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# Augmented Reality and Virtual Reality in English Learning: Bibliometric Analysis of Research Trends, Citation Patterns, and Future Directions

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## Abstract

*This study conducts a comprehensive bibliometric analysis to map the development of research on Augmented Reality (AR) and Virtual Reality (VR) in English language learning (ELL) from 2010 to 2025. Using 386 Scopus-indexed documents, the analysis examines publication growth, citation performance, influential authors and countries, core sources, and the thematic evolution of immersive learning research. The findings show a sharp increase in scientific production after 2020, reflecting the global rise of digital and immersive technologies in education. China, Korea, and Malaysia emerge as dominant contributors, demonstrating Asia's leading role in AR/VR-driven language innovation. Citation trends reveal the coexistence of foundational highly cited works and rapidly influential recent publications. Source impact analysis confirms the interdisciplinary character of the field, spanning educational technology, linguistics, psychology, and computer science. Trend-topic analysis indicates a shift from general pedagogical themes toward AI-enhanced AR applications, deep learning, virtual reality environments, and interactive vocabulary learning systems. Despite significant growth, gaps remain in long-term studies, cross-country collaboration, and research on advanced language competencies. Overall, the study provides a data-driven understanding of how AR and VR have evolved as transformative tools for English language learning and offers strategic insights for guiding future research agendas in immersive educational technologies.*

***Keywords****—Augmented Reality; Bibliometric Analysis; English Language Learning; Mobile Learning; Virtual Reality;*

## 1. Introduction

The integration of immersive technologies in language education has become one of the most significant developments in contemporary educational research over the past decade (Salehi, 2025). Augmented Reality (AR) and Virtual Reality (VR) have transformed pedagogical practices by enabling immersive, interactive, and context-rich learning environments to support English language acquisition (Roman, 2025; Chan, 2025). These technologies provide authentic opportunities for learners to practice language skills beyond traditional classroom constraints, increasing engagement and learning effectiveness (Milad, 2025).

This bibliometric study examines the evolution of research in this field from 2010 to 2025, a period encompassing the emergence, consolidation, and maturation of immersive language learning research (Gao, 2025). Major journals such as Educational Technology Research and Development, Computer Assisted Language Learning, and Language Teaching Research have increasingly featured studies on immersive technologies in language education, indicating the field's rising legitimacy and impact (Rifah, 2025). Empirical studies consistently demonstrate the pedagogical value of immersive technologies. Khodabandeh (2025) reported significant improvements in EFL learners' vocabulary acquisition through the ARLOOPA application in both flipped online and face-to-face learning contexts. Similarly, Jia (2025) found that AR-supported game-based learning resulted in superior academic English vocabulary retention among Chinese EFL university students compared to digital and paper-based approaches.

From a bibliometric perspective, the research trajectory in this domain shows strong growth dynamics. Analysis of 386 publications across 177 sources reveals an annual growth rate of 20.3% (Khodabandeh, 2025), reaching 56 publications in 2024 and 64 in 2025 (Zhang, 2025). The average citation rate of 16.15 per document highlights the substantial influence of this research within the international academic community (Chan, 2025). Furthermore, international co-authorship accounts for 17.62% of publications, suggesting the emergence of global collaboration networks (Parlar, 2025). Traditional classroom instruction often provides limited exposure to authentic communicative contexts (Mishu, 2025). AR and VR address this limitation by enabling learners to practice language skills in simulated real-life environments (Amin, 2025). Khodabandeh (2025) demonstrated that AR-enhanced blended learning produced greater vocabulary gains compared to flipped AR-based instruction alone (Popova, 2025).

Beyond vocabulary acquisition, immersive technologies also facilitate higher-order language competencies. Speaking skills have improved significantly through AR-based instructional approaches (Asadi, 2025; Chen, 2025; Muangchan, 2025). AR-based interventions have also been applied to critical reading instruction, offering benefits such as multisensory engagement, improved cognitive load management, and enhanced learner confidence (Yulianawati et al., 2025). Technological advancements have increased the feasibility of immersive learning. Mourelatos (2025) developed a location-based AR application with geolocation features and reported high user satisfaction and pedagogical effectiveness. The integration of AR with game-based learning has shown enhanced delayed retention (Jia, 2025).

Despite the rapid expansion of empirical research, comprehensive bibliometric analyses mapping the intellectual structure and thematic evolution of AR and VR in English language learning remain limited. This study investigates: (RQ1) How has the publication trend of AR and VR research in English language learning evolved from 2010 to 2025? and (RQ2) What thematic trends and research gaps can be identified? This study aims to synthesize existing knowledge and provide evidence-based insights to guide future research.

## 2. Method

### 2.1 Research Design

This study employed a bibliometric research design complemented by qualitative interpretation to examine research trends on Augmented Reality (AR) and Virtual Reality (VR) in English language learning (ELL). Bibliometric analysis was used to quantitatively map publication growth, citation patterns, and collaboration networks, while qualitative interpretation supported the analysis of thematic development and emerging research directions.

### 2.2 Data Source and Search Strategy

Data were retrieved from Elsevier’s Scopus database due to its extensive coverage of peer-reviewed international publications. The analysis covered the period 2010–2025 to capture the longitudinal development of AR/VR research in English language learning. The search query combined terms related to English language learning (“English learning,” “English Language

Learning," "EFL," "ESL") and immersive technologies ("Augmented Reality," "Virtual Reality," "immersive technology"), applied to titles, abstracts, and keywords. All records were exported in standard metadata formats for analysis.

### 2.3 Inclusion Criteria and Data Preparation

The dataset included peer-reviewed journal articles and conference papers published between 2010 and 2025 that explicitly addressed AR and/or VR applications in English language learning and contained complete bibliographic metadata. Non-peer-reviewed publications, studies unrelated to English learning, and duplicate records were excluded.

Data preparation involved metadata cleaning, removal of duplicates, standardization of author and institutional names, and normalization of key terms (e.g., AR/Augmented Reality; VR/Virtual Reality; ELL/English Language Learning) to ensure consistency in keyword-based analyses.

### 2.4 Analytical Tools and Procedures

Bibliometric analyses were conducted using the Bibliometrix package in R and its web-based interface, Biblioshiny. The analysis focused on two core dimensions: performance analysis and science mapping. Performance analysis examined publication output, citation impact, and contributions by authors, sources, and countries. Science mapping techniques included keyword co-occurrence, co-authorship, and co-citation analyses to identify thematic structures, collaboration patterns, and the intellectual organization of the field. Additional analyses traced keyword evolution, thematic clusters, and emerging research topics over time.

### 2.5 Reliability and Transparency

Methodological rigor was ensured through the use of reproducible search protocols, standardized data-cleaning procedures, and established bibliometric software. The analytical workflow was fully documented to support transparency and replicability, while potential limitations related to database coverage were addressed through explicit reporting of data scope and selection criteria.

## 3. Results And Discussion

### 3.1 Result

Figure 1 presents an overview of the bibliometric characteristics of the 386 publications analyzed within the 2010–2025 timespan. Overall, the visualization summarizes the key indicators that describe the performance and structure of research in the field of Augmented Reality (AR) and Virtual Reality (VR) for English language learning.

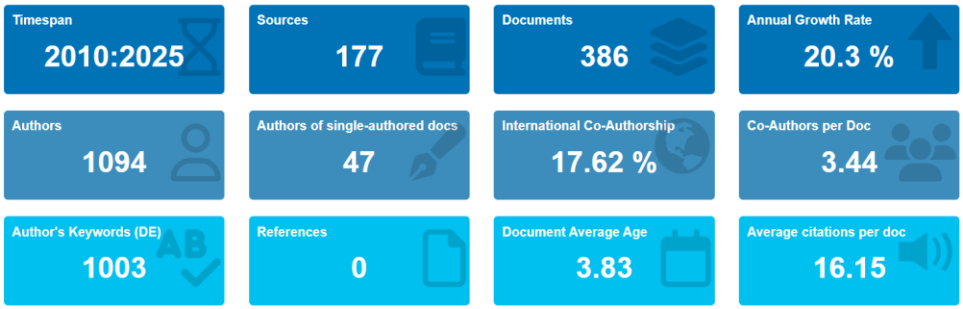



Figure 1. Main Information

### 3.2 Annual Scientific Production

Figure 2 presents the annual publication trend of research on Augmented Reality (AR) and Virtual Reality (VR) in English language learning from 2010 to 2025, based on 386 Scopus-indexed documents. Overall, the data show a clear and sustained increase in scientific production, reflecting the growing academic interest in immersive technologies within English Language Learning (ELL).

During the initial phase (2010–2013), publication output remained low, indicating that AR and VR were still emerging and had limited adoption in language education. A transitional phase began around 2014–2016, marked by a noticeable rise in publications, which corresponds with increased access to mobile devices and early AR/VR platforms that supported experimental educational applications.

From 2017 to 2020, research output exhibited steady and consistent growth, suggesting broader pedagogical adoption of immersive technologies across various English learning domains, including vocabulary, reading, speaking, and immersive learning environments. The most pronounced expansion occurred between 2021 and 2025, when publication numbers increased sharply each year and reached their highest level in 2025. This surge reflects the accelerated integration of immersive technologies in the post-pandemic period, driven by rapid advancements in mobile AR systems and the wider availability of affordable VR devices.

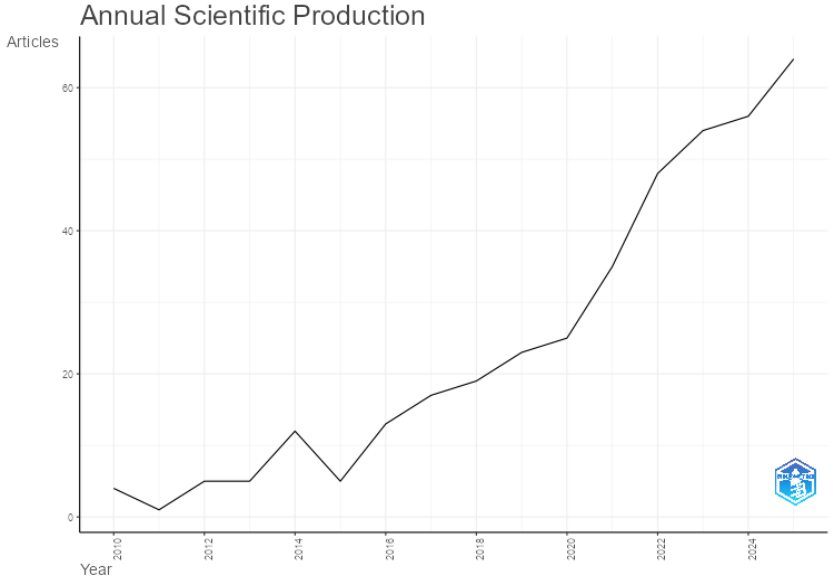



Figure 2. Annual Scientific Production

### 3.3 Average Citations per Year

Figure 3 illustrates the trend of average citations per year for studies on Augmented Reality (AR) and Virtual Reality (VR) in English language learning from 2010 to 2025. Overall, citation impact fluctuates across years, reflecting changes in research visibility, thematic relevance, and the maturity of the field.

In the early period, citation averages were relatively modest and inconsistent, indicating that early AR/VR studies attracted uneven scholarly attention as the field was still emerging. A gradual increase in citation impact appears from the mid-2010s, suggesting that several foundational publications began to shape subsequent research despite variability across years.

Citation performance strengthened notably during 2020–2021, coinciding with heightened global interest in immersive learning technologies during the COVID-19 pandemic. The highest average citation rate occurred in 2022, indicating strong academic influence of publications from this period. In contrast, citation averages declined in the most recent years, which is expected given the shorter time available for newer publications to accumulate citations.

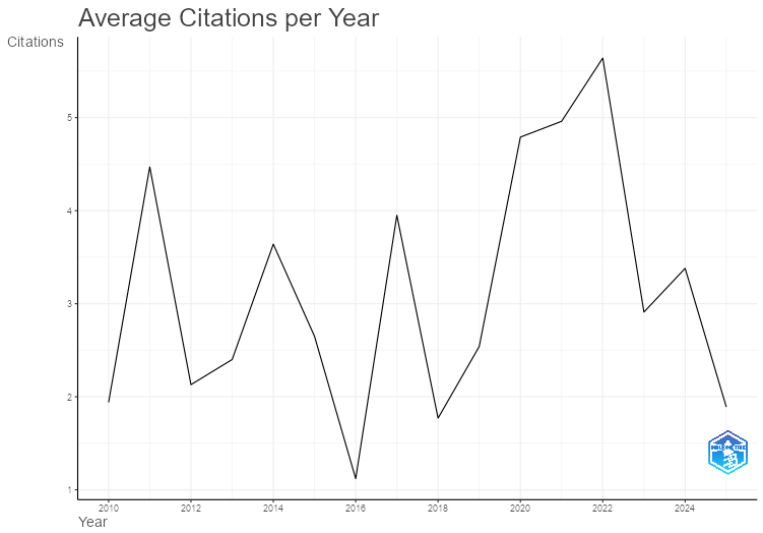



Figure 3. Average Citations per Year

### 3.4 Three-field plot that maps the relationships among authors

Figure 4 presents a three-field plot mapping the relationships among authors' keywords, contributing countries, and merged keywords in research on Augmented Reality (AR) and Virtual Reality (VR) for English language learning. The visualization highlights how thematic emphases are connected to geographical research contributions and broader pedagogical and technological frameworks.

Author keywords are strongly centered on "augmented reality," alongside related themes such as English learning, deep learning, game-based learning, mobile learning, and EFL, indicating AR's central role as both a technological and instructional focus. Country-level analysis shows that China is the most prolific contributor, followed by Malaysia, Indonesia, India, the United States, and Ukraine, demonstrating the global reach of AR/VR research with particularly strong representation from Asia.

Merged keywords emphasize broader concepts including learning systems, e-learning, educational technology, teaching, and vocabulary learning. The alignment between author-level keywords and merged thematic categories suggests strong coherence between specific research topics and overarching conceptual frameworks within immersive language learning studies.

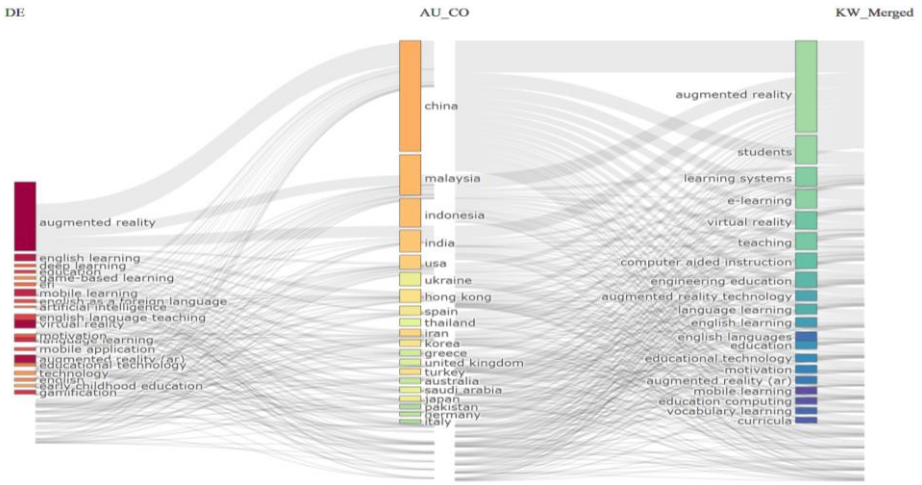



Figure 4. Three-field plot that maps the relationships among authors

### 3.5 Most Relevant Sources

Figure 5 summarizes the most influential publication sources in research on Augmented Reality (AR) and Virtual Reality (VR) for English language learning, based on Scopus-indexed documents. Lecture Notes in Computer Science emerges as the most productive outlet, highlighting the strong role of computer science and immersive systems in this field. Computer Assisted Language Learning follows closely, confirming its central position in technology-mediated language education. Other key sources, including Education and Information Technologies, CEUR Workshop Proceedings, and IEEE-affiliated outlets, reflect the growing integration of AR/VR across educational innovation and engineering domains. The diversity of these sources underscores the interdisciplinary character of AR/VR research, bridging applied linguistics, educational technology, computer science, and human–computer interaction.

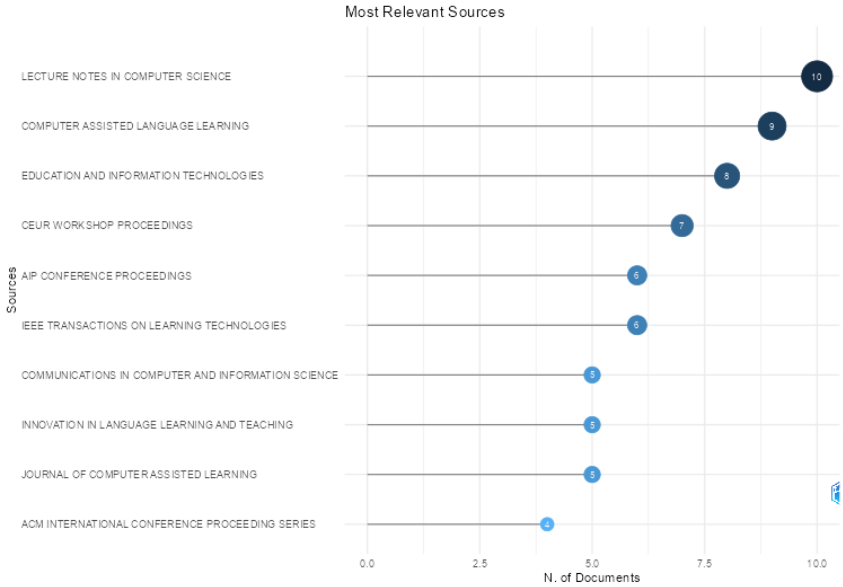



Figure 5. Most Relevant Sources

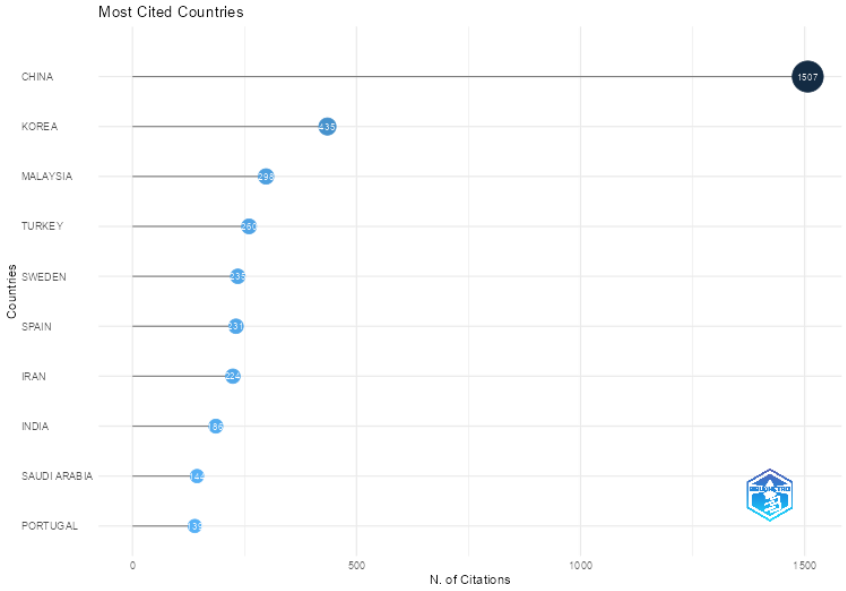
### 3.6 Most Cite Countries

Figure 6 presents the distribution of total citations by country for research related to Augmented Reality (AR) and Virtual Reality (VR) in English language learning. The visualization highlights the citation impact of the top contributing countries, demonstrating differences in research influence and visibility within the global academic community.

The most striking finding is the overwhelmingly high citation count of China, which records 1,507 citations, far surpassing all other countries. This dominance indicates that China not only produces a substantial volume of AR/VR-related research but that its publications also receive extensive scholarly attention and exert significant influence across the field.

The second most influential country is Korea, with 435 citations, followed by Malaysia with 299 citations and Turkey with 250 citations. These values demonstrate strong regional engagement, particularly across Asia, where technological innovation and educational technology adoption have accelerated rapidly in recent years. Sweden (213 citations) and Spain (131 citations) also appear prominently, representing European contributions to the field.

Other countries, including Iran (124 citations), India (95 citations), Saudi Arabia (74 citations), and Portugal (61 citations), show moderate citation levels. Although their total citations are lower than those of the top contributors, these countries still reflect active scholarly involvement and growing interest in immersive learning technologies.



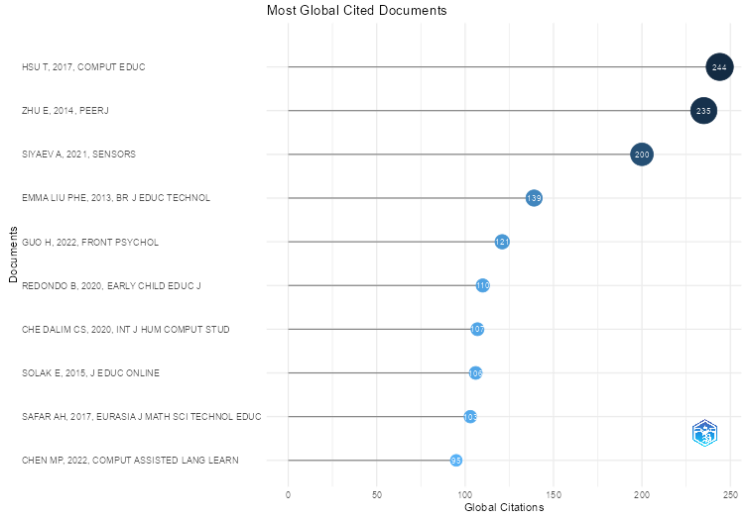

6. Most Cite Countries

### 3.7 Most Global Cited Document

Figure 7 presents the most cited publications in research on Augmented Reality (AR) and Virtual Reality (VR) for English language learning, highlighting studies with the greatest scholarly impact within the dataset. The ranking is based on total citation counts, with marker size indicating relative influence.

The most cited work is Hsu T. (2017) in Computers & Education, reflecting its foundational role in shaping immersive learning research. This is followed by Zhu E. (2014) in PeerJ, whose high citation count indicates sustained relevance over time. Shafaei A. (2021), published in Sensors, ranks third, underscoring the growing importance of sensor-based AR applications in educational contexts.

Several other influential studies further illustrate the field's intellectual diversity. Ema and Liu Phe (2013) in the British Journal of Educational Technology and Guo H. (2022) in Frontiers in Psychology demonstrate the continued impact of both early and recent contributions. Additional highly cited works published in Early Childhood Education Journal and the International Journal of Human–Computer Studies highlight expanding interest in early learning and human–computer interaction. Notably, more recent publications, such as Chen M.P. (2022) in Computer Assisted Language Learning, show rapid citation growth, indicating strong and emerging influence within the field.




### 3.8 Trend Topic

Figure 8 illustrates the trend topic analysis of research on Augmented Reality (AR) and Virtual Reality (VR) in English language learning from 2012 to 2025, highlighting the evolution of dominant themes over time. In the early period (2012–2016), research focused primarily on broad pedagogical and technological concepts such as learning motivation, learning effectiveness, and information systems, reflecting an exploratory phase grounded in general educational frameworks.

Between 2016 and 2018, attention shifted toward technology-oriented themes, including mobile learning, educational technology, computer-aided instruction, and interactive learning environments, alongside increased pedagogical experimentation across different educational levels. From 2018 onward, immersive technologies became more central, with augmented reality, language learning, and vocabulary learning emerging as sustained research priorities.

The period from 2020 to 2023 marked a further thematic expansion toward AI-enhanced approaches, incorporating deep learning, artificial intelligence, user interfaces, and behavioral research. In the most recent years (2023–2025), both AR and VR have become core themes, indicating a maturing research field characterized by technological sophistication, thematic specialization, and broader adoption of immersive learning systems.

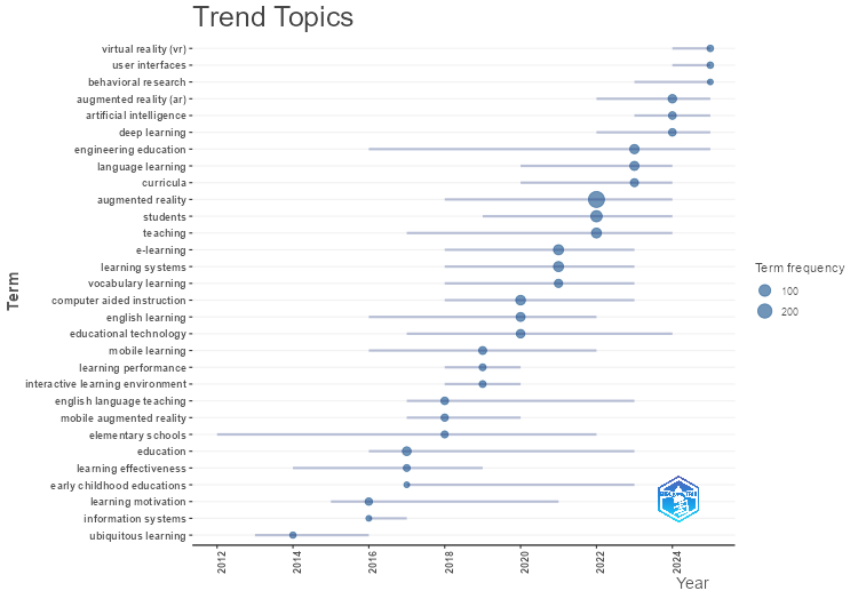



Figure 8. Tren Topic

### 3.9 Keyword Co-occurrence Network

Figure 2 displays a keyword co-occurrence network of AR and VR research in English language learning, revealing four thematic clusters. The central cluster is dominated by "augmented reality," indicating its core role and strong links to pedagogical themes such as language learning, EFL, educational technology, vocabulary learning, and gamification. A second cluster highlights emerging computational approaches, including artificial intelligence, deep learning, and machine learning, reflecting increasing convergence between immersive technologies and advanced computing. Another cluster emphasizes mobile-based learning, encompassing mobile applications, mobile AR, and game-based learning, underscoring the role of mobile platforms in expanding access. A smaller cluster represents broader conceptual foundations connecting multiple research themes, while the peripheral position of VR-related terms suggests opportunities for further VR-focused research.

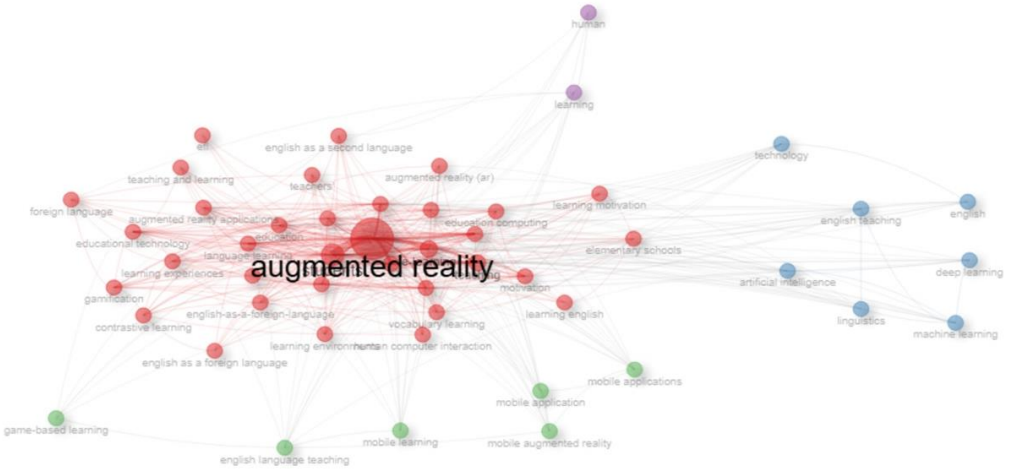



Figure 9. Keyword Co-occurrence Network

## 4. Discussion

This bibliometric analysis demonstrates that research on Augmented Reality (AR) and Virtual Reality (VR) in English language learning (ELL) has evolved into a rapidly expanding and increasingly sophisticated field between 2010 and 2025. The sharp growth in publications after 2020 reflects not only the acceleration of digital transformation during the COVID-19 pandemic but also the technological maturation of immersive systems that have become more accessible, mobile, and pedagogically adaptable. These developments position AR and VR as integral components of contemporary language education rather than experimental add-ons.

Citation patterns further indicate that the field is characterized by both continuity and renewal. Foundational studies from the mid-2010s continue to exert strong influence, suggesting that early theoretical and methodological frameworks remain relevant. At the same time, several post-2020 publications have accumulated citations rapidly, highlighting intensified scholarly attention toward AI-enhanced AR, immersive speaking environments, and data-driven vocabulary learning. This pattern suggests a shift from exploratory adoption toward more targeted and analytically sophisticated research agendas.

The distribution of influential publication sources underscores the interdisciplinary nature of AR/VR research in ELL. High-impact studies appear across educational technology, applied linguistics, computer science, and engineering outlets, confirming that immersive language learning research operates at the intersection of pedagogy, human–computer interaction, and artificial intelligence. While this interdisciplinarity enriches methodological diversity, it also poses challenges for theoretical consolidation, as pedagogical models must increasingly align with computational and design-oriented frameworks.

Geographically, the dominance of Asian countries—particularly China—reflects strong policy support, research funding, and institutional investment in educational technology, corroborating earlier findings by Li et al. (2021). However, the relatively low rate of international co-authorship contrasts with collaboration levels in more mature fields, such as computer-supported collaborative learning (Hwang & Tsai, 2020). This suggests that AR/VR research in ELL is still in a formative stage of global network integration.

Thematic evolution analysis reveals a clear progression from broad pedagogical concerns (e.g., motivation and learning effectiveness) toward immersive, AI-driven learning systems. Recent emphases on deep learning, adaptive interfaces, and behavioral analytics indicate a move toward intelligent and personalized learning environments. This transition aligns with established educational technology adoption models, such as the SAMR framework, where AR/VR applications have progressed from substitution toward modification and redefinition of learning tasks.

Despite these advances, several gaps remain. Research continues to prioritize short-term learning outcomes—particularly vocabulary acquisition—while more complex competencies, such as pragmatics, intercultural communication, and academic writing, remain underexplored. Moreover, the dominance of short-term experimental designs limits understanding of long-term learning impact. Consistent with prior bibliometric studies (Chen et al., 2022; Zhang & Wang, 2023), these findings highlight the need for longitudinal, classroom-embedded, and mixed-methods research.

## 5. Conclusions

This bibliometric analysis synthesizes the evolution and research structure of studies on Augmented Reality (AR) and Virtual Reality (VR) in English language learning from 2010 to 2025. The findings indicate rapid and sustained growth in scholarly output, particularly after 2020, reflecting the maturation of immersive technologies and their increasing integration into digital language education. With 386 publications across 177 sources, AR and VR research has developed into a highly interdisciplinary field spanning educational technology, applied linguistics, computer science, and human–computer interaction.

The analysis reveals a thematic shift from exploratory pedagogical applications toward AI-enhanced, learner-centered immersive learning systems, alongside the continued influence of foundational studies. Geographically, research is dominated by Asian countries, while international collaboration remains limited.

This study contributes by providing a comprehensive longitudinal mapping of publication trends, thematic evolution, and research gaps. Future research should prioritize AI-driven personalization, higher-order language competencies, large-scale and longitudinal implementations, and stronger international collaboration to support the sustainable and pedagogically grounded integration of immersive technologies in English language learning.

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