Virtual and Augmented Reality in English Language Teaching: Prospects and Limitations

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Abstract: Virtual Reality (VR) and Augmented Reality (AR) have emerged as transformative technologies in English Language Teaching (ELT), offering immersive, interactive, and contextualized learning experiences. This article synthesizes recent empirical evidence (primarily 2020–2025) on their applications in EFL/ESL contexts, focusing on vocabulary acquisition, speaking skills, motivation, engagement, and overall language proficiency. Prospects include enhanced immersion, contextual learning, increased retention, and motivation through gamification and real-world simulation. Meta-analyses and systematic reviews indicate moderate to positive effects on learning outcomes. However, significant limitations persist: high costs, technical infrastructure requirements, cybersickness, teacher training gaps, accessibility issues, and pedagogical integration challenges. The discussion highlights the need for hybrid approaches combining XR with traditional methods. Future directions emphasize affordable mobile-based solutions, teacher professional development, and ethical considerations for equitable implementation in diverse educational settings.

Keywords: Virtual Reality, Augmented Reality, English Language Teaching, Immersive Learning, EFL/ESL, Vocabulary Acquisition, Motivation, Limitations of XR in Education.

Introduction. The integration of Extended Reality (XR) technologies — encompassing Virtual Reality (VR) and Augmented Reality (AR) — represents one of the most significant innovations in contemporary English Language Teaching (ELT). VR creates fully immersive synthetic environments, while AR overlays digital content onto the real world, both fostering experiential learning that traditional classrooms often cannot provide (Huang et al., 2021; Luo et al., 2024). Recent advancements in hardware (e.g., affordable standalone headsets like Meta Quest series) and software (mobile AR apps) have accelerated XR adoption in EFL/ESL contexts. Studies from 2023–2025 demonstrate growing interest in XR for vocabulary building, speaking practice, cultural understanding, and motivation enhancement (Haoming & Wei, 2024; Schorr et al., 2024).

Literature Review. Research on XR in language education has proliferated since the mid-2010s. Early meta-analyses showed positive effects of VR on general learning outcomes (Merchant et al., 2014), while recent reviews focus specifically on language skills. Systematic reviews indicate that AR is predominantly used for vocabulary acquisition via marker-based mobile applications (Schorr et al., 2024), while VR excels in immersive scenarios for speaking and contextual practice (Ironsi, 2023). Meta-analyses report small to moderate positive effects: VR-assisted EFL learning yields an effect size of $g = 0.445$ compared to traditional methods (various 2023 studies), with stronger impacts on vocabulary retention and motivation (Yang & Zhang, 2024; Frontiers reviews, 2025).

Empirical studies highlight VR's role in reducing speaking anxiety through safe virtual environments and AR's advantage in portability and real-world integration (Al-Ansi et al., 2023; Parlar, 2025). Gamified XR applications further boost engagement (Haoming & Wei, 2024). However, many studies note that XR works best as a supplement rather than a replacement for conventional teaching (Luo et al., 2024).

Prospects of VR and AR in English Language Teaching

Enhanced Immersion and Contextual Learning

VR provides complete immersion, enabling learners to practice English in simulated real-world settings (e.g., virtual cafes, airports, or international conferences), which significantly improves contextual understanding and pragmatic competence (Hsu, 2024). AR supports situated learning by overlaying vocabulary or pronunciation cues onto physical objects, making abstract concepts tangible (Ngo & Vo, 2025).

Improved Vocabulary Acquisition and Retention

Multiple systematic reviews confirm that both VR and AR significantly enhance vocabulary gains, with VR showing advantages in long-term retention due to higher immersion levels (Chen & Yuan, 2023; Frontiers, 2025). AR's mobile accessibility makes it suitable for frequent, low-stakes practice.

Increased Motivation and Engagement

Learners report higher motivation, reduced anxiety, and greater willingness to communicate in XR environments (Ironsi, 2023; Parong & Mayer, 2018 updates). Gamification elements in XR further amplify these effects, particularly among young and higher education learners (Budianto et al., 2023).

Development of Communicative Competence

VR facilitates safe speaking practice with virtual avatars or peers, improving fluency and confidence (Iskender & Erkan, 2023). AR supports interactive tasks like object labeling or cultural exploration.

Limitations and Challenges

Technical and Infrastructural Barriers

High costs of VR hardware, need for powerful devices, and stable internet connections limit accessibility, especially in developing regions or under-resourced schools (Chen, 2020; Alalwan et al., 2020). AR is more affordable but still requires compatible smartphones/tablets.

Physical and Psychological Discomfort

Cybersickness (nausea, dizziness) affects 20–80% of VR users, particularly in prolonged sessions (Xi et al., 2023). AR causes fewer issues but can lead to visual fatigue.

Pedagogical and Teacher-Related Challenges

Many teachers lack training in XR integration, leading to superficial use (Kaplan-Rakowski et al., 2023). Designing effective XR tasks requires specialized skills, and over-reliance may reduce teacher-student interaction.

Equity and Ethical Concerns

Digital divide exacerbates inequalities; not all learners have equal access (Al-Ansi et al., 2023). Privacy issues arise from data collection in XR platforms.

Limited Generalizability and Evidence Gaps

Most studies focus on short-term effects and vocabulary/speaking; long-term impacts on integrated skills remain underexplored (Luo et al., 2024). Small sample sizes and context-specific results limit broader conclusions.

Discussion. The reviewed evidence from systematic reviews, meta-analyses, and empirical studies (primarily 2020–2025) underscores that Virtual Reality (VR) and Augmented Reality (AR) — collectively termed Extended Reality (XR) — represent powerful affordances for transforming English Language Teaching (ELT) in EFL/ESL contexts. Immersive environments facilitate experiential, situated learning that traditional classrooms rarely achieve, leading to statistically significant improvements in key areas such as vocabulary acquisition (with moderate effect sizes, e.g., $g \approx 0.45$ for VR-assisted learning), long-term retention, speaking confidence, reduced foreign language anxiety, and overall learner motivation (Chen & Yuan, 2023; Yang & Zhang, 2024; Frontiers reviews, 2025; Schorr et al., 2024). These gains are particularly pronounced when XR incorporates gamification elements or task-based activities, as they amplify cognitive engagement, emotional involvement, and willingness to communicate (Haoming & Wei, 2024; Ironsi, 2023).

VR's strength lies in its high-immersion capacity, enabling learners to rehearse authentic communicative scenarios (e.g., virtual travel, job interviews, or cultural interactions) in a psychologically safe space, which is especially beneficial for reducing speaking anxiety among introverted or lower-proficiency learners (Hsu, 2024; Gu, 2025). AR, by contrast, offers greater accessibility and flexibility through mobile integration, supporting situated vocabulary learning and real-world object interaction with minimal disruption to classroom routines (Ngo & Vo, 2025; Parlar, 2025). Recent comparative analyses suggest that while VR tends to produce stronger effects on retention and pragmatic competence due to deeper presence, AR excels in scalability and frequent, low-stakes practice (Frontiers in Virtual Reality, 2025).

Nevertheless, these prospects must be tempered by persistent limitations that continue to hinder widespread, equitable adoption. Technical and infrastructural barriers — including high initial costs of VR hardware, requirements for stable high-speed internet, and device compatibility — remain pronounced, particularly in under-resourced educational settings and developing regions (Chen, 2020; Alalwan et al., 2020; Luo et al., 2024). Cybersickness affects a substantial proportion of users (20–80% in prolonged sessions), manifesting as nausea, dizziness, visual fatigue, and disorientation, which can undermine learning efficacy and discourage repeated use (Xi et al., 2023; recent teacher surveys, 2023–2025). Pedagogically, many educators lack adequate training in XR integration, resulting in superficial implementation that fails to capitalize on the technologies' full potential and risks reducing meaningful teacher-learner interaction (Kaplan-Rakowski et al., 2023). Equity concerns are equally critical: the digital divide exacerbates access disparities, while privacy risks from data-tracking in XR platforms raise ethical questions (Al-Ansi et al., 2023).

The most promising pathway forward lies in hybrid instructional models that strategically blend XR with conventional methods. Recent studies advocate for phased integration: using AR for preparatory and reinforcement activities (due to its portability) and reserving high-immersion VR for targeted, high-impact tasks such as speaking practice or cultural immersion (Pérez-Jorge et al., 2025; hybrid XR-ESL reviews, 2025). Such approaches mitigate health and accessibility risks (e.g., shorter sessions, optional participation) while maximizing pedagogical synergy. Mobile-based AR solutions, in particular, hold strong potential for inclusive scaling in diverse global contexts, including resource-constrained EFL environments.

From a broader perspective, the moderate-to-positive effect sizes reported across meta-analyses indicate that XR is not a panacea but a valuable supplement when aligned with sound instructional design principles (e.g., task authenticity, scaffolding, and reflective debriefing). Future directions should prioritize:

longitudinal and large-scale studies to evaluate sustained impacts on integrated language skills (listening, writing, intercultural competence) beyond short-term vocabulary and speaking gains;

inclusive design frameworks addressing cybersickness mitigation, accessibility for diverse learners (including those with disabilities), and cultural adaptation of content;

teacher professional development programs focused on XR pedagogy, ethical use, and hybrid curriculum design;

cost-reduction strategies such as open-source XR content, cloud-based platforms, and mobile-first approaches to bridge the equity gap.

XR technologies offer transformative prospects for making ELT more immersive, motivating, and effective, their successful integration demands careful navigation of technical, human, and ethical challenges. Evidence-based hybrid implementations, supported by ongoing teacher support and rigorous research, will be essential to realizing XR's full promise in fostering equitable, high-quality English language education worldwide.

Conclusion. Virtual and Augmented Reality technologies hold transformative potential for English Language Teaching by creating immersive, motivating, and contextualized learning experiences. Empirical evidence from 2023–2025 confirms benefits in vocabulary retention, speaking confidence, and learner engagement. Nevertheless, technical, financial, pedagogical, and equity challenges must be addressed through affordable solutions, teacher training programs, and ethical frameworks. Future research should prioritize longitudinal studies, large-scale implementations, and inclusive designs to realize XR's full promise in global ELT.

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