

Technology-Enhanced Language Learning In Higher Education: A Systematic Literature Review of Pedagogical Effectiveness, Learner Engagement, and Digital Learning Conditions

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ABSTRACT

Technology-enhanced language learning (TELL) has become increasingly prominent in higher education, with artificial intelligence (AI), mobile-assisted language learning, virtual and augmented reality (VR/AR), gamification, digital flashcards, learning management systems (LMS), and blended learning reshaping language education. However, evidence concerning technological effectiveness, learner engagement, and the conditions required for sustainable digital learning remains fragmented. This systematic literature review synthesizes empirical evidence on the pedagogical effectiveness, learner perceptions and engagement, and digital learning conditions influencing technology-enhanced foreign and second-language learning in higher education. Following the PRISMA framework, a systematic search of Scopus and Web of Science identified 706 records. After screening and eligibility assessment, 28 peer-reviewed studies published between 2022 and 2026 were included and subjected to integrative thematic analysis. The findings revealed three major themes. First, technology-enhanced language learning and pedagogical effectiveness constituted the largest theme (46.4%), demonstrating improvements in vocabulary, speaking, communication, motivation, autonomy, and other learning outcomes when technologies were purposefully integrated with pedagogy. Second, learner perceptions, acceptance, readiness, and engagement accounted for 39.3%, with perceived usefulness, ease of use, confidence, digital competence, trust, and motivation shaping technology adoption and participation. Third, digital learning conditions, challenges, and learner wellbeing represented only 14.3%, highlighting network instability, limited interaction and feedback, inadequate personalization, technostress, and burnout. Overall, the review demonstrates that technological availability alone does not ensure effective language learning. Sustainable TELL requires pedagogically aligned technology, meaningful interaction, learner readiness, institutional support, reliable infrastructure, personalization, and attention to wellbeing.

Keywords: Technology-enhanced language learning; Higher education; Pedagogical effectiveness; Learner engagement; Digital learning conditions.

INTRODUCTION

Background of the study

Technology-enhanced language learning has become increasingly important in higher education as digital technologies transform the ways university students learn and practise foreign and second languages. Technologies such as artificial intelligence (AI), mobile applications, digital flashcards, gamification, virtual and augmented reality (VR/AR), learning management systems (LMS), and blended learning environments provide opportunities for greater flexibility, accessibility, interaction, feedback, and learner autonomy. The reviewed literature indicates that these technologies can contribute to language-learning outcomes when they are appropriately integrated with instructional strategies and meaningful learning activities. For instance, Jwaied et al. (2024) reported vocabulary gains through VR/AR, Zakian et al. (2022) found benefits from digital flashcards, and Benlaghrissi and Ouahidi (2024) demonstrated improvements in speaking through mobile-assisted project-based learning.

Statement of Problem & Research Gap

Despite these potential benefits, the effectiveness of technology-enhanced language learning is not determined by technology alone. Learners' acceptance, readiness, perceived usefulness, confidence, technical competence, and trust can influence their engagement, while network instability, limited interaction, inadequate feedback, insufficient personalization, and technostress may constrain learning experiences. The existing literature therefore presents evidence across different technologies and learning contexts, but the studies are unevenly distributed across key dimensions. The review shows that 13 studies (46.4%) focused on pedagogical effectiveness, 11 (39.3%) examined learner perceptions and engagement, whereas only four (14.3%) addressed digital learning conditions, challenges, and wellbeing. This imbalance highlights a research gap in understanding these dimensions collectively. Thus, this systematic literature review addresses the need for an integrated synthesis of pedagogical effectiveness, learner engagement, and the digital conditions that support sustainable and wellbeing-oriented language learning in higher education.

Research Questions

Research questions are important to a systematic literature review (SLR). The questions provide the foundation and direction for the entire review process. A well-defined research question ensures that the literature search is exhaustive and systematic, covering all relevant studies that address key aspects of the topic (Kitchenham, 2007). The research questions in this SLR are formulated based on the PICO framework. This framework is a mnemonic style used to formulate research questions, particularly in qualitative research, proposed by Lockwood et al. (2015). PICO stands for Population, Interest, and Context. This SLR is done to answer the four research questions below;

RQ1 How do technology-enhanced language learning technologies and pedagogical approaches influence language-learning effectiveness and educational outcomes among university EFL/ESL and foreign-language learners?

RQ2 What are university EFL/ESL and foreign-language learners' perceptions, acceptance, readiness, and engagement toward the use of digital technologies for language learning?

RQ3 What digital learning conditions and challenges influence technology-enhanced language learning, and how do these factors relate to the well-being of university EFL/ESL and foreign-language learners?

LITERATURE REVIEW

Theoretical Framework

This SLR is anchored by three main theories: (i) Sociocultural theory, (ii) Technology Acceptance Model, and (iii) Community of Inquiry.

Sociocultural Theory

Sociocultural Theory, developed by Vygotsky (1978), provides a strong theoretical foundation for understanding technology-enhanced language learning and pedagogical effectiveness because it conceptualizes learning as a socially mediated process in which knowledge develops through interaction, collaboration, and the use of cultural tools. From this perspective, digital technologies can function as mediating tools that support learners in interacting with teachers, peers, digital resources, and intelligent systems while developing language knowledge and skills. Technologies such as mobile applications, digital flashcards, gamification, VR/AR, and AI-supported learning environments can provide opportunities for interaction, feedback, scaffolding, and independent practice, thereby extending learning beyond the traditional classroom. This perspective is consistent with the reviewed studies, which demonstrate improvements in vocabulary, speaking, pronunciation, engagement, motivation, and other language-learning outcomes through technology-supported approaches. For example, digital flashcards supported vocabulary development, while mobile-assisted project-based learning enhanced students' speaking performance. Thus, Vygotsky's theory explains that the pedagogical effectiveness

of technology depends not simply on the technology itself, but on how it mediates meaningful interaction, scaffolding, participation, and language-learning activities.

Technology Acceptance Model

The Technology Acceptance Model (TAM) developed by Davis (1986) provides a strong theoretical foundation for understanding learner perceptions, acceptance, readiness, and engagement with digital technologies. TAM proposes that users' adoption of technology is primarily influenced by two key beliefs: perceived usefulness, referring to the extent to which individuals believe that a technology will improve their performance, and perceived ease of use, referring to the extent to which they believe that using the technology will require minimal effort. These perceptions influence users' attitudes and behavioural intentions, which subsequently affect actual technology use. This framework is highly relevant to technology-enhanced language learning because learners are more likely to accept and engage with digital tools when they perceive them as useful, accessible, and easy to operate. The reviewed studies support these relationships, particularly those examining AI tools, mobile dictionaries, mobile-assisted language learning, and ICT adoption. For example, studies by Braha (2026), Zhang et al. (2025), and Sulistiyo et al. (2022) emphasize the importance of perceived usefulness, ease of use, attitudes, motivation, and behavioural intention in technology adoption. Thus, TAM helps explain why learners accept, engage with, or resist digital technologies in language-learning contexts.

Community of Inquiry (CoI)

The Community of Inquiry (CoI) framework developed by Garrison et al. (2000) provides a useful theoretical foundation for understanding digital learning conditions, challenges, and learner wellbeing in technology-mediated language education. The framework conceptualizes effective online learning through the interaction of three interconnected elements: teaching presence, social presence, and cognitive presence. Teaching presence concerns the design and facilitation of learning activities, social presence emphasizes meaningful interaction and communication among learners and instructors, while cognitive presence concerns learners' engagement in constructing and developing knowledge. This framework is particularly relevant to the reviewed studies because several challenges involve limited interaction, insufficient feedback, technical difficulties, and inadequate learning support. Suriaman et al. (2023), for example, found that LMS platforms supported comprehension and independent learning but were constrained by network instability, limited real-time discussion, and reduced opportunities for immediate lecturer feedback. Elansari and Laachach (2025) similarly emphasized technical support, user engagement, content relevance, and personalization as important factors influencing e-learning quality. Therefore, CoI helps explain how supportive digital environments, meaningful interaction, effective teaching presence, and learner participation can contribute to effective and sustainable online language learning while reducing challenges that may negatively affect learners' experiences and wellbeing.

Conceptual Framework

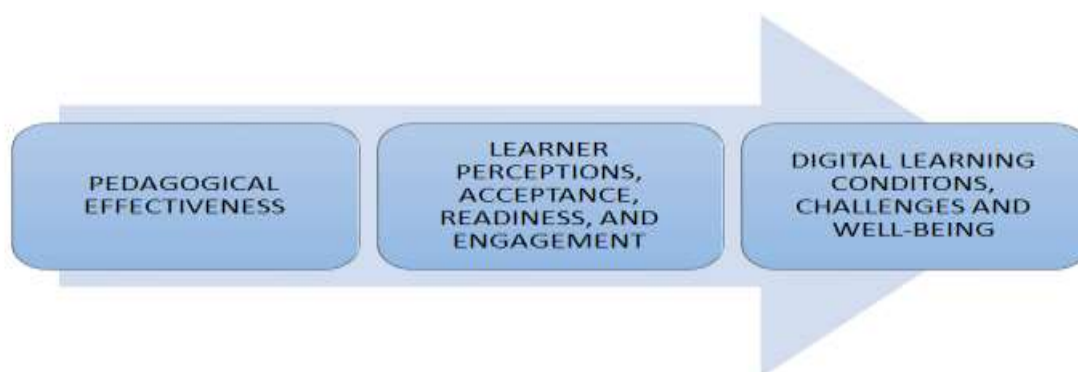


Figure 1- Technology for Language Learning in Higher Education

Higher institutions are transforming language learning using technology. This transformation calls for more studies to investigate learners' perceptions, acceptance, readiness, and engagement. In light of this transformation, there is a need to improve digital learning conditions in order to minimize the challenges and to

ensure learners' well-being is taken into consideration.

The conceptual framework presented in Figure 1 positions *Technology-Enhanced Language Learning in Higher Education* as a transformative process that connects three interrelated dimensions: pedagogical effectiveness; learner perceptions, acceptance, readiness, and engagement; and digital learning conditions, challenges, and learner well-being. Higher education institutions are increasingly transforming language learning through digital technologies, creating opportunities to improve teaching practices and language-learning outcomes. This dimension is anchored in Vygotsky's (1978) Sociocultural Theory, which views learning as socially mediated and emphasizes interaction, participation, and the use of mediating tools. From this perspective, technology can support language learning through interaction, scaffolding, collaboration, feedback, and learner autonomy, thereby contributing to pedagogical effectiveness.

The second dimension focuses on learners and is theoretically supported by Davis's (1986) Technology Acceptance Model (TAM). Learners' perceptions of usefulness and ease of use can influence their acceptance, readiness, and engagement with digital technologies. Consequently, the transformation of language learning through technology calls for greater attention to learners' experiences and willingness to adopt and use these technologies. The third dimension is anchored in the Community of Inquiry (CoI) framework of Garrison et al. (2000), which emphasizes teaching presence, social presence, and cognitive presence in digital learning environments. Accordingly, improving digital learning conditions including interaction, support, infrastructure, and learning design is essential for minimizing technological and pedagogical challenges and supporting learner wellbeing. Together, the three theoretical perspectives provide an integrated framework in which effective technology-enhanced pedagogy, learner engagement, and supportive digital conditions interact to promote sustainable language learning in higher education.

MATERIAL AND METHODS

For conducting systematic literature reviews, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach is a widely accepted standard that guarantees transparency, completeness, and consistency throughout the procedure by Page et al. (2021). guide how to systematically identify, screen, and include studies in the review. In the context of this SLR, the writers involved in this article act as researchers and work together to analyse the articles deemed relevant for the title. Two important databases, Web of Science and Scopus, were used in this analysis because of their wide coverage and robustness.

The PRISMA approach is organized into four key stages: (i) identification, (ii) screening, (iii) eligibility, and (iv) data abstraction. In the identification phase, databases are searched to locate all relevant studies. The screening phase then involves evaluating these studies against predefined criteria to eliminate irrelevant or low-quality research. During the eligibility phase, the remaining studies are thoroughly assessed to confirm they meet the inclusion criteria. Finally, data abstraction focuses on extracting and synthesizing data from the included studies, which is essential for deriving meaningful and reliable conclusions. This structured method ensures that the systematic review is conducted with rigor, leading to trustworthy results that can guide future research and practice. The PRISMA framework lists five main stages for analysis: (i) identification, (ii) screening, (iii) eligibility, (iv) data abstraction and analysis, as well as (v) quality of appraisal.

Identification

In accordance with the PRISMA framework, the identification phase represents a critical starting point in the systematic literature review process, as it is designed to ensure exhaustive coverage of relevant studies while reducing the risk of selection bias. In this study, a structured and comprehensive search was conducted across two leading bibliographic databases, Scopus and Web of Science (WoS), using the keywords "technology," "language learning," and "higher education." Table 1 below shows the search string.

These databases were deliberately selected because of their extensive multidisciplinary coverage, stringent indexing criteria, and strong representation of high-quality, peer-reviewed journals. The search process resulted in the retrieval of 606 records from Scopus and 100 records from Web of Science, yielding a combined total of 706 records prior to the removal of duplicates.



The higher number of results obtained from Scopus can be attributed to its broader inclusion of journals and stronger coverage in the social sciences, whereas WoS contributed a more targeted collection of highly cited and methodologically rigorous studies. As shown in Table 1, the identification of 706 records reflects the growing academic interest in technology and language learning within higher education and highlights the conceptual diversity of research spanning linguistic, pedagogical, and psychological perspectives. Employing multiple databases enhances the methodological robustness of the review by minimizing database-specific bias and increasing the likelihood of capturing diverse research traditions and geographical contexts.

Additionally, the use of carefully designed search terms ensured sensitivity to terminological variation while maintaining alignment with the review's objectives. Overall, this transparent and systematic identification process establishes a strong foundation for subsequent screening and eligibility stages, consistent with PRISMA standards and expectations for rigorous, replicable research

Table 1 The search string.

Scopus	TITLE-ABS-KEY (("language learning" OR "language acquisition" OR "language education" OR "foreign language learning") AND ("digital technology" OR "educational technology" OR "e-learning" OR "online learning" OR "digital tools") AND (university OR "higher education" OR "tertiary education") AND (benefits OR advantages OR "positive outcomes" OR challenges OR "barriers" OR "difficulties"))
Web of Science	TITLE-ABS-KEY (("language learning" OR "language acquisition" OR "language education" OR "foreign language learning") AND ("digital technology" OR "educational technology" OR "e-learning" OR "online learning" OR "digital tools") AND (university OR "higher education" OR "tertiary education") AND (benefits OR advantages OR "positive outcomes" OR challenges OR "barriers" OR "difficulties")) Extracted Aug 2026

Screening

During the screening stage of the systematic literature review, potentially relevant studies were evaluated to ensure their alignment with the four established research questions. This phase focused on refining the initial pool of records by removing duplicates and applying predefined inclusion and exclusion criteria. Following the initial review, 706 publications were excluded for failing to meet the scope and relevance requirements of the study, leaving 82 (Scopus=60; WoS; 22) articles for further consideration, as outlined in Figure 2. The primary inclusion criterion was the type of literature, with priority given to scholarly sources that offer substantive and empirical insights. As a result, materials such as book reviews, book series, meta-syntheses, meta-analyses, conference proceedings, and book chapters not directly related to the core focus of the review were excluded. To ensure consistency and relevance to contemporary academic discourse, only peer-reviewed publications written in English and published between 2022 and 2026 were retained. Additionally, a duplication check led to the removal of 1 repeated record across the databases. This systematic and criteria-driven screening process enhanced the focus and quality of the evidence base, ensuring that only the most relevant and methodologically sound studies progressed to the subsequent stages of analysis.

Eligibility

For the third step, known as eligibility, a total of 82 articles have been prepared. All articles' titles and key content were thoroughly reviewed (refer Table 2) at this stage to ensure that the inclusion requirements were fulfilled and fit into the present study with the current research aims. Finally, 82 articles are available for review.



Table 2 The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2022 – 2026	< 2022
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press
Subject Area	e-learning, students, language learning	Besides e-learning, students, language learning

Data Abstraction and Analysis

An integrative analysis was used as one of the assessment strategies in this study to examine and synthesize a variety of research designs (quantitative, qualitative, and mixed methods). To develop themes, the researcher carefully analyzed 82 publications for relevant material related to the study's topics. The researcher analysed each document by analyzing

The methodology and research results of significant studies. The researcher then referred to an expert in the area to confirm the consistency in theme design. This expert review phase established the validity of each subtheme by ensuring clarity, importance, and suitability.

Quality of Appraisal

According to Kitchenham and Charters (Kitchenham, 2007), the researchers need to assess the quality of the research chosen. The next stage is applying quality assessment suggested by Abouzahra et al., (2020), which consist of six questions complying to a scoring procedure for evaluating each criteria. The possible ratings are

"Yes" (Y) with a score of 1 if the criterion is fully met, "Partly" (P) with a score of 0.5 if the criterion is somewhat met but contains some gaps or shortcomings, and "No" (N) with a score of 0 if the criterion is not met at all.

Table 3- Possible ratings for 6 questions by Abouzahra et al., (2020),

No	Question
QA1	Is the purpose of the study clearly stated?
QA2	Is the interest and the usefulness of the work clearly presented?
QA3	Is the study methodology clearly established?
QA4	Are the concepts of the approach clearly defined?
QA5	Is the work compared and measured with other similar work?
QA6	Are the limitations of the work clearly mentioned?

The researcher assesses the study according to these criteria, and the scores are then totalled across all experts to determine the overall mark. For a study to be accepted for the next process, the total mark, derived from summing the scores from all three experts, must exceed 3.0. This threshold ensures that only studies meeting a certain quality standard proceed further. The results are shown in Table 4.

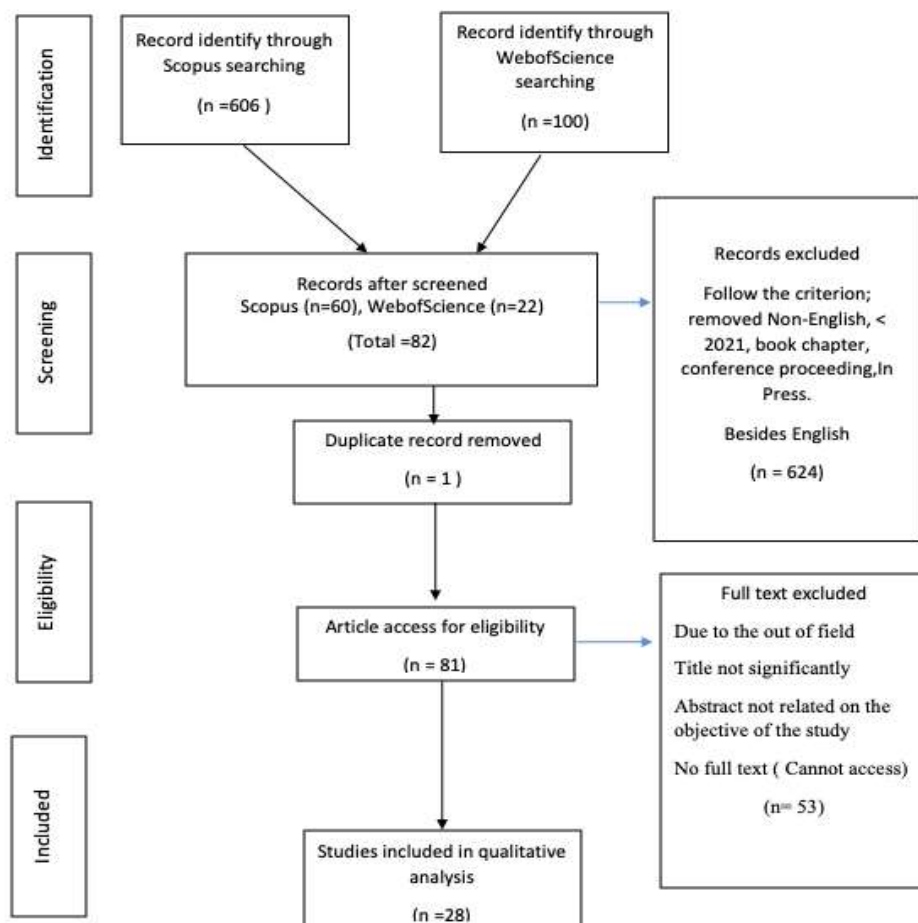


Figure 2. Flow diagram of the proposed searching study (Moher D, Liberati A, Tetzlaff J, 2009)

RESULT AND FINDING

Quality of Assessment

Table 4 shows the result of the assessment performance for selected 28 primary studies. The overall quality of the articles is as follows;

- **High quality ($\geq 80\%$):** Majority of studies
- **Moderate quality (60–79%):** Conceptual or descriptive studies
- **Lower quality ($< 60\%$):** Primarily survey-only or exploratory abstracts

Table 4- Quality of Assessment

PS	Author and Year	Title of Document	QA1	QA2	QA3	QA4	QA5	QA6	Total Mark	Percentage (%)
PS1	Van Horn (2024)	<i>ChatGPT in English Language Learning: Exploring Perceptions and Promoting Autonomy in a University EFL Context</i>	Y	Y	Y	P	P	P	4.5	75.0



PS2	Hirata (2022)	<i>Are Japanese University Students Ready for Remote Language Learning?</i>	Y	Y	Y	Y	Y	Y	6.0	100.0
PS3	Braha (2026)	<i>Kosovan EFL Students' Acceptance of AI Tools for English Language Learning: Practices, Perceptions, Challenges, and Suggestions for Improvement</i>	Y	Y	Y	Y	P	N	4.5	75.0
PS4	Alshayban (2023)	<i>A Study of Saudi Students' Attitude Towards E-learning Through Blackboard During Covid-19</i>	Y	Y	Y	Y	P	P	5.0	83.3
PS5	Zhuang & Liu (2026)	<i>Web-Integrated Speech Correction System Use in Intelligent Oral English Teaching</i>	P	Y	Y	Y	Y	P	5.0	83.3
PS6	Yurong (2023)	<i>Perceptions of ESL Undergraduates Regarding the Impact of Smartphones on Learning the English Language</i>	Y	Y	Y	P	P	Y	5.0	83.3
PS7	Metruk & Rafajlovičová (2022)	<i>Perspectives and Challenges of Online Language Learning: Slovak University Students' Viewpoints</i>	Y	Y	Y	P	P	P	4.5	75.0
PS8	Ali & Eiten (2026)	<i>Attitudes Toward AI as Communicative Partners: A Human–Machine Communication (HMC) Analysis of Undergraduate Language Learners</i>	Y	Y	Y	Y	P	Y	5.5	91.7
PS9	Pikhart et al. (2024)	<i>Exploring University Students' Preferences and Satisfaction in Utilizing Digital Tools for Foreign Language Learning</i>	Y	Y	Y	P	P	Y	5.0	83.3



PS10	Suriaman et al. (2023)	<i>Effective or Impractical? Discussing Students' Perceptions Toward Learning Management Systems in English Language Learning</i>	Y	Y	Y	P	P	P	4.5	75.0
PS11	Elansari & Laachach (2025)	<i>Exploring Factors Influencing Perceived E-Learning Quality in Foreign Language Education: Insights from Morocco</i>	Y	Y	Y	Y	P	P	5.0	83.3
PS12	Lo et al. (2025)	<i>Thai EFL University Students' Views on the Effectiveness of Duolingo for Enhancing Listening and Speaking Skills</i>	Y	Y	Y	Y	P	Y	5.5	91.7
PS13	Jwaied et al. (2024)	<i>Utilizing Virtual Reality (VR) and Augmented Reality (AR) Technologies in EFL Classrooms: A Novel Approach to Improve Vocabulary Learning and Retention</i>	Y	Y	Y	Y	Y	P	5.5	91.7
PS14	Wang (2025)	<i>Application of the Blended Teaching Mode in Russian Language Courses in Colleges and Universities in the Context of the Internet</i>	P	Y	P	P	P	P	3.5	58.3
PS15	Liakhovska et al. (2025)	<i>Advancing Foreign Language Education Through Technological Innovations in Higher Education</i>	P	Y	P	Y	P	P	4.0	66.7
PS16	Zakian et al. (2022)	<i>Out-of-the-Classroom Learning of English Vocabulary by EFL Learners: Investigating the Effectiveness of Mobile Assisted Learning With Digital Flashcards</i>	Y	Y	Y	Y	Y	N	5.0	83.3



PS17	Khlaisang & Sukavatee (2023)	<i>Mobile-Assisted Language Learning to Support English Language Communication Among Higher Education Learners in Thailand</i>	Y	Y	Y	Y	P	P	5.0	83.3
PS18	Pradana et al. (2022)	<i>Increasing the Effectiveness of Educational Technologies in the Foreign Languages Learning Process by Linguistic Students: Comparative Analysis of Russian, Indonesian and Egyptian Experience</i>	Y	Y	Y	P	Y	P	5.0	83.3
PS19	Zhang et al. (2025)	<i>An Investigation of Chinese EFL Learners' Acceptance of Mobile Dictionaries in English Language Learning</i>	Y	Y	Y	Y	Y	P	5.5	91.7
PS20	Ebadi & Raygan (2023)	<i>Investigating the Facilitating Conditions, Perceived Ease of Use and Usefulness of Mobile-Assisted Language Learning</i>	Y	Y	Y	Y	P	P	5.0	83.3
PS21	Assapari & Hidayati (2023)	<i>EFL Speaking Student Readiness to Use Mobile-Assisted Language Learning</i>	Y	Y	Y	P	P	P	4.5	75.0
PS22	Sulistiyo et al. (2022)	<i>Determinants of Technology Acceptance Model (TAM) Towards ICT Use for English Language Learning</i>	Y	Y	Y	Y	Y	P	5.5	91.7
PS23	Liu et al. (2024)	<i>Using Digital Gamification to Improve Language Achievement, Foreign Language Enjoyment, and Ideal L2 Self: A Case of English as a</i>	Y	Y	Y	Y	Y	P	5.5	91.7



		<i>Foreign Language Learners</i>								
PS24	Benlaghrissi & Ouahidi (2024)	<i>The Impact of Mobile-Assisted Project-Based Learning on Developing EFL Students' Speaking Skills</i>	Y	Y	Y	Y	Y	N	5.0	83.3
PS25	Lu et al. (2022)	<i>The Roles of Mobile App Perceived Usefulness and Perceived Ease of Use in App-Based Chinese and English Learning Flow and Satisfaction</i>	Y	Y	Y	Y	P	P	5.0	83.3
PS26	Ye & Shi (2026)	<i>Investigating the Potential of Changing the Smartphone System Language to L2 for Facilitating Vocabulary Learning and Motivation</i>	Y	Y	Y	Y	Y	N	5.0	83.3
PS27	Ali et al. (2025)	<i>The Use of Digital Learning in the EFL Classroom and Its Effect on Self-Perceived Knowledge, Learning, and English Use at the University of Tabuk</i>	Y	Y	Y	P	P	N	4.5	75.0
PS28	Niu et al. (2022)	<i>Digital Learning of English as a Foreign Language Among University Students: How Are Approaches to Learning Linked to Digital Competence and Technostress?</i>	Y	Y	Y	Y	Y	P	5.5	91.7

The quality assessment of the 28 selected studies indicates an overall moderate-to-high level of methodological and reporting quality, with scores ranging from 3.5 (58.3%) to 6.0 (100%). Hirata (2022) achieved the highest score of 6.0 (100%), satisfying all six criteria, while Wang (2025) obtained the lowest score of 3.5 (58.3%). Most studies scored between 5.0 (83.3%) and 5.5 (91.7%), suggesting that the majority clearly stated their research purpose, demonstrated the usefulness of the work, and established appropriate methodologies. QA1, QA2, and QA3 were generally the strongest criteria, as most abstracts explicitly identified their objectives, significance, and research methods. QA4 was also well addressed in studies that clearly employed theoretical or conceptual frameworks such as TAM, HMC, and situated learning theory. However, QA5 showed some variation because several studies did not explicitly compare their findings with similar studies or alternative approaches. QA6 was the weakest criterion overall, with several studies failing to explicitly report their

limitations, resulting in P or N ratings. Overall, the findings demonstrate that the selected studies provide a sufficiently strong evidence base for this SLR.

Themes

Table 5- Analysis for Themes

Theme	No. of Studies	Study Numbers	Percentage	Main Focus
Theme 1: Technology-Enhanced Language Learning and Pedagogical Effectiveness	13	PS5, PS6, PS12, PS13, PS14, PS15, PS16, PS17, PS18, PS23, PS24, PS26, PS27	46.4%	Examines how AI, mobile technologies, VR/AR, blended learning, gamification, digital applications, and other technologies improve language skills, achievement, motivation, communication, and learning outcomes.
Theme 2: Learner Perceptions, Acceptance, Readiness, and Engagement	11	PS1, PS2, PS3, PS4, PS8, PS9, PS19, PS20, PS21, PS22, PS25	39.3%	Examines learner attitudes, acceptance, perceived usefulness, ease of use, readiness, satisfaction, trust, behavioural intention, autonomy, and engagement with digital technologies.
Theme 3: Digital Learning Conditions, Challenges, and Learner Wellbeing	4	PS7, PS10, PS11, PS28	14.3%	Examines technical and pedagogical challenges, infrastructure, interaction, personalization, digital competence, technostress, burnout, and conditions affecting sustainable digital learning.
Total	28	PS1–PS28	100%	Technology-enhanced foreign/second-language learning

The thematic analysis of the 28 selected studies identifies three major themes within technology-enhanced foreign and second-language learning. Theme 1, Technology-Enhanced Language Learning and Pedagogical Effectiveness, is the largest category, comprising 13 studies (46.4%), and focuses on the effectiveness of AI, mobile technologies, VR/AR, blended learning, gamification, and digital applications in improving language skills, motivation, communication, achievement, and learning outcomes. Theme 2, Learner Perceptions, Acceptance, Readiness, and Engagement, includes 11 studies (39.3%) and emphasizes learners' attitudes, perceived usefulness, ease of use, readiness, satisfaction, trust, behavioural intentions, autonomy, and engagement with digital technologies. Theme 3, Digital Learning Conditions, Challenges, and Learner Wellbeing, represents four studies (14.3%) and addresses technical and pedagogical challenges, infrastructure, interaction, personalization, digital competence, technostress, and burnout. Overall, the distribution shows that research is concentrated primarily on the effectiveness of technology and learner responses to digital learning, while fewer studies examine the broader contextual and wellbeing factors influencing sustainable implementation. Together, the three themes account for all 28 studies (100%), providing a comprehensive framework for synthesizing the SLR findings. For a systematic analysis of the documents, the analysis of data is presented in relation to the three research questions planned above.

Theme 1: Technology-Enhanced Language Learning and Pedagogical Effectiveness

This section presents data to answer research question 1: How do technology-enhanced language learning technologies and pedagogical approaches influence language-learning effectiveness and educational outcomes among university EFL/ESL and foreign-language learners?



Table 6- Theme 1

Study Number	Author and Year	Title of Article
PS5	Zhuang & Liu (2026)	<i>Web-Integrated Speech Correction System Use in Intelligent Oral English Teaching</i>
PS6	Yurong (2023)	<i>Perceptions of ESL Undergraduates Regarding the Impact of Smartphones on Learning the English Language</i>
PS12	Lo et al. (2025)	<i>Thai EFL University Students' Views on the Effectiveness of Duolingo for Enhancing Listening and Speaking Skills</i>
PS13	Jwaied et al. (2024)	<i>Utilizing Virtual Reality (VR) and Augmented Reality (AR) Technologies in EFL Classrooms: A Novel Approach to Improve Vocabulary Learning and Retention</i>
PS14	Wang (2025)	<i>Application of the Blended Teaching Mode in Russian Language Courses in Colleges and Universities in the Context of the Internet</i>
PS15	Liakhovska et al. (2025)	<i>Advancing Foreign Language Education Through Technological Innovations in Higher Education</i>
PS16	Zakian et al. (2022)	<i>Out-of-the-Classroom Learning of English Vocabulary by EFL Learners: Investigating the Effectiveness of Mobile Assisted Learning With Digital Flashcards</i>
PS17	Khlaisang & Sukavatee (2023)	<i>Mobile-Assisted Language Learning to Support English Language Communication Among Higher Education Learners in Thailand</i>
PS18	Pradana et al. (2022)	<i>Increasing the Effectiveness of Educational Technologies in the Foreign Languages Learning Process by Linguistic Students: Comparative Analysis of Russian, Indonesian and Egyptian Experience</i>
PS23	Liu et al. (2024)	<i>Using Digital Gamification to Improve Language Achievement, Foreign Language Enjoyment, and Ideal L2 Self: A Case of English as a Foreign Language Learners</i>
PS24	Benlaghrissi & Ouahidi (2024)	<i>The Impact of Mobile-Assisted Project-Based Learning on Developing EFL Students' Speaking Skills</i>
PS26	Ye & Shi (2026)	<i>Investigating the Potential of Changing the Smartphone System Language to L2 for Facilitating Vocabulary Learning and Motivation</i>
PS27	Ali et al. (2025)	<i>The Use of Digital Learning in the EFL Classroom and Its Effect on Self-Perceived Knowledge, Learning, and English Use at the University of Tabuk</i>

The synthesis of the selected studies demonstrates that technology-enhanced language learning has become an increasingly important component of foreign and second-language education. The studies examine a wide range of technologies, including intelligent speech-correction systems, smartphones, Duolingo, virtual and augmented reality (VR/AR), blended learning, digital flashcards, mobile-assisted language learning (MALL), gamification, and smartphone-based L2 learning. Across these studies, technology is generally presented as providing greater flexibility, accessibility, interactivity, and opportunities for learner autonomy. For example, digital flashcards supported vocabulary development, while mobile-assisted and gamified learning provided additional opportunities for learners to practise language beyond the classroom.



Regarding pedagogical effectiveness, the evidence indicates that technology can produce measurable improvements in specific language-learning outcomes when appropriately integrated into instruction. Jwaied et al. (2024) reported significant vocabulary gains through VR and AR compared with traditional learning, while Zakian et al. (2022) found stronger vocabulary development among learners using digital flashcards. Benlaghrissi and Ouahidi (2024) similarly found mobile-assisted project-based learning more effective for speaking development than project-based and conventional approaches. Pradana et al. (2022) further reported benefits in engagement, interaction, autonomy, accessibility, and pronunciation across different educational contexts. Overall, the synthesis suggests that technology itself does not automatically guarantee effective learning; its pedagogical value depends on how digital tools are integrated with appropriate instructional strategies, learning objectives, and opportunities for meaningful language practice.

Theme 2 : Learner Perceptions, Acceptance, Readiness, and Engagement with Digital Technologies

This section presents data to answer research question 2: What are university EFL/ESL and foreign-language learners' perceptions, acceptance, readiness, and engagement toward the use of digital technologies for language learning?

Table 7- Theme 2

Study Number	Author and Year	Title of Article
PS1	Van Horn (2024)	<i>ChatGPT in English Language Learning: Exploring Perceptions and Promoting Autonomy in a University EFL Context</i>
PS2	Hirata (2022)	<i>Are Japanese University Students Ready for Remote Language Learning?</i>
PS3	Braha (2026)	<i>Kosovan EFL Students' Acceptance of AI Tools for English Language Learning: Practices, Perceptions, Challenges, and Suggestions for Improvement</i>
PS4	Alshayban (2023)	<i>A Study of Saudi Students' Attitude Towards E-learning Through Blackboard During Covid-19</i>
PS8	Ali & Eiten (2026)	<i>Attitudes Toward AI as Communicative Partners: A Human–Machine Communication (HMC) Analysis of Undergraduate Language Learners</i>
PS9	Pikhart et al. (2024)	<i>Exploring University Students' Preferences and Satisfaction in Utilizing Digital Tools for Foreign Language Learning</i>
PS19	Zhang et al. (2025)	<i>An Investigation of Chinese EFL Learners' Acceptance of Mobile Dictionaries in English Language Learning</i>
PS20	Ebadi & Raygan (2023)	<i>Investigating the Facilitating Conditions, Perceived Ease of Use and Usefulness of Mobile-Assisted Language Learning</i>
PS21	Assapari & Hidayati (2023)	<i>EFL Speaking Student Readiness to Use Mobile-Assisted Language Learning</i>
PS22	Sulistiyono et al. (2022)	<i>Determinants of Technology Acceptance Model (TAM) Towards ICT Use for English Language Learning</i>
PS25	Lu et al. (2022)	<i>The Roles of Mobile App Perceived Usefulness and Perceived Ease of Use in App-Based Chinese and English Learning Flow and Satisfaction</i>



The synthesis of the selected studies generally demonstrates positive attitudes toward technology-supported language learning, although their responses are influenced by perceived usefulness, ease of use, confidence, technical competence, and trust. In terms of learner perceptions, Van Horn (2024) found largely positive perceptions of ChatGPT among Korean university students, with increased confidence, collaboration, metacognitive awareness, and autonomy following training. Similarly, Alshayban (2023) reported that Saudi students were generally satisfied with Blackboard because it provided flexibility, self-directed learning, ease of use, and diverse learning materials. Pikhart et al. (2024) also identified positive perceptions of digital resources such as Duolingo, ChatGPT, and Google Translate, although connectivity and content diversity remained concerns.

Regarding acceptance, the studies demonstrate that perceived usefulness and perceived ease of use are important determinants of learners' willingness to adopt digital technologies. Braha (2026) found that Kosovan EFL learners considered AI tools useful and easy to use for vocabulary, grammar, and writing, but concerns regarding feedback reliability, accuracy, overdependence, and contextual understanding limited complete trust. Zhang et al. (2025) similarly found that perceived usefulness, ease of use, and behavioural intention shaped Chinese learners' acceptance of mobile dictionaries. Sulistiyo et al. (2022) further demonstrated that motivation, ICT skills, attitudes, perceived usefulness, and perceived ease of use significantly influenced actual ICT use.

The evidence concerning readiness suggests that access to technology alone does not guarantee successful adoption. Hirata (2022) found that Japanese university students experienced relatively few difficulties using e-learning software but showed limited enthusiasm and aptitude for online English learning. However, their confidence increased after participating in online courses. Assapari and Hidayati (2023) similarly found that students' readiness affected their use of mobile-assisted language learning and emphasized the importance of motivation, attitudes, technology skills, and technical support. These findings indicate that readiness is multidimensional, involving not only technical ability but also psychological preparedness and willingness to participate in technology-mediated learning.

Theme 3 : Digital Learning Conditions, Challenges, and Learner Wellbeing

This section presents data to answer research question 3: What digital learning conditions and challenges influence technology-enhanced language learning, and how do these factors relate to the well-being of university EFL/ESL and foreign-language learners?

Table 8- Theme 3

Study Number	Author and Year	Title of Article
PS7	Metruk & Rafajlovičová (2022)	<i>Perspectives and Challenges of Online Language Learning: Slovak University Students' Viewpoints</i>
PS10	Suriaman et al. (2023)	<i>Effective or Impractical? Discussing Students' Perceptions Toward Learning Management Systems in English Language Learning</i>
PS11	Elansari & Laachach (2025)	<i>Exploring Factors Influencing Perceived E-Learning Quality in Foreign Language Education: Insights From Morocco</i>
PS28	Niu et al. (2022)	<i>Digital Learning of English as a Foreign Language Among University Students: How Are Approaches to Learning Linked to Digital Competence and Technostress?</i>

The synthesis of the four studies under Digital Learning Conditions, Challenges, and Learner Wellbeing indicates that the effectiveness of technology-enhanced language learning depends substantially on the conditions in which digital learning is implemented. Metruk and Rafajlovičová (2022) found that Slovak university EFL learners were generally neutral or positive about their online-learning conditions and their ability

to develop language skills through online learning. However, the study also identified behavioural challenges, including students visiting social networking sites and chatting with peers for non-academic purposes. Similarly, Suriaman et al. (2023) found that LMS platforms could improve comprehension, independent learning, task completion, and learning outcomes, suggesting that digital platforms can provide valuable learning conditions when appropriately implemented.

The studies also highlight important challenges affecting the quality and sustainability of digital language learning. Suriaman et al. (2023) identified network instability, limited opportunities for real-time discussion, and restricted access to immediate lecturer feedback as key disadvantages of LMS use. Elansari and Laachach (2025) similarly found that content relevance, user engagement, and technical support were strongly associated with perceived e-learning quality. Their findings further indicate that external platforms may fail to accommodate learners' diverse needs because of insufficient individualized content, suggesting that personalization is an important condition for maintaining student commitment and engagement.

The learner wellbeing dimension is particularly evident in Niu et al. (2022), which examined the relationships among approaches to learning, digital competence, technostress, burnout, and EFL outcomes. The findings show that deep and organized approaches to learning were associated with stronger digital competence, while digital competence was associated with lower technostress and burnout. In contrast, technostress was positively associated with exhaustion and cynicism, with cynicism negatively related to EFL learning outcomes.

Overall, the synthesis suggests that successful digital language learning requires more than access to technological platforms. Appropriate infrastructure, reliable technical support, meaningful interaction, relevant and personalized content, and adequate digital competence are essential conditions for effective implementation. At the same time, educators and institutions need to consider learners' psychological wellbeing because excessive technological demands may contribute to technostress, exhaustion, and burnout. Thus, the evidence suggests that sustainable digital language education should balance technological effectiveness with pedagogical support and learner wellbeing, rather than focusing exclusively on the availability or adoption of digital tools.

CONCLUSION

This conclusion is presented in terms of (i) summary of findings and (ii) implications and suggestions for future research.

Summary of Findings

This systematic literature review examined technology-enhanced language learning in higher education through three interconnected dimensions: pedagogical effectiveness, learner perceptions and engagement, and digital learning conditions and wellbeing. The synthesis of 28 selected studies indicates that digital technologies—including AI, mobile applications, VR/AR, gamification, digital flashcards, LMS platforms, and blended learning—can support language development, motivation, autonomy, communication, and learning outcomes when appropriately integrated into pedagogy. For example, Jwaied et al. (2024), Zakian et al. (2022), and Benlaghrissi and Ouahidi (2024) reported positive effects on vocabulary and speaking development, while Van Horn (2024), Pikhart et al. (2024), and Alshayban (2023) demonstrated generally positive learner perceptions of digital tools. However, the evidence also shows that acceptance and engagement depend on perceived usefulness, ease of use, confidence, readiness, and trust.

Implications and Suggestions for Future Research

The findings have important implications for higher education institutions, language educators, and technology developers. Technology should not be treated as an end in itself; rather, its effectiveness depends on purposeful pedagogical integration, meaningful interaction, appropriate support, and alignment with language-learning objectives. Institutions should therefore strengthen infrastructure, technical support, personalization, digital competence, and opportunities for interaction while monitoring learner wellbeing. The findings of Niu et al. (2022) particularly highlight the importance of addressing technostress and burnout, while Suriaman et al. (2023) and Elansari and Laachach (2025) demonstrate the importance of reliable networks, feedback, relevant content,



and individualized learning conditions. Future research should employ longitudinal, experimental, and mixed-method designs to examine the sustained effects of emerging technologies, particularly AI and immersive technologies, across diverse higher-education contexts. Further research should also investigate how technological adoption interacts with learner wellbeing, digital competence, personalization, and pedagogical design, thereby developing a more holistic understanding of effective, engaging, and sustainable technology-enhanced language learning.

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