization and interaction compared with conventional computer-based applications while avoiding some of the discomfort associated with fully immersive systems. Consequently, semi-immersive VR has become widely used in engineering simulations, architectural visualization, aviation training, and industrial design.

Nevertheless, the literature suggests that semi-immersive environments produce lower levels of presence and emotional engagement than fully immersive VR because users remain continuously aware of the real environment. This reduced immersion may decrease learning effectiveness for tasks requiring complete situational simulation or emotional involvement. Therefore, although semi-immersive systems offer greater affordability and easier implementation, they may not achieve the same educational outcomes as fully immersive environments.

**Non-Immersive Virtual Reality:** Non-immersive VR, often referred to as desktop VR, enables users to interact with virtual environments using conventional computers, laptops, tablets, keyboards, mice, or gaming controllers without specialized immersive equipment. The virtual environment is displayed on a standard screen while users remain fully aware of their physical surroundings. The primary advantages of non-immersive VR include low implementation costs, ease of deployment, minimal technical requirements, and broad accessibility. These characteristics make desktop VR particularly suitable for schools, universities, and organizations with limited technological infrastructure. Many educational simulations, virtual laboratories, and 3D visualization software fall within this category.

However, researchers consistently report that non-immersive VR generates lower levels of presence, engagement, and realism than immersive alternatives. Because users interact indirectly with virtual environments, the psychological feeling of "being there" is significantly reduced. As a result, non-immersive VR may be less effective for applications requiring experiential learning, spatial understanding, or realistic skill development.

Critically, although non-immersive VR lacks the experiential richness of immersive systems, its affordability and accessibility make it an attractive option for many educational institutions, particularly in developing countries where advanced VR equipment remains financially unattainable.

### 2.2.3 Language Instruction

Language instruction has developed through several major approaches, reflecting changes in educational theories, technological advancements, and understandings of how languages are acquired. Traditional language teaching, often associated with teacher-centered approaches such as grammar-translation and direct instruction, emphasizes explicit teaching of vocabulary, grammar rules, and linguistic structures. While such approaches provide learners with systematic knowledge of language forms and allow teachers to closely monitor progress, they have been criticized for giving insufficient attention to communicative competence and authentic language use (Richards & Rodgers, 2014). Contemporary perspectives therefore increasingly emphasize learner participation, interaction, and meaningful communication as essential components of effective language learning (Brown, 2014).

The emergence of Computer-Assisted Language Learning (CALL) introduced new possibilities for language instruction through the integration of digital technologies. CALL enables learners to engage with multimedia resources, online exercises, electronic dictionaries, language corpora, and interactive communication platforms. It has expanded opportunities for individualized learning, immediate feedback, and exposure to authentic language materials beyond the classroom (Chapelle, 2001). However, CALL effectiveness depends not only on technological availability but also on appropriate pedagogical design and teachers' ability to integrate digital tools meaningfully into instruction (Levy & Hubbard, 2005).

Mobile-Assisted Language Learning (MALL) represents a further development of CALL through the use of smartphones, tablets, and other portable devices. MALL supports flexible and personalized learning by allowing learners to practice language skills across different locations and contexts. Research indicates that mobile technologies can facilitate vocabulary development, listening practice, collaborative learning, and informal language exposure (Kukulska-Hulme & Shield, 2008). Nevertheless, challenges such as digital inequality, learner distraction, limited device capabilities, and insufficient teacher training remain important considerations when implementing mobile-based language learning (Burston, 2015).

Immersive language learning emphasizes the importance of authentic interaction and meaningful exposure to the target language and culture. Immersion may occur through experiences such as study-abroad programs, bilingual education, virtual environments, or communication with proficient speakers. Immersive approaches are valued because they encourage learners to use language for real communicative purposes and develop intercultural competence (Lantolf & Thorne, 2006). However, immersion alone does not guarantee successful language acquisition; learners often require structured guidance, feedback, and opportunities for reflection to develop linguistic accuracy and proficiency (Lightbown & Spada, 2013).

Overall, contemporary language instruction is characterized by the integration of traditional pedagogical practices with technological and experiential approaches. Rather than replacing earlier methods, CALL, MALL, and immersive learning environments extend the possibilities of language education by providing additional opportunities for interaction, autonomy, and authentic language use. Effective language instruction therefore requires a balanced approach that combines sound pedagogy with appropriate technological and contextual support.

### 2.3 Theoretical Review

The theoretical foundation of a study provides a framework for explaining how learning occurs and why particular instructional approaches may influence learners' knowledge, skills, and engagement. The theories identified Constructivist Learning Theory, Experiential Learning Theory, Situated Learning Theory, Cognitive Theory of Multimedia Learning, and Social Constructivism are relevant to contemporary learning environments; however, each theory has particular strengths and limitations that must be critically considered.

### 2.3.1 Constructivist Learning Theory

Constructivist Learning Theory proposes that learners actively construct knowledge through experiences, reflection, and interaction with their environment rather than passively receiving information. Jean Piaget and later constructivist scholars argue that learning occurs when individuals integrate new experiences with existing cognitive structures (Piaget, 1970). This theory supports learner-centred approaches where students explore problems, participate in discussions, and develop personal understanding.

However, constructivism has been criticized for potentially underestimating the importance of direct instruction, especially for novice learners who may lack prior knowledge structures required for independent discovery (Kirschner, Sweller, & Clark, 2006). While active engagement enhances understanding, excessive reliance on unguided learning can increase cognitive demands and reduce learning efficiency. Therefore, constructivism is most effective when combined with appropriate guidance and instructional support.

### 2.3.2 Experiential Learning Theory (Kolb) David Kolb's

Experiential Learning Theory emphasizes that learning occurs through a cycle involving concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). The theory strongly supports practical activities, simulations, laboratory work, and real-world problem-solving because learners develop knowledge through experience and reflection.

Despite its influence, Kolb's model has been questioned because its learning cycle may appear overly linear and does not fully account for cultural differences, emotional factors, or variations in how individuals learn (Miettinen, 2000). Additionally, experience alone does not guarantee learning; meaningful reflection and theoretical understanding are necessary to transform experiences into knowledge. Consequently, experiential learning is valuable but requires careful instructional design.

### 2.3.3 Situated Learning Theory

Situated Learning Theory argues that knowledge is developed through participation in authentic social and cultural contexts rather than being acquired separately from real-life situations. Jean Lave and Etienne Wenger introduced the concept of legitimate peripheral participation, where learners gradually become members of communities of practice (Lave & Wenger, 1991).

The strength of this theory is its emphasis on authentic learning environments, professional practice, and social participation. However, critics argue that situated learning may be difficult to implement in formal educational settings where curriculum requirements, assessment systems, and limited resources restrict authentic participation (Anderson, Reder, & Simon, 1996). Therefore, while situated learning provides valuable insights into contextual learning, it may require adaptation within structured classroom environments.

### 2.3.4 Cognitive Theory of Multimedia Learning (Mayer)

The Cognitive Theory of Multimedia Learning (CTML), developed by Richard E. Mayer, explains how learners process information presented through words and images. The theory proposes that humans possess separate channels for processing verbal and visual information, but each channel has limited capacity; effective multimedia learning occurs when information is selected, organized, and integrated with existing knowledge (Mayer, 2021).

This theory is particularly relevant in technology-enhanced learning because it provides principles for designing educational videos, digital presentations, simulations, and interactive materials. However, critics note that multimedia principles may not apply equally across all learners and contexts because individual differences, prior knowledge, motivation, and cultural factors influence multimedia processing (de Jong, 2010). Therefore, multimedia tools should support—not replace—sound pedagogical strategies.

### 2.3.5 Social Constructivism (Vygotsky)

Social Constructivism, based on the work of Lev Vygotsky, emphasizes that learning is socially mediated through interaction, language, and collaboration. A central concept is the Zone of Proximal Development (ZPD), which describes the difference between what learners can achieve independently and what they can accomplish with guidance from more knowledgeable others (Vygotsky, 1978). The theory highlights the importance of collaborative learning, peer interaction, and teacher scaffolding. Nevertheless, social constructivism has been criticized for giving limited attention to individual cognitive processes and biological factors influencing learning (Palincsar, 1998). Furthermore, collaboration does not automatically lead to improved learning outcomes unless activities are carefully structured and learners actively participate.

**Overall Critical Synthesis** The reviewed theories collectively demonstrate that learning is a complex process involving cognitive activity, social interaction, practical experience, and meaningful engagement with learning resources. Constructivist and social constructivist theories emphasize active participation and collaboration, while experiential and situated learning theories highlight the importance of authentic experiences and real-world application. The Cognitive Theory of Multimedia Learning contributes an important explanation of how digital resources can enhance learning when designed according to cognitive principles.

However, no single theory adequately explains all dimensions of learning. Constructivist approaches may require stronger guidance, experiential learning depends on effective reflection, situated learning can be challenging within formal education systems, multimedia learning must consider learner differences, and social constructivism requires purposeful collaboration. Therefore, an integrated theoretical framework combining these perspectives provides a stronger foundation for examining technology-supported, learner-centred, and practice-oriented learning environments.

## 2.4 Review of Empirical Literature

### 2.4.1 Theme 1: Emerging Trends in VR and AR Language Instruction

Recent empirical research indicates that virtual reality (VR) and augmented reality (AR) have become increasingly influential technologies in language education due to their capacity to create immersive, interactive, and socially meaningful learning environments. Unlike traditional digital learning platforms, immersive technologies allow learners to experience simulated real-world contexts where language is used purposefully. Mapping and systematic review studies show that current research trends are

moving beyond simple content delivery toward learner-centered environments characterized by immersion, interaction, personalization, and integration with artificial intelligence (AI) (Parmaxi, 2020; Radianti et al., 2020). However, while studies frequently report improvements in motivation, engagement, and learner confidence, evidence regarding long-term language proficiency gains remains developing, partly because many studies rely on small samples and short intervention periods.

AI-integrated VR language learning represents a major emerging direction in immersive language education. The integration of artificial intelligence enables adaptive learning experiences, intelligent tutoring, automated feedback, and personalized language practice within virtual environments. Empirical studies suggest that AI-supported immersive platforms can enhance vocabulary acquisition, speaking practice, and learner autonomy by providing immediate responses and opportunities for repeated interaction (Chen, 2022; Tai & Chen, 2022). Speech recognition technologies and conversational agents, in particular, allow learners to practice pronunciation and communication without the anxiety often associated with face-to-face interaction. Nevertheless, researchers highlight concerns regarding the accuracy of AI feedback, limited emotional understanding of conversational agents, and the risk that technology may replace rather than support meaningful human interaction.

The development of metaverse classrooms has further expanded discussions about the future of language instruction. Metaverse-based learning environments combine VR, AR, avatars, social networking, and digital spaces to create persistent environments where learners can interact synchronously. Research suggests that these environments may increase social presence and collaboration by enabling learners to participate in authentic communicative activities through digital representations of themselves (Dwivedi et al., 2022). In language education, metaverse classrooms provide opportunities for role-play, intercultural communication, and collaborative problem-solving. However, empirical evidence remains limited, and challenges related to digital inequality, technological infrastructure, privacy, and teacher preparedness continue to restrict large-scale implementation.

Gamification has also become a significant trend in VR and AR language learning. By incorporating game elements such as challenges, rewards, competition, and progress tracking, immersive language applications attempt to increase learner motivation and persistence. Studies have shown that gamified VR environments can improve learner engagement and reduce boredom associated with repetitive language exercises (Sailer & Homner, 2020). In addition, gamification may encourage active participation by transforming language practice into goal-oriented activities. However, empirical findings suggest that excessive focus on rewards may shift learners' attention from meaningful language use toward completing game objectives. Therefore, effective gamification requires alignment between game mechanics and pedagogical goals rather than simply adding entertainment features.

Mobile augmented reality applications have also contributed to the expansion of immersive language learning by making AR experiences more accessible through smartphones and tablets. Empirical studies demonstrate that mobile AR applications can support vocabulary development, contextual learning, and learner autonomy by linking language input with physical environments (Godwin-Jones, 2021). For example, learners can interact with digital annotations, objects, and visual information connected to real-world contexts, which may strengthen memory and comprehension. Despite these advantages, research identifies limitations including device compatibility issues, distractions, limited interaction quality, and insufficient theoretical grounding in some AR applications. Avatar-based communication represents another important development in VR language instruction. Avatars allow learners to participate in simulated conversations and social interactions while potentially reducing speaking anxiety and increasing willingness to communicate. Research indicates that virtual identities can encourage participation among learners who may feel hesitant in traditional classroom settings (Lan, 2020). Avatar-mediated communication also supports collaborative learning through virtual role-play and intercultural exchanges. However, questions remain regarding whether communication through avatars can fully replicate authentic human interaction and whether learners develop transferable communication skills beyond virtual environments. Mixed Reality (MR), which combines elements of both physical and virtual environments, has gained attention because it provides more flexible learning experiences than fully immersive VR. MR applications allow learners to interact with digital language resources while remaining connected to their physical surroundings. Empirical studies suggest that MR can enhance contextualized learning by allowing learners to manipulate virtual objects and participate in realistic language activities (Kye et al., 2021). However, MR research in language education is still relatively limited compared with VR, and further investigation is needed to determine its effectiveness across different language skills, learner populations, and educational contexts.

Virtual cultural immersion has become an important application of VR and AR technologies because language learning is closely connected to cultural understanding. Immersive environments enable learners to explore virtual representations of foreign locations, participate in cultural scenarios, and interact with simulated communities. Studies indicate that such experiences can improve intercultural awareness and provide exposure to contexts that may be inaccessible through traditional classroom approaches (Faiola et al., 2019). Nevertheless, researchers caution that virtual cultural experiences may oversimplify cultural realities or present stereotypical representations if they are not designed with authentic cultural input.

Speech recognition systems and conversational agents have emerged as key components of intelligent language-learning environments. These technologies provide learners with opportunities for oral practice, automated pronunciation assessment, and conversational interaction. Empirical research suggests that AI-driven speaking tools can increase practice opportunities and provide immediate corrective feedback, supporting improvements in pronunciation and fluency (McCrocklin, 2019). However, limitations remain regarding recognition accuracy, contextual understanding, and the ability of automated systems to provide nuanced feedback comparable to human instructors. Overall, empirical literature demonstrates that VR and AR language instruction is evolving toward highly interactive, intelligent, and socially connected learning ecosystems. Current research highlights the potential of immersive technologies to improve motivation, communication practice, cultural awareness, and learner engagement. However, existing studies frequently face methodological limitations, including small participant groups, short-term interventions, inconsistent assessment methods, and limited exploration of teachers' roles. Future research should therefore move beyond evaluating technological novelty and examine how immersive technologies can be integrated into evidence-based language pedagogy to achieve sustainable improvements in language learning outcomes.

### 2.4.2 Theme 2: Research Gaps

The existing body of research on immersive technologies in language learning reveals several important gaps that limit the generalizability and practical application of current findings. Although studies consistently report positive effects of Virtual Reality (VR), Augmented Reality (AR), and related technologies on language acquisition, many investigations are exploratory, short-term, and conducted under controlled conditions. Consequently, there remains insufficient evidence to determine how these technologies influence sustained language development across diverse educational settings.

One major gap is the scarcity of longitudinal studies. Most existing research evaluates learners over short intervention periods ranging from a few weeks to a single academic semester. While these studies often demonstrate immediate improvements in vocabulary acquisition, learner motivation, speaking confidence, and engagement, they provide little evidence regarding the durability of these gains. Longitudinal research spanning multiple semesters or academic years is necessary to establish whether immersive learning technologies produce lasting improvements in language proficiency, learner autonomy, and retention.

Another significant limitation is the limited representation of African educational contexts. The majority of empirical studies originate from Asia, Europe, and North America, where technological infrastructure, educational funding, and digital literacy differ considerably from many African countries. Consequently, findings from these regions may not accurately reflect the realities of institutions facing infrastructural challenges such as unreliable internet connectivity, inadequate technological resources, and limited institutional support. More context-specific studies conducted across African higher education institutions are therefore essential to generate evidence that is relevant to local educational systems and policy development.

The literature also demonstrates a lack of standardized assessment methods for evaluating the effectiveness of immersive language learning technologies. Researchers employ diverse measurement tools, including researcher-developed questionnaires, language achievement tests, interviews, observational methods, and self-reported perceptions. This methodological inconsistency makes it difficult to compare findings across studies or conduct robust meta-analyses. Developing standardized and validated assessment instruments would improve the reliability, comparability, and cumulative value of future research.

A further research gap concerns the limited exploration of teachers' perspectives. Most studies prioritize learners' experiences, motivation, satisfaction, and language performance while paying comparatively little attention to educators who are responsible for implementing these technologies. Teachers' perceptions of usability, instructional effectiveness, professional preparedness, pedagogical challenges, and institutional support remain underexplored. Understanding these perspectives is crucial because teacher acceptance and competence significantly influence the successful integration of immersive technologies into language instruction.

Another area requiring greater scholarly attention is the lack of comparative studies between Virtual Reality and Augmented Reality. Existing research often examines VR or AR independently, making it difficult to determine which technology is more effective for specific language learning objectives. Comparative investigations that evaluate both technologies using similar instructional designs, learner populations, and assessment criteria would provide clearer evidence regarding their relative strengths, limitations, cost-effectiveness, and suitability for different educational contexts.

The literature also provides insufficient evidence on long-term learning outcomes beyond immediate academic performance. While many studies report improvements in engagement, motivation, communication skills, and short-term language achievement, relatively few examine whether these benefits translate into sustained language proficiency, academic success, workplace communication skills, or lifelong language learning. Future research should investigate the transferability and persistence of learning outcomes over extended periods to better understand the broader educational impact of immersive technologies.

Finally, there is limited research on AI-powered immersive language learning, despite rapid advances in artificial intelligence. Emerging technologies that combine AI with VR and AR—such as intelligent virtual tutors, adaptive learning environments, speech recognition systems, conversational agents, and personalized feedback mechanisms—have significant potential to transform language education. However, empirical evidence regarding their effectiveness, scalability, ethical implications, and pedagogical value remains limited. Future studies should investigate how AI-enhanced immersive environments can personalize language instruction, improve learner engagement, and support diverse learning needs while addressing concerns related to privacy, accessibility, and algorithmic bias.

Overall, these research gaps highlight the need for more rigorous, contextually diverse, and methodologically consistent investigations. Addressing these limitations through longitudinal, comparative, and multidisciplinary research will strengthen the evidence base for immersive language learning technologies and support their effective implementation in higher education, particularly in underrepresented regions such as Africa.

### 2.5 Summary of Literature Review

The literature reviewed indicates that the study topic has received considerable attention from researchers, with most studies emphasizing its importance in improving organizational performance, efficiency, and sustainability. Overall, the findings suggest that the key variables examined in previous studies are positively related, although the strength and significance of these relationships vary across different industries, geographical locations, and research contexts. Most scholars agree that effective implementation of the identified practices contributes to better outcomes, while inadequate implementation often results in reduced performance and operational challenges. Despite this broad consensus, the literature also reveals some contradictory findings. While several studies report strong positive relationships between the variables, others find weak, insignificant, or context-dependent effects, suggesting that organizational size, leadership style, technological capability, regulatory environment, and cultural factors may influence the outcomes. Furthermore, many previous studies have focused on developed economies or specific sectors, leaving limited evidence from developing countries and other underrepresented contexts. Methodologically, much of the existing research relies on cross-sectional designs, with fewer longitudinal or mixed-method studies that could provide deeper insights into causal relationships. These gaps highlight the need for further research to address contextual differences, explore additional moderating and mediating factors, and generate evidence that is more applicable to the specific setting of the current study.

### 3. Research Methodology

This study adopted a Critical Literature Review (CLR) using a Systematic Narrative Review (SNR) approach to examine the application of Virtual Reality (VR) and Augmented Reality (AR) in language education. This methodology was appropriate because the study sought to synthesize, evaluate, and critically interpret existing scholarly evidence rather than generate primary empirical data. Unlike experimental or survey-based research, the chosen design enabled the researcher to identify patterns, inconsistencies, strengths, and limitations across previous studies while providing a comprehensive understanding of current developments in immersive language learning technologies.

The search strategy relied on established academic databases, including Scopus, Web of Science, ERIC, Google Scholar, ScienceDirect, SpringerLink, and IEEE Xplore. Using multiple databases enhanced the breadth and credibility of the review by minimizing publication bias and ensuring access to interdisciplinary studies spanning education, technology, and linguistics. However, despite the comprehensive search, it is acknowledged that relevant studies indexed in regional databases or unpublished sources may have been excluded, potentially limiting the completeness of the evidence base.

The inclusion criteria restricted the review to peer-reviewed journal articles published in English between 2018 and 2026 that focused specifically on VR and AR applications in language instruction. These criteria ensured that the review reflected recent technological advancements and high-quality academic evidence. Nevertheless, limiting the review to English-language publications introduced the possibility of language bias, particularly considering that many innovative language education studies originate from non-English-speaking countries.

Similarly, the exclusion of conference abstracts, duplicate studies, non-English publications, and research unrelated to language education improved the relevance and reliability of the review. While excluding conference abstracts reduced the risk of including incomplete findings, it may also have omitted emerging innovations in VR and AR that are often first reported in conference proceedings before appearing in journal publications.

Data extraction followed a structured framework that captured key study characteristics, including authorship, publication year, country, research design, participant characteristics, technologies employed, targeted language skills, principal findings, reported challenges, and recommendations. This systematic extraction facilitated meaningful comparison across studies and ensured consistency in the synthesis process. However, differences in research methodologies, participant demographics, educational settings, and technological platforms made direct comparisons difficult, highlighting the heterogeneous nature of the existing literature.

Thematic analysis was employed to synthesize findings into four major themes: emerging trends, opportunities, challenges, and research gaps. This analytical approach was effective in identifying recurring patterns while allowing the integration of both qualitative and quantitative evidence. Through thematic synthesis, the review revealed increasing adoption of immersive technologies for language learning, improvements in learner engagement and communicative competence, persistent barriers related to cost, infrastructure, teacher readiness, and accessibility, and significant gaps concerning longitudinal studies, standardized assessment measures, and research from developing countries. Although thematic analysis provided flexibility and depth, its interpretive nature may introduce researcher subjectivity despite efforts to maintain systematic coding procedures.

Overall, the methodology demonstrated a rigorous and transparent process for identifying, selecting, evaluating, and synthesizing relevant literature. The combination of systematic searching, clearly defined eligibility criteria, structured data extraction, and thematic analysis strengthened the reliability and credibility of the review. At the same time, acknowledged limitations including publication bias, language restrictions, database coverage, and methodological heterogeneity among reviewed studies should be considered when interpreting the findings. Despite these limitations, the methodological approach provided a robust foundation for critically examining the current state of knowledge on VR and AR in language instruction and for identifying future research priorities.

### 4. Critical Analysis and Discussion

#### 4.1 Emerging Trends

Recent studies indicate that language teaching is increasingly shifting from traditional teacher-centred approaches to learner-centred and technology-enhanced pedagogies. Digital learning platforms, artificial intelligence, blended learning, and collaborative instructional strategies have gained prominence due to their ability to promote active engagement and improve language proficiency. Researchers generally agree that these innovations have transformed classroom practices by creating more interactive and flexible learning environments.

However, the effectiveness of these emerging trends remains inconsistent across different educational contexts. While studies conducted in technologically advanced settings report significant improvements in learners' motivation and achievement, research from resource-constrained institutions often highlights limited implementation due to inadequate infrastructure, insufficient teacher training, and unequal access to digital tools. This suggests that the success of recent innovations depends largely on contextual factors rather than the instructional methods alone.

#### 4.2 Opportunities

The reviewed studies consistently demonstrate that innovative language teaching approaches provide opportunities for improving learners' communication skills, critical thinking, and overall language competence. Most scholars acknowledge that integrating authentic learning materials, collaborative learning, and digital technologies encourages greater learner participation and supports meaningful language use beyond the classroom.

Despite this consensus, differences emerge regarding the extent of these benefits. Some studies report substantial gains in academic performance and learner autonomy, whereas others find only moderate improvements due to variations in research design, participant characteristics, and educational settings. These contrasting findings indicate that no single instructional approach is universally effective, and successful implementation requires adaptation to learners' needs and institutional contexts. Another point of concern is the role of a teacher as a Centre of emotional and personalized transmission of moral values putting into consideration that we are living in an era of absent parenting and critical cultural transition.

#### 4.3 Challenges

A common challenge identified across the literature is the inadequate preparation of teachers to implement contemporary language teaching strategies effectively. Many educators lack sufficient professional development opportunities, resulting in limited confidence and competence in using innovative instructional methods. Additionally, shortages of teaching resources, overcrowded classrooms, and unreliable technological infrastructure continue to hinder effective language instruction.

Another significant challenge is the inconsistency in research findings concerning the effectiveness of different teaching approaches. Variations in sample sizes, methodologies, assessment tools, and cultural contexts make direct comparison difficult and reduce the generalizability of conclusions. These methodological differences underscore the need for more rigorous and context-sensitive research.

#### 4.4 Research Gaps

The literature reveals several areas that remain insufficiently explored. Many existing studies focus on short-term interventions, with relatively few examining the long-term impact of innovative language teaching strategies on learners' language development and retention. Consequently, evidence regarding sustained learning outcomes remains limited.

Furthermore, limited attention has been given to underrepresented educational contexts, particularly rural schools, low-resource institutions, and learners with diverse educational needs. There is also a shortage of comparative and longitudinal studies that examine how contextual variables influence the effectiveness of language teaching approaches. Addressing these gaps would strengthen the evidence base and enhance the applicability of future research.

#### 4.5 Implications for Language Teaching Teachers

Teachers should adopt learner-centred instructional practices that encourage interaction, collaboration, and critical thinking while integrating appropriate educational technologies. Continuous professional development is essential to enable teachers to respond effectively to evolving pedagogical demands and diverse learner needs.

**Curriculum Developers** Curriculum developers should design flexible language curricula that integrate digital literacy, communicative competence, and authentic learning activities. Curriculum content should remain responsive to technological advancements and the changing linguistic needs of learners in contemporary society.

**Educational Institutions** Educational institutions should provide adequate technological infrastructure, instructional resources, and ongoing professional development opportunities for teachers. Creating supportive learning environments will enhance the effective implementation of innovative language teaching practices and improve learner outcomes.

#### 4.6 Policymakers

Policymakers should formulate educational policies that promote equitable access to quality language education, particularly through investments in digital infrastructure, teacher capacity building, and evidence-based curriculum reform. Policies should also support continuous research and innovation to ensure that language education remains relevant, inclusive, and responsive to emerging educational challenges.

### 5. Conclusions and Recommendations

#### 5.1 Summary of Findings

This section summarizes the major findings of the study by highlighting the key themes identified in the literature. The review demonstrates that Virtual Reality (VR) and Augmented Reality (AR) have significantly transformed language education by providing immersive, interactive, and learner-centered experiences. These technologies improve learners' speaking, listening, vocabulary acquisition, pronunciation, and cultural understanding through realistic simulations and contextual learning environments.

The findings also indicate that VR and AR increase learner motivation, engagement, confidence, and collaboration compared to traditional teaching methods. However, the review identifies several challenges, including high implementation costs, limited technological infrastructure, insufficient teacher training, technical difficulties, and unequal access to digital devices, particularly in developing countries. Overall, the evidence suggests that while immersive technologies hold considerable promise, their successful implementation depends on adequate institutional support, teacher preparedness, and equitable access to technology.

#### 5.2 Conclusions

Based on the reviewed literature, it can be concluded that VR and AR represent innovative approaches capable of improving language teaching and learning. Their ability to create authentic communication environments enhances learners' practical language skills while making learning more engaging and meaningful. These technologies align well with modern educational theories that emphasize experiential, collaborative, and learner-centered instruction.

Nevertheless, VR and AR should be viewed as complementary instructional tools rather than complete replacements for conventional classroom teaching. Their effectiveness depends on thoughtful pedagogical integration, teacher competence, curriculum alignment, and continuous technological support. As technology continues to evolve, immersive learning is expected to play an increasingly important role in language education worldwide.

#### 5.3 Recommendations

##### 5.3.1 Recommendations for Teachers

Teachers should integrate VR and AR activities into language lessons to promote authentic communication, active participation, and experiential learning. They should also participate in continuous professional development programs to improve their technological and pedagogical skills. Furthermore, teachers should carefully select immersive applications that align with curriculum objectives and learners' proficiency levels.

### 5.3.2 Recommendations for Schools

Schools should invest in the necessary technological infrastructure, including VR headsets, AR-enabled devices, reliable internet connectivity, and technical support services. School administrators should also organize regular teacher training workshops and encourage collaborative lesson planning that incorporates immersive technologies into language instruction.

### 5.3.3 Recommendations for Governments

Governments should formulate educational policies that support the integration of immersive technologies into national education systems. Increased funding should be allocated for digital infrastructure, teacher training, and educational technology research. Governments should also promote equitable access to VR and AR resources to reduce the digital divide between urban and rural schools.

### 5.3.4 Recommendations for Educational Technology Developers

Educational technology developers should design affordable, user-friendly, and curriculum-aligned VR and AR applications that address diverse language learning needs. Developers should incorporate adaptive learning features, multilingual support, accessibility options for learners with disabilities, and AI-driven personalized feedback to improve learning outcomes.

### 5.3.5 Recommendations for Researchers

Researchers should continue investigating the educational effectiveness of VR and AR across different educational contexts, age groups, and language proficiency levels. Future studies should employ rigorous experimental and mixed-methods research designs to better understand the long-term impact of immersive technologies on language acquisition, learner motivation, and classroom practices.

## 5.4 Suggestions for Future Research

Although research on immersive technologies in language education has expanded rapidly, several areas require further investigation to strengthen existing knowledge.

### 5.4.1 AI-Powered VR Language Tutors

Future studies should explore how artificial intelligence can be integrated into VR environments to create intelligent virtual tutors capable of providing personalized instruction, adaptive feedback, pronunciation correction, and real-time conversational practice.

### 5.4.2 Metaverse-Based Language Education

Researchers should investigate the educational potential of metaverse platforms for language learning, focusing on collaborative virtual classrooms, intercultural communication, social interaction, and learner engagement within persistent virtual worlds.

### 5.4.3 Adaptive AR Systems

Further research should examine adaptive AR applications that automatically personalize learning materials according to learners' abilities, preferences, progress, and learning styles, thereby improving instructional effectiveness.

### 5.4.4 Longitudinal Studies on Language Proficiency

Most existing studies evaluate short-term learning outcomes. Future longitudinal research should investigate whether VR and AR produce sustained improvements in language proficiency, retention, communicative competence, and learner confidence over extended periods.

### 5.4.5 Comparative Studies of VR, AR, and Mixed Reality

Comparative studies are needed to determine the relative effectiveness of Virtual Reality, Augmented Reality, and Mixed Reality across different language skills, educational settings, learner characteristics, and instructional objectives.

### 5.4.6 Inclusive and Accessible Immersive Language Learning

Future research should focus on designing inclusive immersive learning environments that accommodate learners with disabilities, diverse socioeconomic backgrounds, and varying technological access. Such studies can help ensure that immersive language education benefits all learners equitably.

## 5.5 Suggested Keywords for Literature Search

The following keywords can support future literature reviews and academic database searches related to immersive language learning:

- Virtual Reality in Language Learning
- Augmented Reality in Language Education
- Immersive Language Learning
- Computer-Assisted Language Learning (CALL)
- Mobile-Assisted Language Learning (MALL)
- Extended Reality (XR) in Education
- Gamification and Language Learning
- Metaverse Language Education
- AI and Language Learning
- VR/AR Language Pedagogy

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