

TECHNOLOGY-ENHANCED PEDAGOGY FOR TEACHING ENGLISH AS AN APPLIED LANGUAGE IN HIGHER EDUCATION: A PRISMA REVIEW

Simron Krisnuarjati Hindom^{1a}, Galuh Wuryaningtyas^{2b}, Natalina Antonia dos Santos^{3c},
and Edeltrudis Patrisia Soge^{4e*}, Markus Budiraharjo^{5f}

¹²³⁴⁵ English Language Education Master Program, Faculty of Education, Sanata Dharma University,
Yogyakarta, Indonesia, 57126 Indonesia

^aE-mail: simronkrisnu50@gmail.com

^bE-mail: galuhwuryaningtyas25@gmail.com

^cE-mail: natasantosfdcc@gmail.com

^dE-mail: patriciasoge1819@gmail.com

^eE-mail: markbudi@dosen.usd.ac.id

(*) Corresponding Author

patriciasoge1819@gmail.com

ARTICLE HISTORY

Received : 06-01-2026

Revised : 07-04-2026

Accepted : 15-06-2026

KEYWORDS

Digital education
technology;
pedagogical implications;
English as an Applied
language;
PRISMA review

ABSTRACT

Digital technology has increasingly shaped the teaching of English as an applied language in higher education. Although many university students are familiar with digital tools, educators often face challenges in selecting technologies that support meaningful learning outcomes. Existing research only emphasizes single tools or discrete language abilities, hence breaking up existing research information about each tool used individually; limiting the support/assistance provided by pedagogical recommendations to higher education settings. A systematic literature review (SLR) was conducted following PRISMA 2020 guidelines. Fifty journal articles were retrieved from Scopus, Web of Science, and Google Scholar. After screening and eligibility assessment, 16 studies were included for synthesis, representing experimental, quasi-experimental, mixed-methods, qualitative, survey-based, and conceptual analytical research. The findings show that Mobile-Assisted Language Learning (MALL), particularly vocabulary apps and digital flashcards, provides the most consistent evidence of effectiveness, especially for vocabulary acquisition and retention. AI-supported tools and intelligent personal assistants demonstrate skill-specific benefits, particularly for speaking practice, pronunciation awareness, learner autonomy, and engagement, while effects on receptive skills are less consistent. Emerging technologies such as chatbots, robotics, and virtual reality show promising potential but remain underrepresented in rigorous classroom-based research. Overall, the review highlights that technology is most effective when integrated with clear learning objectives, structured tasks, and teacher guidance. Practical recommendations are provided to support educators in selecting and implementing digital tools that align with instructional goals and learner needs.

This is an open access article under the CC-BY-SA license.



INTRODUCTION

In higher education, digital technology has become an essential part that cannot be separated from the teaching and learning process. According to Tang (2025), numerous digital tools enrich education, such as Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), and Mobile Applications. It is also supported by Phua (2025),

who explained that Educational Technology (EdTech) has changed the atmosphere of teaching and learning in the classroom due to its existence in personalizing, facilitating, and engaging the process. In this case, it regularly shows that those digital tools offer massive resources and assistance that support the development of learners' individual experiences.

Today's generations, well known as Generation Z (Gen Z) and Generation Alpha, are connected to digital technology. Klimova et al. (2023) mentioned that since these generations are really growing up with the new digital technology tools, it is expected that their learning environment should have digital and interactive contents. While learners are mostly confident about technology, many teachers and educators are still challenged with their pedagogical use in academic settings, which can guide students to manage their digital identities or visuals. Cao et al. (2023) also added that digital competency positively correlates with better language learning outcomes. Therefore, the shift to online learning will promote critical reflection and foster pedagogical decisions for the integration of digital technology in English as an applied language.

Educators face serious challenges in incorporating various technologies into teaching practices. Gamboa (2022) reveals that several challenges occur when there is a lack of available gadgets, poor internet connection, sudden power interruption, and less basic knowledge in operating modern technological tools. In responding to their digitally savvy students and to enhance their interest in learning a foreign language, educators must utilize recent technology from chatbots to virtual reality. As Kumari (2025) suggests, digital technology in education contributes to learning achievement when effectively integrated, but it requires thoughtful instructional design. At the same time, educators need to evaluate the impact of digital technology on their classroom by reflecting on its strengths and limitations. The goal is to help educators with the pedagogical applications based on the relevant EdTech (Educational Technology). Not only focus on helping students to develop knowledge in a learning context, but also develop their skills in the 21st century, such as critical thinking, creativity, communication, and collaborative skills.

The use of Artificial Intelligence (AI) technologies has now become a norm in life and education. There have been many types of AI that can be used in language learning, such as Generative AI (GenAI) and chatbots. Maity et al. (2024) claimed that GenAI and chatbots could improve and change the intelligent tutoring system through highly personalized and adaptive learning environments. Through live interaction, AI for language learning can analyse learners' input and tailor the learning process and feedback according to their needs. It creates personalized learning for learners' strengths and weaknesses. Moreover, AI supports effective learning through feedback and evaluations. Zhai et al. (2021) indicated that automated writing evaluation provides formative and summative assessment that can work in collaboration with human rating skill in high-stakes, large-scale tests or one-rater low-stakes assessments and classroom contexts. Overall, AI in education supports the flexible and learner-centered approaches similar to Mobile-Assisted Language Learning (MALL).

As technology advances MALL has gained attention as a tool to improve interactivity, accessibility and learning engagement. Alisoy et al. (2024) emphasized that MALL offers several educational benefits, particularly in enhancing the overall language learning experience and improving learning outcomes. This indicates that simple and accessible design enhances the language learning process and engagement. Sholekhah et al. (2023) added that the modern design elements in MALL are targeted to make the learning process more appealing and sustained. The examples of MALL are Duolingo, Google Classroom, and Moodle Mobile. Previous discussion noted that MALL is accessible and promotes learner engagement and self-directed learning. This leads to more immersive tools such as Virtual Reality (VR) and Augmented Reality (AR), which simulate real-world contexts to increase engagement and understandings. The availability of simulated environments such as VR and AR can improve the experience of learning; this claim is supported by Zhao et al (2023), who say VR and AR can replicate real-world learning, which allows the students to experience hands-on learning. VR and AR can create realistic and contextual environments to learn language authentically. This experience increases engagement, communicative competence, and connects the classroom to the real-world.

Although VR and AR share similar concepts, they are fundamentally different. As Vener et al. (2022) argued, AR expands real life with digital data, and on the other hand, VR generates an entirely fabricated experience through digital data. Through VR and AR, learners engage with realistic and technology-enhanced education. That results in a shift toward technology-driven learning, followed by the adoption of Learning Management Systems (LMS) in

education. Turnbull et al, (2020) assert that utilizing LMS in educational environments enhance both student and teacher experiences through instruction and promotion of purposeful activities. LMS can provide a benefit to not only learners, but instructors as well. Learners benefit from being able to access learning materials while instructors can track learners' progress. This benefit works to allow learners and instructors to collaborate in real-time and customize the learning process. Additionally, LMS provides learning analytics capabilities. Pan et al. (2024), note that modern LMSs use log data from learners and teachers to refine and support language learning activities. This evolution not only improves teaching management but also encourages the integration of gamified and interactive tools that enhance interest and motivation.

The adoption of gamification and interactive tools in education has become an innovative learning method that can help learners learn a language better. Zeroual (2025) agreed and stated that gamification boosts learner motivation by offering immediate feedback and a sense of achievement that strengthens self-efficacy. Gamification's interactive features reshape language learning into rewarding experiences that highlight persistence and active participation. Examples of gamification and interactive tools are Kahoot!, Quizlet and Word-wall. Features in gamification provide clear goals that can sustain effort in learning and sustain attention throughout the learning process. Febriansah et al, (2024) add that gamification features promote an interactive and motivating learning process by providing clear goals that sustain effort and attention. This is also effective in improving receptive skills. Yoshania et al, (2023) said that it allows students to learn at their own speed, giving them more time to understand the material. Ratna et al, (2023) stated that through gamification students are more motivated and engaged to learn the learning materials. This shows that gamified learning supports a positive learner-centered approach by giving students opportunity and motivation to actively engage with the learning material.

Pongsakdi (2021) stated that effective pedagogical implementation relies on teachers' digital skill. This competence allows teachers to manage and deliver materials effectively while enabling students to access the digital media. Similarly, Yudha et al, (2025) stated that teachers' digital competence influences instructional efficiency, specifically in providing timely feedback, materials, and fostering learner autonomy. This review shows that such practices motivate students to access materials flexibly and engage in interactive learning environments. Correspondingly, Ikhsanudin et al. (2023) stated that the digital competence of the teachers is effective in supporting student-centered learning, and this helps improve the instructional efficiency and, at the same time, promotes inclusivity by allowing students to access language tools through learning necessities in different contexts. Accordingly, Munif et al. (2024) emphasize that teachers must master digital technologies to increase opportunities for interaction and collaboration. This skill enhances students' cognitive involvement, showing that digital competence extends beyond mere technical skills.

Tang (2023) stated that the change of focus and responsibility reflects a new educational paradigm emphasizing collaboration and learner empowerment through digital tools. It shows that language learning is no longer passive, but centered on active participation and collaboration. The learner-centered forces students to play an active role in their education, in contrast to the passive role traditionally used. In other words, a learner-centered approach encourages deeper learning and helps students become independent learners (Darsih, 2018). Similarly, Qoiriah and Febrianto (2025) note that it encourages students to study independently, work diligently, and explore new concepts and skills driven by intrinsic motivation. A Learner-centered approach focuses on meeting students' needs to improve (Pratiwi & Sudirtha, 2022). It aims to make a comfortable environment to learn that leads to greater autonomy, and improved learning outcomes.

Regarding this issue, several studies have delved into the same topic related to technology in education. The first research was conducted by Thurm and Barzel (2021), which explored mathematics teachers' beliefs in using technology. In the same year, Suparwito et al. (2021) discussed students' perception of online learning as part of technology facilities integration. Then, Manurung et al. (2024) raised a topic related to Augmented Reality (AR) in the development of building modelling for learning media. In the same year, Azis and Kusnafizal (2024) discovered the utilization of information and communication technology in the learning process. Moreover, Soge and Mbato (2025) delved into the topic of the impact of Generative AI on graduate student motivation in academic writing.

Although multiple studies have explored the technology in education, it is important to acknowledge that these studies reveal different findings. The first research by Thurm and Barzel (2021) presents that teachers' self-efficacy

beliefs about teaching with technology are crucial factors that impact the mathematics teaching and learning process. The second research from Suparwito et al. (2021) revealed that, related to online learning, students' satisfaction with the online learning is influenced by the relationship between teachers and students, the learning materials, and the effectiveness of technology use. The third research by Manurung et al. (2024) discovered that Augmented Reality (AR), can be used as a teaching tool since it creates a more interactive atmosphere for teaching and the learning process by showing visually in 3 dimensions related to the mathematics subject. Moreover, the fourth research by Azis and Kusnafizal (2024) revealed that during online learning, the historical subject employed technology such as the WhatsApp application and Smartphone to make the learning process more engaging. Furthermore, the fifth research by Soge and Mbato (2025) showed that, for academic writing, master's students use a lot of Generative Artificial Intelligence (AI) such as ChatGPT, Gemini,

NotebookLM, DeePL, etc to help them expand the topic, and these AI enhance students' students' motivation. These studies above discover the implementation of technology in education, such as the use of Mobile Assisted Language Learning (MALL), Augmented Reality (AR), Artificial Intelligence (AI), and online learning, which impact the teaching and learning process. Although positive benefits are influenced by technology, the practical use of the newest technologies in Applied Language classes is needed. Thus, to bridge this gap, the current research identifies, brings together, compares, and analyzes all of the technologies that are currently implemented in teaching English as an applied language, related to the findings of experimental studies. The goal is to provide specific pedagogical implications of using technology for teaching English as an applied language in higher education. Therefore, this research will answer two research questions:

What are the most efficient digital tools that can be used for teaching and learning English as an applied language based on empirical research findings?

What practical implications can emerge from these findings?

Auguinis et al. (2022) describe research and policy implications as principles that guide informed courses of action. In educational research, these implications are essential for connecting empirical findings with practical decision-making and policy development. In the context of foreign language education, research must not only contribute to theoretical understanding but also provide guidance that can be meaningfully applied by teachers and learners. Previous studies emphasize the importance of translating research findings into classroom practice. For example, Azahra (2025) highlights that language teachers are more likely to implement research-informed practices when studies address real classroom challenges and present clear pedagogical implications. Similarly, Aminah and Supriyono (2024) argue that language education research should inform teacher training and curriculum development to ensure relevance to policy and practice. Together, these studies highlight the importance of clear research and policy implications in bridging theory and classroom realities.

By answering these research questions, this research will contribute to the new nuance of research by providing pedagogical implications based on a literature review of several studies, which help both educators and learners in diving into the digital transformation.

METHOD

Research Design

This study applied a Systematic Literature Review based on the PRISMA 2020 Guidelines (Page et al., 2021). The study was conducted over four phases: Coverage, Analysis, Synthesis, and Grounding. First, during the coverage phase, inclusion and exclusion criteria were formulated and applied to screen articles based on titles, abstracts, and keywords. Full texts of 28 articles were then reviewed to assess their eligibility. For the analysis phase, each selected studies were reviewed and relevant data were extracted. In the synthesis phase, the extracted data were compared and integrated across studies to address the research questions. In the final phase, the synthesized findings were compared with the existing literature to identify research gaps and directions for future research. After the screening process, 16 articles met the inclusion criteria and were included in the final review.

Data Search

The systematic search was carried out through the three main databases: Scopus, Web of Science (WoS), and Google Scholar. Due to their broad coverage of research publications from across the disciplines of education, educational technology, and applied linguistics, these databases were selected. The following search string was utilized to find studies on innovative technology to teach English:

("mobile application" OR "mobile apps" OR "virtual reality" OR "augmented reality" OR "chatbot" OR "intelligent personal assistant" OR "artificial intelligence" OR "neural machine translation" OR "machine learning") AND ("English as a foreign language" OR "English language teaching" OR "English as an applied language" OR "English for specific purposes" OR "English for academic purposes") AND ("college" OR "university" OR "tertiary education" OR "higher education").

The search focused on peer-reviewed journal publications published in English and in the timeframe of 2021 to 2025, to include the most current research, which would incorporate the technological innovations that occurred in higher education. The records were managed using Mendeley Reference Manager, which assisted in the organization of bibliographic information and automatic duplicate record identification.

Inclusion and Exclusion Criteria

After removing duplicates, the databases yielded a total of 50 journal articles. Titles, abstracts, and full texts were reviewed using the PRISMA 2020 guidelines to determine inclusion and exclusion. The development of the criteria for inclusion and exclusion in systematic reviews meets the requirements of designing excellent research procedures. The inclusion criteria are related to the main features of the population in the research, which connect with the research aims. In contrast, the exclusion criteria are related to features that, while fulfilling inclusion criteria, could have an impact on the viability and reliability of the research because of the lack of quality and potential biases (Patino & Ferreira, 2018).

Inclusion Criteria

Empirical studies employing experimental, quasi-experimental, mixed-methods, qualitative, survey-based, or conceptual analytical research designs that investigated the use of digital technologies to teach English as an applied language at the university level.

Primarily published from 2021 to 2025, with several earlier studies retained due to their continued relevance and frequent citation in recent applied linguistics and educational technology research.

Indexed in Scopus, Web of Science (WoS), and Google Scholar databases.

The search phrases were included in the articles' titles, abstracts, and keywords.

Studies reporting empirical evidence related to learning outcomes, learner perceptions, motivation, engagement, or pedagogical language teaching.

The journal articles were peer-reviewed and written in English

Exclusion Criteria

Types of research include descriptive without analytical depth, proceedings of conferences, single participant case studies without transferable pedagogical studies, observational studies, chapters of books, editorials, systematic review, and meta-analysis.

Studies conducted outside higher education contexts.

Research addressing general education technology use without a focus on English teaching.

After screening and eligibility checking, 16 journal articles fulfilled all inclusion criteria and were selected for data extraction and synthesis. The overall process of identification, screening, eligibility, and inclusion is summarized in the PRISMA flow chart (Figure 1).

Data Collection and Analysis

The process of the systematic literature review was conducted in four stages, in accordance with the PRISMA 2020 guidelines. As a result, it enabled transparency, consistency, and replicability in identifying, screening, and evaluating the studies suitable for the research. The utilized databases are Scopus, Web of Science, and Google Scholar.

The first step involved a starting search of the databases using a predetermined search string. The search resulted in 50 records: 20 in Google Scholar, 15 in Scopus, and 15 in Web of Science. The researchers imported all records into Mendeley References Manager to compile bibliographic information and facilitate automatic duplicate identification. After removing eight duplicates and records not in English, 42 articles remained.

Titles, abstracts, and keywords within the relevant publications were reviewed during the second stage for the application of the inclusion criteria. Non-experimental or those unrelated to the utilization of new technology in higher-level English language teaching, that do not fit the inclusion criteria, have been excluded. This stage removed 14 articles.

At the third stage, the exclusion criteria were applied with a full-text review of the remaining 28 articles. These studies were excluded if categorized as theoretical, case studies, book chapters, systematic reviews, descriptive, observational studies, meta-analyses, or editorials. Therefore, a further 12 articles were excluded.

After all eligible studies were selected, they were sorted and analysed in Microsoft Excel 2021. The direct results obtained were summarised by study (author and year), the technology used, the target skills or focus, the methodology, the key result, and the pedagogical implications. An overview of studies was provided in Table 1, which will be the basis of synthesizing in the next part.

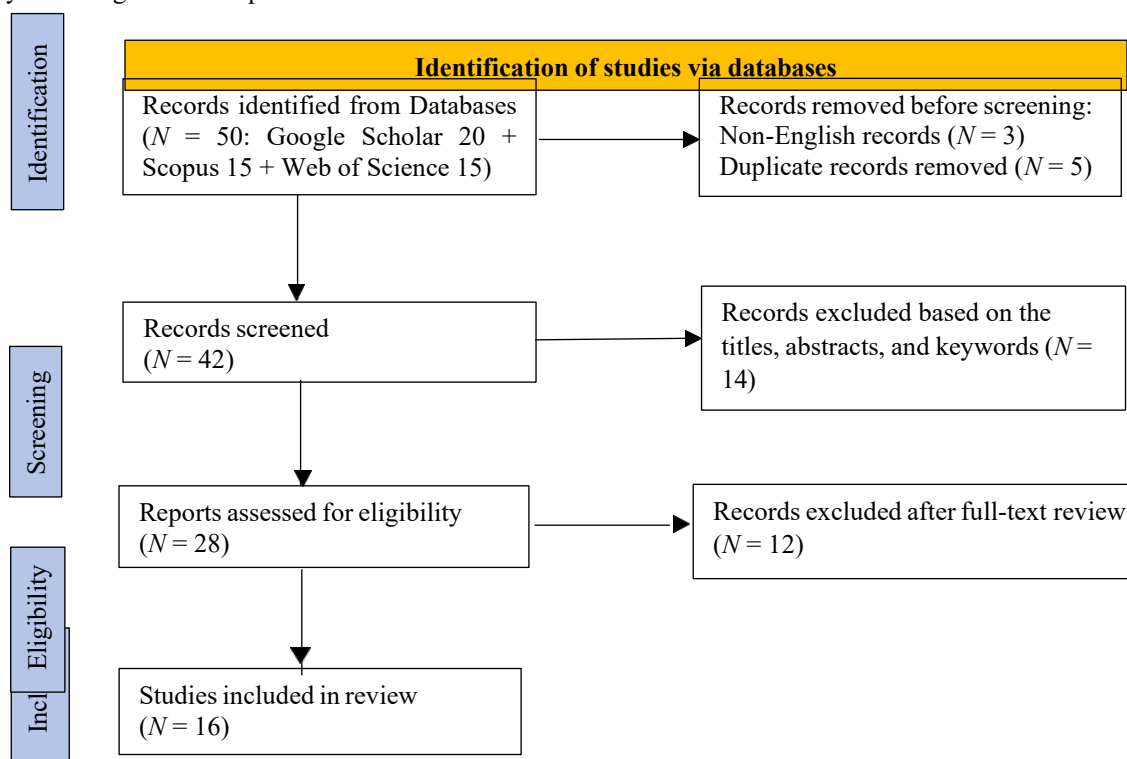


Figure 1. PRISMA Flow Chart

RESULT AND DISCUSSION

Result (ALL)

This systematic literature review synthesized evidence from 16 empirical studies investigating the integration of digital technologies in teaching English as an applied language in higher education. The included studies were published between the years 2021 – 2025 and met PRISMA 2020 guidelines in order to show transparency and methodological quality with several earlier studies retained due to their continued relevance and frequent citation in recent applied linguistics and educational technology research.

Study Characteristics

The selected studies were conducted in a variety of geographic and educational settings, including Saudi Arabia, Yemen, Serbia, Slovakia, China, Japan, South Korea, Northern Cyprus, Kazakhstan, Indonesia, and the Philippines. The sample sizes for the studies ranged from 20 to 496, resulting in a total of more than 1,700 university students participating in the studies. Most of the participants were EFL learners at the undergraduate level who were studying English for

academic or professional purposes.

Regarding research design:

11 studies employed experimental or quasi-experimental designs with pre-test and post-test measures

3 studies used mixed-methods designs combining performance data and perception surveys

2 studies were qualitative or survey-based empirical investigations

Intervention durations varied from two weeks to one academic semester, with most effective interventions lasting 10 weeks or longer.

Distribution of Technologies and Targeted Skills

The reviewed studies have classified the digital technologies under review into five categories:

Mobile-Assisted Language Learning (MALL): 6 Studies

Artificial Intelligence (AI) and Intelligent Personal Assistants (IPA): 4 Studies

Robots (such as the NAO robot): 1 Study

Virtual Reality (VR): 1 Study

ICT Platforms and Intricate Tools: 4 Studies

No	Study (Author, Year)	Technology / Tool	Target skill(s) / Focus	Design • Sample • Duration	Key result	Pedagogical implication
1	Alenezi et al. (2022) – WhatsApp & Medical English Vocabulary	WhatsApp vs Blackboard	Vocabulary + learner attitudes	Quasi-exp (pre/post); N=108; 10 weeks	No significant vocab difference vs Blackboard; attitudes positive (motivation/interest).	Use WhatsApp as a flexible supplement to formal platforms; add structured vocab tasks.
2	Sosas (2021) – Technology in Teaching Speaking	Skype/Messenger, Facebook, email	Speaking (fluency, confidence, anxiety)	Qualitative phenomenology; N=21; 1 semester	Technology supported fluency/accuracy, reduced anxiety, increased confidence.	Design communicative speaking tasks using familiar tech + performance tech rehearsal/self-correction.
3	Banaeian et al. (2021) – NAO Robot Teaching Assistant	NAO humanoid robot	Vocabulary + attitudes	Mixed-method; N=36; 4 sessions / 2 weeks	No significant vocab gain vs control; students motivated but distracted/technical issues.	Robots can assist interaction if technical limits are addressed and teachers trained.
4	Stefanovic (2021) – Smart Platform in EFL (Mobil2Eng)	Mobil2Eng mobile smart platform	Technical vocabulary + satisfaction	Experimental; N=360; 1 semester	Higher test scores and high satisfaction (personalized learning paths valued).	Use smart platforms for autonomy and individualized learning routes in ESP/EAP.
5	Chung & Bong (2022) – Korean-Accented English Intelligibility	Google Assistant (ASR)	Pronunciation intelligibility/error patterns	Comparative testing; 6 KoE speakers + 30 listeners; one session	Humans understood better than ASR; moderate AI-human correlation; similar error types.	Teach for intelligibility (stress/vowels); use ASR as adjunct feedback, not judge.
6	Dizon (2020) – Alexa for L2 Listening & Speaking	Amazon Alexa (Echo Dot)	Speaking + listening + perceptions	Quasi-exp; N=28 completers; 10 weeks (~12 min/week)	Speaking improved; listening not significant; perceptions positive (useful/enjoyable).	Use IPAs for low-pressure speaking practice; don't rely on them for listening gains.
7	Jeong (2022) – AI-Supported Self-Directed Learning	AI-supported English learning system	Achievement + motivation + autonomy	Quasi-exp mixed; N not reported in summary; 1 semester	Higher achievement and motivation; stronger autonomy/engagement than control.	Use AI for personalized paths + timely feedback to build sustainable autonomy.



8	Baskara (2023) – Implications of ChatGPT for Language Education	ChatGPT (GenAI)	Potential benefits/risks for language learning	Conceptual/analytical; no participants	Can support feedback and practice; risks include context limits and academic integrity.	Use as support tool; redesign tasks to develop critical AI literacy + integrity.
9	Polakova & Klimova (2022) – Vocabulary App in Blended Learning	Mobile vocabulary app (Angličtina Today)	Vocabulary + motivation/satisfaction	Mixed quasi-exp; N=36; several weeks (blended course)	App group showed higher vocab gains and higher motivation/satisfaction.	Integrate vocab apps with guidance and alignment to learner needs.
10	Ma (2021) – VR Immersive Context Teaching (AI/ML-supported)	VR immersive learning environment	English proficiency + engagement	Experimental comparative; N not reported in summary; one teaching cycle	VR group outperformed control; engagement and satisfaction higher.	VR can boost communicative competence if infrastructure + teacher training exist.
11	Zakian et al. (2022) – Out-of-Class Digital Flashcards	NGSL Builder (digital flashcards)	Vocabulary gains + retention	Experimental (pre/post/delayed); N=86; 1 semester	Mobile flashcards improved vocab gains and long-term retention vs word lists. Tools seen as motivating/beneficial; barriers: access, training, institutional limits.	Encourage structured out-of-class mobile practice aligned with curriculum goals. Invest in teacher digital literacy + institutional support for meaningful integration.
12	Çelik & Aytin (2014) – Teachers' Views on Digital Tools (Turkey)	Various digital tools (computers, internet, media)	Teacher perceptions (benefits/barriers)	Qualitative interviews; N=6; no intervention		Use interactive CRS tools to improve participation, feedback, and online satisfaction.
13	Abdelrady & Akram (2022) – ClassPoint & Online Satisfaction	ClassPoint (PowerPoint-integrated CRS)	E-learning satisfaction	Quasi-exp; N=32; 4 weeks	ClassPoint group had higher satisfaction; tech environment strongest predictor.	Use WhatsApp for contextualized practice and peer learning beyond class time.
14	Ahmed (2020) – WhatsApp for Reading & Writing	WhatsApp English chat group	Reading + writing + motivation	Mixed-method; N=20; 2 months	Improved reading comprehension and writing accuracy/vocabulary; motivation increased.	Use guided authentic digital materials to support reading and cultural understanding.
15	Adilbayeva et al. (2022) – Digital Tools for Reading & Culture	Websites/apps (Memrise, Lingualo, British Council, etc.)	Reading comprehension + cultural learning + motivation	Experimental; N=32; duration not stated	Experimental group improved reading scores and motivation vs control.	Build learner digital literacy; design meaningful online activities; teacher as facilitator.
16	Didin et al. (2022) – Digital Literacy & Online English Learning	Internet-based digital tools (general use)	Digital literacy + satisfaction/interest	Quantitative survey; N=496; no intervention	Digital literacy and online activities correlated with satisfaction and interest.	

Source: Compiled from Alenezi et al. (2022), Sosas (2021), Banaeian et al. (2021), Stefanovic (2021), Chung & Bong (2022), Dizon (2020), Jeong (2022), Baskara (2023), Polakova & Klimova (2022), Ma (2021), Zakian et al. (2022), Çelik & Aytin (2014), Abdelrady & Akram (2022), Ahmed (2020), Adilbayeva et al. (2022), Didin et al. (2022).

Based on the table 1, it can be seen that regarding the language skills that were assessed using these technologies, there are

Vocabulary acquisition was the focus of the majority of studies (8 studies).

Speaking & pronunciation were also assessed in 4 studies.

Reading & writing skills were assessed in 3 studies.

Learner satisfaction, motivation and engagement were measured in 9 studies.

Vocabulary Learning Outcome

Vocabulary development was the primary focus area found to have improved with mobile-assisted language learning across a number of studies reviewed in this research study. This finding is aligned with previous research on

the effectiveness of mobile-assisted language learning in helping improve learners' abilities to learn new vocabulary. Mobile technologies allow more opportunities for users to repeatedly practice words, control their learning through a mobile phone, and continue to be exposed to new vocabulary outside of the classroom (Alisoy et al., 2024). Along these lines, Sholekhah et al., (2023) show that the design of modern Mobile Assisted Language Learning has been developed to allow learners to engage actively in language learning and provide an ongoing opportunity for continued lexical growth.

In addition to the supporting evidence for mobile-assisted language learning as an instrument for vocabulary development, prior research has suggested that digital tools can enhance vocabulary memory retention, which is conducive to continued learning rather than fostering short term memories (Alisoy et al., 2024). The findings above regarding mobile-assisted language learning support the premise that vocabulary-related outcomes are more stable and consistent compared to the other language-related skills reviewed in this research study.

However, it is important to note that not all mobile apps are effective for improving learning outcomes. Tang (2023) suggests that while motivation can be positively influenced by using communication platforms such as WhatsApp, tasks must be structured through pedagogical means to achieve measurable cognitive learning outcomes. This information provides insight to help explain the mixed results associated with vocabulary development, where affective types of motivational support were more prevalent than achievement-related support.

Speaking, Pronunciation, and Oral Communication

Previous research on AI-based and communication-focused technology's role in language learning have shown improvements in an individual's ability to speak a language as well as increased awareness of how to pronounce a word properly. Maity, et al. (2024) noted that when a language is supported by an AI system, interactive digital tools create a customized and adaptable learning environment. These technologies are particularly effective for helping to build productive language skills such as speaking.

Additionally, technology-enhanced speaking tasks decreased anxiety and increased student confidence by providing valuable opportunities for 'low-pressure' practice and real-time feedback (Maity et al., 2024). The research supports the increase in fluency, intelligibility, and confidence in speaking that is evident from the literature examined.

The results related to pronunciation are consistent with the findings of previous studies on automatic feedback systems. According to Zhai et al. (2021), feedback delivered using artificial intelligence technology is most beneficial when it increases notable awareness concerning errors made by language learners and assists with learner self-monitoring, rather than acting as a substitute for human assessment. This helps to clarify how pronunciation gains are viewed by learners as having increased awareness and diagnostic support but not necessarily mastery. Artificial Intelligence, Robotics, and Immersive Technologies

Research about artificial intelligence, robotics, and virtual and augmented reality is consistent with previous identified literature. AI Learning Systems have demonstrated an increase in autonomy, motivation and engagement of learners by providing adaptive feedback and personalized learning pathways (Maity et al., 2024). The characteristics of Artificial Intelligence (AI)-based learning systems can also help in understanding the overall instructional benefits seen in studies with longer research periods.

Previous research regarding the efficacy of these technologies on academic performance supports the current research that finds minimal improvement in student learning when using robotic and immersive technologies. According to Zhao et al. (2023), while virtual reality and augmented reality provide the opportunity to engage students through simulated real-life learning environments, they are very dependent on appropriate instructional design, physical infrastructure, and teacher preparation to be effective. Likewise, Turnbull et al. (2020) believe that without deliberate integration of the technology into instructional strategies, gains are not assured.

Learner Satisfaction and Engagement

The consistently positive findings concerning learner satisfaction and motivation have been documented in multiple studies. Gamification and interactive tools provide opportunities for immediate feedback, interaction, and a sense of accomplishment, which have all been shown to enhance motivation (Zeroual, 2025). Furthermore, learner-centred digital environments promote engagement through increased autonomy and participation in the learning process (Tang, 2023).

However, several researchers have warned that any outcomes resulting from emotion or affective dimensions are interpretable/best understood alongside cognitive measures. Tang (2023) states while motivation is an important facilitator for learners, motivation cannot supplant the importance of quality design. Therefore, it is important to use objective methods of measuring educator satisfaction to provide a complete picture of the effectiveness of the methodology.

Discussion (ALL)

The findings of the systematic review have been interpreted through their relationship with the literature on Technology-Enhanced Language Learning (TELL). In accordance with PRISMA 2020 guidelines, this section goes beyond just reporting the frequency of studies and the outcomes of TELL and provides an interpretation of the effectiveness of TELL by analysing patterns of effectiveness and limitations between different TELL technologies from theoretical perspectives established by other researchers (Page et al., 2021).

Effectiveness of Mobile-Assisted Language Learning

Mobile-Assisted Language Learning (MALL) has become the leading approach to the development of vocabulary and has been supported by recent literature highlighting mobile technologies' pedagogical benefits. Other research has found that MALL assists with vocabulary development by providing repeated exposure, allowing learners to have control over the amount of time they spend on learning activities, being able to learn anywhere, at any time, and giving learners easy, immediate access to their desired learning resources. The combination of all these benefits leads to increased engagement and retention (Alisoy et al. 2024; Sholekhah et al. 2023). Thus, since mobile apps can support frequent, independent practice and thus improve vocabulary development, they are ideal for maintaining the discrete aspects of language learning.

However, the results of using general-purpose mobile platforms for mixed learning have shed light on an important instructional design principle that was established in earlier studies, and that principle is that the effectiveness of technology depends more on how it is used than on what it is (Tang, 2023; Kumari, 2025). Specifically, research has shown that in order to be effective contributors to a student's learning success, digital tools need to be used with clearly defined goals and structured assignments, as well as pedagogical techniques that encourage a collaborative environment. Therefore, MALL (Mobile-Assisted Language Learning) should be considered as having the same amount of pedagogical value as it does technological value.

Skill-Specific Contributions of Artificial Intelligence

Research regarding the influence of AI-supported language environments highlights the same principles that were identified through this systematic review of the effectiveness of selective AI tools. According to Maity et al. (2024), the use of AI technology allows for the personalization and adaptation of instructional content in order to cultivate greater learner autonomy as well as increased involvement in the process of learning. The benefits of these traits are particularly evident when it comes to productive language skills, such as speaking; learners must practice and receive immediate feedback on their performance multiple times.

The early research mentioned here also cautioned against relying on artificial intelligence (AI) as the sole source of instructional guidance, Zhai et al. (2021) noted that automated feedback systems should primarily serve as formative assessments and diagnostic tools, rather than provide independent teacher/student interaction. Thus, it follows logically that AI-based tools must be thoughtfully considered and integrated within the pedagogical framework to fully realize their full potential as instructional resources.

Emerging Technologies: Potential Versus Evidence

Emerging technologies, such as virtual reality (VR), augmented reality (AR), and intelligent systems, have a powerful motivational appeal; however, there is a lack of empirical validation for these technologies. Thus, the trends seen in the literature reflect the same trends previously identified by researchers. Immersive environments create an engagement-enhancing experience for users by creating a simulated environment that mirrors reality and encourages users to learn from experience (Zhao et al., 2023). In addition to supporting engagement, the way in which VR and AR are perceived will influence their ability to enhance the learning experience for students; specifically, VR has the potential to create a fully simulated experience, while AR allows for the user to interact with aspects of reality that have been digitally enhanced (Vener et al., 2022).

Although it is expected that immersive technologies will enhance learning experiences, prior research emphasizes that their successful implementation is highly dependent on the context in which they are used. Specifically, this context includes teacher training and preparation, instructional design/structure, and the availability of the appropriate technology infrastructure. As noted by Turnbull et al., (2020), unless technology is integrated into meaningful pedagogical practices, the use of a new technology will not necessarily lead to sustained and consistent overall gains in student learning. This perspective may provide an explanation for the reason many new technologies receive substantial amounts of enthusiasm, yet have not shown significant improvements in measurement of student language learning.

Motivation as a Mediator

The importance of learner motivation and engagement is a central theme that has emerged in all of the studies reviewed and the findings are consistent with what researchers have found in prior studies. Gamification and interactivity of learning tools provide an enhanced level of motivation to learners by providing them with immediate feedback via interactivity, along with a sense of accomplishment. Gamification and interactive tools may not only extend learner participation over time (Zeroual, 2025), but they also create conditions for learners to have an active role in their digital learning environment and be autonomous in their learning activities (Tang, 2023). However, existing research also suggests that while motivation may lead to student success in terms of learning, it is not enough on its own. Tang (2023) states that learners must engage deeply with their knowledge; the motivational gains that are achieved through the use of gamification and interactive tools need to be interpreted in combination with quantitative performance data.

Significance of Pedagogy and Educators

The central theme that has emerged in this review is the necessity for pedagogy and teachers in the implementation of technology-enhanced language learning (Pongsakdi, 2021). The digital competency of teachers is critical when it comes to managing instructional materials, facilitating engagement with students, and guiding students to utilize digital tools effectively. Technology-enhanced language learning also requires that educators shift from simply being instructors to being facilitators who design, scaffold, and assess learning activities in a technology-enhanced, learner-centered manner. From a broader perspective, research and policy frameworks indicate that educational technology will continue to be an essential component for supporting and enhancing the learning outcomes of students (Auguinis et al., 2022; Tang, 2023).

CONCLUSION

This study investigated the use of technology-enhanced methods in teaching English as a second language (ESL) at the college level through a PRISMA-based systematic review of 16 studies. The review provides insights into how different digital tools support language learning in higher education. The findings revealed that Mobile-Assisted Language Learning (MALL), particularly vocabulary apps and electronic flashcards, plays a significant role in improving students' vocabulary development and retention. AI-based tools and Intelligent Personal Assistants were also found to support speaking skills, pronunciation awareness, learner autonomy, and engagement. However, emerging technologies such as chatbots, robots, and virtual reality still lack strong classroom-based evidence. Overall, the review highlights that technology is most effective when integrated into structured lessons with clear objectives and teacher guidance, rather than used independently. Nevertheless, the study has limitations, including the limited number of reviewed studies and insufficient long-term empirical evidence on newer technologies. Future research should involve more rigorous, controlled classroom experiments and examine the long-term effects of technology integration, teacher training, and instructional design on second language learning outcomes.

REFERENCES

- Adilbayeva, U., Mussanova, G. A., Mombekova, N. B., & Suttibayev, N. A. (2022). Digital communication technology for teaching a foreign language and culture through reading. *International Journal of Society, Culture & Language*, 10(3), 21-30. <http://dx.doi.org/10.22034/10.22034/ijscsl.2022.543110.2472>
- Aguinis, H., Jensen, S. H., & Kraus, S. (2022). Policy implications of organizational behavior and human resource management research. *Academy of Management Perspectives*, 36(3), 857-878.

- <https://doi.org/10.5465/amp.2020.0093>
- Ahmed, S. T. (2019). Chat and learn: Effectiveness of using WhatsApp as a pedagogical tool to enhance EFL learners reading and writing skills. *International Journal of English Language and Literature Studies*, 8(2), 61-68. <https://doi.org/10.18488/journal.23.2019.82.61.68>
- Alenezi, S., & Bensalem, E. (2022). The effect of using WhatsApp on EFL students' medical English vocabulary learning during the COVID-19 pandemic. *English Studies at NBU*, 8(1), 29- 42. <https://doi.org/10.33919/esnbu.22.1.2>
- Alisoay, H., & Sadiqzade, Z. (2024). Mobile-Assisted Language Learning (Mall): Revolutionizing language education. *Luminis Applied Science and Engineering*, 1(1), 60–72. <https://doi.org/10.69760/lumin.202400002>
- Azis, A., & Kusnafizal, T. (2024). Information and communication technology in the learning process. *JTP-Jurnal Teknologi Pendidikan*, 26(1), 158-170. <https://doi.org/10.21009/jtp.v26i1.33561>
- Gilanlioglu, I. (2021). Influence of the NAO robot as a teaching assistant on university students' vocabulary learning and attitudes. *Australasian Journal of Educational Technology*, 71-87. <https://doi.org/10.14742/ajet.6130>
- Baskara, R., & Mukarto, M. (2023). Exploring the implications of ChatGPT for language learning in higher education. *IJELTAL (Indonesian Journal of English Language Teaching and Applied Linguistics)*, 7(2), 343. <https://doi.org/10.21093/ijeltal.v7i2.1387>
- Bremner, N., Sakata, N., & Cameron, L. (2022). The outcomes of learner-centred pedagogy: A systematic review. *International Journal of Educational Development*, 94, 102649. <https://doi.org/10.1016/j.ijedudev.2022.102649>
- Cao, J., Bhuvanewari, G., Arumugam, T., & R, A. (2023). The digital edge: Examining the relationship between digital competency and language learning outcomes. *Frontiers in Psychology*, 14. <https://doi.org/10.3389/fpsyg.2023.1187909>
- Çelik, S., & Aytin, K. (2014). Teachers' views on digital educational tools in English language learning: Benefits and challenges in the Turkish context. *Tesl-Ej*, 18(2), n2.
- Chung, B., & Bong, H. K. M. (2022). A study on the intelligibility of Korean-Accented English: Possibilities of implementing AI applications in English education. *Journal of Asia TEFL*, 19(1), 197. <http://dx.doi.org/10.18823/asiatefl.2022.19.1.12.197>
- Dizon, G. (2020). Evaluating intelligent personal assistants for L2 listening and speaking development. *Language Learning & Technology*, 24(1), 16–26. <https://doi.org/10.125/44705>
- Febriansah, A. T., Syaifuddin, A., & Soepriyanto, Y. (2024). Perkembangan gamifikasi di bidang pendidikan. *Scholaria: Jurnal Pendidikan dan Kebudayaan*, 14(2), 177–186. <https://doi.org/10.24246/j.js.2024.v14.i2.p177-186>
- Gamboa, D. (2022). Get ready to be techy: Struggles of senior citizen teachers in the utilization of technology in the classroom. *International Journal of Multidisciplinary Research and Analysis*. <https://doi.org/10.47191/ijmra/v5-i8-16>.
- Hidayat, D. N., Lee, J. Y., Mason, J., & Khaerudin, T. (2022). Digital technology supporting English learning among Indonesian university students. *Research and Practice in Technology Enhanced Learning*, 17(1). <https://doi.org/10.1186/s41039-022-00198-8>
- Ikhsanudin, I., Putri, T. C., Puspitasari, N. L., & Ulyasari, N. (2023). Systematic literature review on current instruments of Indonesian information technology-based ELT materials development. *Journal of English Language Teaching Innovations and Materials (Jeltim)*, 7(1), 146–166. <https://doi.org/10.26418/jeltim.v7i1.87864>
- Jeong, K. (2022). Facilitating sustainable self-directed learning experience with the use of mobile-assisted language learning. *Sustainability*, 14(5), 2894. <https://doi.org/10.3390/su14052894>
- Klimova, B.; Pikhart, M.; Polakova, P.; Cerna, M.; Yayilgan, S.Y.; Shaikh, S. (2023). A systematic review on the use of emerging technologies in teaching English as an applied language at the university level. *Systems* 2023, 11, 42. <https://doi.org/10.3390/systems11010042>
- Kumari, S. (2025). Impact of technology on student learning outcomes: Examining digital tools, online platforms, and ai in modern education. *International Journal for Multidisciplinary Research*.

- <https://doi.org/10.36948/ijfmr.2025.v07i01.29499>.
- Ma, L. (2021). An immersive context teaching method for college English based on artificial intelligence and machine learning in virtual reality technology. *Mobile Information Systems*, 2021, 1–7. <https://doi.org/10.1155/2021/2637439>
- Maas, M., & Hughes, J. (2020). Virtual, augmented and mixed reality in K–12 education: A review of the literature. *Technology, Pedagogy and Education*, 29, 231–249. <https://doi.org/10.1080/1475939x.2020.1737210>.
- Maity, S., & Deroy, A. (2024). Generative AI and Its Impact on Personalized Intelligent Tutoring Systems. <https://doi.org/10.36227/techrxiv.172954174.48041095/v1>
- Manurung, A. A., Sari, I. P., & Manurung, S. H. (2024). Implementation of augmented reality (AR) in the development of space building modeling learning media for elementary school students Juma Raja village. *Indonesian Journal of Education and Mathematical Science*, 5(1), 40–46. <https://doi.org/10.30596/ijems.v5i1.16892>
- OECD (2023). Who really cares about using education research in policy and practice?: Developing a culture of research engagement, educational research and innovation, *OECD Publishing*, <https://doi.org/10.1787/bc641427-en>.
- Oliveira, W., Hamari, J., Shi, L., Toda, A. M., Rodrigues, L., Palomino, P. T., & Isotani, S. (2022). Tailored gamification in education: A literature review and future agenda. *Education and Information Technologies*, 28(1), 373–406. <https://doi.org/10.1007/s10639-022-11122-4>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., & Moher, D. (2021). Updating guidance for reporting systematic reviews: Development of the PRISMA 2020 statement. *Journal of Clinical Epidemiology*, 134, 103–112. <https://doi.org/10.1016/j.jclinepi.2021.02.003>
- Pan, Z., Biegley, L., Taylor, A., & Zheng, H. (2024). A systematic review of learning analytics. *Journal of Learning Analytics*, 11(2), 52–72. <https://doi.org/10.18608/jla.2023.8093>
- Paul, J., & Barari, M. (2022). Meta-analysis and traditional systematic literature reviews—What, why, when, where, and how? *Psychology & Marketing*, 39(6), 1099–1115. <https://doi.org/10.1002/mar.21657>
- Phua, J., & Aripadono, H. (2025). Enhancing foreign language learning through educational technology. *International Journal Software Engineering and Computer Science (IJSECS)*. <https://doi.org/10.35870/ijsecs.v5i1.3483>.
- Polakova, P., & Klimova, B. (2022). Vocabulary mobile learning application in blended English language learning. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.869055>
- Pongsakdi, N., Kortelainen, A., & Veermans, M. (2021). The impact of digital pedagogy training on in- service teachers' attitudes towards Digital Technologies. *Education and Information Technologies*, 26(5), 5041–5054. <https://doi.org/10.1007/s10639-021-10439-w>
- Ratna, A., Mohammed, L., Kirplani, A., Hiranadani, Komal., Tolani, L. V., Nandi, S. (2023). Impacts of gamification learning approach on student's performance and perception during covid 19 post pandemic 2021 in Indonesia new normal learning. *The Seybold Report*. <https://doi.org/10.5281/zenodo.7337419>
- Retnawati, L., Dewi, U., & Arianto, F. (2026). The effect of collaborative problem based learning model on problem solving skills. *Veredas do Direito*, 23(1), e234100–e234100. <https://doi.org/10.18623/rvd.v23.n1.4100>
- Sholekhah, M. F., & Fakhurriana, R. (2023). The use of Elsa speak as a mobile-assisted language learning (MALL) towards EFL students pronunciation. *JELITA: Journal of Education, Language Innovation, and Applied Linguistics*, 2(2), 93–100. <https://doi.org/10.37058/jelita.v2i2.7596>
- Soge, E. P., & Mbato, C. L. (2025). The perceived impacts of generative AI on Indonesian EFL master's students' motivation in academic writing. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 6(4), 692–704. <https://doi.org/10.37478/jpm.v6i4.6120>
- Sosas, R. (2021). Technology in teaching speaking and its effects to students learning English. *Journal of Language and Linguistic Studies*, 17(2), 958–970. <https://doi.org/10.52462/jlls.66>
- Stefanovic, S., & Klochkova, E. (2021). Digitalisation of teaching and learning as a tool for increasing students' satisfaction and educational efficiency: Using smart platforms in EFL. *Sustainability*, 13(9), 4892. <https://doi.org/10.3390/su13094892>
- Suparwito, H., Polina, A. M., & Budiraharjo, M. (2021). Student perceptions analysis of online learning: a machine

- learning approach. *Indonesian Journal of Information Systems*, 4(1), 64-75. <https://doi.org/10.24002/ijis.v4i1.4594>
- Szűts, Z., Molnár, G., Racsko, R., Vaughan, G., & Molnár, T. L. (2023). Pedagogical implications and methodological possibilities of digital transformation in digital education after the COVID-19 epidemic. *Computers*, 12(4), 73. <https://doi.org/10.3390/computers12040073>.
- Tang, K. H. (2023). Student-centered approach in teaching and learning: What does it really mean? *Acta Pedagogica Asiana*, 2(2), 72–83. <https://doi.org/10.53623/apga.v2i2.218>
- Tang, Y. (2025). Pedagogical Approaches Integrated with technologies in foreign language education pre- and post-COVID-19. *Journal of e-learning Research*. <https://doi.org/10.33422/jelr.v3i2.780>.
- Thurm, D., & Barzel, B. (2022). Teaching mathematics with technology: A multidimensional analysis of teacher beliefs. *Educational Studies in Mathematics*, 109(1), 41–63. <https://doi.org/10.1007/s10649-021-10072-x>
- Turnbull, D., Chugh, R., & Luck, J. (2020). Learning management systems: A review of the research methodology literature in Australia and China. *International Journal of Research & Method in Education*, 44(2), 164–178. <https://doi.org/10.1080/1743727x.2020.1737002>
- Verner, I., Cuperman, D., Perez-Villalobos, H., Polishuk, A., & Gamer, S. (2022). Augmented and virtual reality experiences for Learning Robotics and Training Integrative Thinking Skills. *Robotics*, 11(5), 90. <https://doi.org/10.3390/robotics11050090>
- Yoshania, R. N., Yusuf, F. N., & Sundari, H. (2023). Gamification-assisted flipped learning in EFL reading classroom: A case of secondary school in Indonesia. *Indonesian EFL Journal*, 9(1), 1–10. <https://doi.org/10.25134/ieflj.v9i1.7265>
- Yudha, V. P., Jamaludin, U., & Hilaliyah, T. (2025). Drill methods for enhancing reading skills in the era of digital disruption: A systematic literature review. *Jurnal Pendidikan Progresif*, 15(1), 646–658. <https://doi.org/10.23960/jpp.v15i1.pp646-658>
- Zakian, M., Xodabande, I., Valizadeh, M., & Yousefvand, M. (2022). Out-of-the-classroom learning of English vocabulary by EFL learners: Investigating the effectiveness of mobile assisted learning with digital flashcards. *Asian-Pacific Journal of Second and Foreign Language Education*, 7(1). <https://doi.org/10.1186/s40862-022-00143-8>
- Zeroual, L. (2025). Gamification of learning to boost students' motivation and study engagement. *Advances in Web Technologies and Engineering*, 349-364. <https://doi.org/10.4018/979-8-3693-2973-3.ch013>
- Zhai, N., & Ma, X. (2021). Automated Writing Evaluation (AWE) feedback: A systematic investigation of college students' acceptance. *Computer Assisted Language Learning*, 35(9), 2817–2842. <https://doi.org/10.1080/09588221.2021.1897019>
- Zhao, X., Ren, Y., & Cheah, K. S. (2023). Leading virtual reality (VR) and augmented reality (AR) in education: Bibliometric and content analysis from the Web of Science (2018–2022). *Sage Open*, 13(3). <https://doi.org/10.1177/21582440231190821>