The Effectiveness of CALL in EFL Learning: A Synthesis of Empirical Evidence

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ABSTRACT

Technology integration has been shown to enhance learners' language proficiency by creating authentic learning environments, fostering confidence, and improving technological skills. This literature review explores the effectiveness of computer-assisted language learning (CALL) in enhancing EFL learning, addressing learning gaps, and offering global perspectives on CALL implementation. the present study conducts a systematic literature review to synthesize empirical findings on the impact of CALL on EFL learning outcomes and to identify pedagogical and contextual factors mediating its effectiveness. Drawing on more than 70 peer-reviewed studies published between 1991 and 2025 and indexed in Scopus, ERIC, and Google Scholar, the review encompasses quantitative, qualitative, and mixed-methods research. The selected studies were analyzed using thematic synthesis to trace recurring patterns across language skills development, learner engagement, autonomy, and technology-enhanced instructional practices. The synthesis indicates that CALL is associated with consistent gains in vocabulary, grammar, listening, speaking, reading, and writing, particularly when embedded within blended learning designs, scaffolded pedagogical tasks, and technologies offering adaptive and timely feedback. At the same time, the effectiveness of CALL appears contingent upon the quality of instructional design, teachers' digital pedagogical competence, and institutional support structures. Overall, the review suggests that CALL constitutes a robust pedagogical approach to EFL instruction when implemented through principled design and sustained professional development. Persistent challenges related to digital inequality and uneven teacher preparedness underscore the need for systemic investment to ensure equitable and sustainable CALL integration.

Keywords: *CALL; EFL learning; technology integration; blended learning; language proficiency.*

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INTRODUCTION

The rapid advancement of digital technologies over the past three decades has profoundly shaped the landscape of English as a Foreign Language (EFL) education. Computer-assisted language learning (CALL), once characterized by drill-based programs and tutorial software (Warschauer, 1996; Beatty, 2003), has evolved into a complex ecosystem of adaptive applications, mobile learning platforms, multimodal tools, and artificial intelligence–driven systems (Hubbard, 2009; Kristiawan et al., 2024). While early work in CALL focused on broad descriptions of technological possibilities, recent research highlights the need to critically assess how and under what conditions technology enhances EFL learning (Han, 2020; Garrett, 2009). As technological innovation continues to advance rapidly, from AI-based pronunciation tutors (Dennis, 2024; Vančová, 2023) to immersive virtual reality environments (Ding, 2024), educators, researchers, and policymakers are increasingly challenged to evaluate the pedagogical value and constraints of CALL within contemporary language learning contexts.

Despite the extensive body of CALL literature, several issues justify the need for an updated and critically synthesized review. First, the integration of technology in EFL classrooms has expanded far beyond traditional computer labs. Language learning now takes place through mobile apps (Nushi & Eqbali, 2017; Kessler et al., 2023), learning management systems (Jeong, 2017), online annotation tools (Lu & Deng, 2013), interactive video platforms (Jordán et al., 2023; Meisterheim, 2016), and AI-enabled writing assistants (O'Neil & Russell, 2019; Dizon & Gold, 2023). However, this abundance of tools does not automatically lead to effective learning outcomes. As Hubbard and Levy (2014) argued, the proliferation of CALL tools demands clearer pedagogical frameworks to determine which technologies truly foster language development and under what learning conditions they are most beneficial.

Second, existing review studies tend to focus on narrowly defined CALL applications, including vocabulary learning (Enayati and Gilakjani, 2020; Hosseini and Amirkhani, 2024), writing support tools (Damayanti and Azizah, 2024; Sari et al., 2024), speaking and pronunciation applications (Luu et al., 2021; Marlinda and Huda, 2024), and immersive technologies (Weng et al., 2024). As a result, relatively few studies have offered an integrative synthesis of CALL effectiveness across multiple language skills, learner motivation, learner autonomy, and broader technology-enhanced pedagogical practices. Given that EFL learning is inherently multidimensional, a broader synthesis is needed to draw meaningful conclusions about the effectiveness of CALL in real instructional settings. This gap is significant because learners rarely develop skills in isolation; instead, CALL environments often influence multiple

linguistic, cognitive, and affective outcomes simultaneously (Yeh, 2018; Cong-Lem, 2018).

Third, while motivation and autonomy have long been recognized as central to successful language learning (Ryan & Deci, 2000; Zimmerman & Schunk, 2011), the role of CALL in shaping these affective dimensions remains underexplored in large-scale synthesis. Individual studies demonstrate that CALL can enhance motivation through gamification (Deterding et al., 2011; Shabaneh & Farrah, 2019), increase self-regulated learning through adaptive feedback (Yeh et al., 2020), and reduce anxiety through AI-based speaking tools (Bashori et al., 2021). Yet, there is little integrative analysis on how these motivational gains contribute to measurable improvements in language proficiency, or on whether motivational benefits are sustained over time. This gap is critical because motivation is often cited as a major rationale for CALL adoption, but the empirical evidence remains fragmented.

Fourth, the pedagogical conditions influencing CALL effectiveness require deeper analysis. Research increasingly shows that technology alone does not guarantee learning improvement; rather, instructional design, scaffolding, feedback, and teacher expertise are decisive factors (Meskill, 2005; Egbert et al., 2002; Zou & Wang, 2024). Blended learning, for example, leads to positive outcomes only when effectively integrated with clear objectives and meaningful interaction (Albiladi & Alshareef, 2019; Bataineh et al., 2019; Lai & Le, 2025). Similarly, CALL tools that incorporate multimodal input and structured tasks tend to outperform those relying on passive content delivery (Plass et al., 1998; Mayer, 2009). However, few reviews systematically examine which pedagogical strategies consistently support successful CALL implementation across skills and contexts.

Another pressing issue is the shifting technological profile of EFL learners. While many are assumed to be "digital natives," research shows that digital competence varies widely and cannot be taken for granted (Li & Ranieri, 2010; Nurhidayat et al., 2024). This disparity, combined with challenges such as digital inequality (Bsharat & Behak, 2020), infrastructure limitations (Mili & Ahmad, 2019), and varying teacher readiness (Kholis, 2021; Yahya & Nazli, 2023), impacts the extent to which CALL can be implemented effectively. Without synthesizing how these contextual variables interact with CALL outcomes, educators may adopt technologies without understanding the constraints that shape their effectiveness.

Given these issues, there is a clear need to revisit and reassess the effectiveness of CALL in enhancing EFL learning by examining both empirical trends and the instructional mechanisms that underlie successful technology integration. This review, therefore, synthesizes more than 70 empirical CALL studies published between 1991 and 2025

across key EFL domains, including language skills development, learner motivation and autonomy, and technology-enhanced pedagogy. By drawing on research from established journals such as *Language Learning & Technology*, *CALL Journal*, *System*, *TESL-EJ*, and the *Arab World English Journal*, the review seeks to identify consistent patterns regarding the conditions under which CALL is most effective, the types of technologies that yield positive learning outcomes, and the challenges that persist across diverse educational settings.

The contribution of this review lies in its comprehensive and analytical approach. Rather than merely cataloging technologies or listing reported benefits, this study critically synthesizes how CALL influences multiple dimensions of EFL learning and why certain tools or pedagogical designs lead to more effective outcomes. Through this analysis, the review aims to inform educators on how to select and implement CALL tools strategically; assist researchers by mapping current trends, inconsistencies, and remaining gaps; and guide institutions seeking to promote equitable and high-quality technology-enhanced language instruction. Ultimately, by addressing the need for updated, skill-focused, and pedagogically grounded insights, this review contributes to a deeper understanding of CALL's role in contemporary EFL education and identifies areas requiring further empirical investigation.

METHOD
Research Design

This study adopted a systematic literature review design, guided by established frameworks for evidence synthesis in educational research (Booth, Sutton, and Papaioannou, 2016; Randolph, 2009; Snyder, 2019). The review aimed to synthesize empirical findings across diverse educational contexts, with a specific focus on studies examining the effectiveness of computer assisted language learning in EFL settings.

The review process was conducted through a series of interrelated stages, beginning with the delineation of the review scope, research questions, search terms, and inclusion criteria. This was followed by a systematic search of relevant databases, study screening, and quality appraisal to ensure the relevance and methodological soundness of the selected studies. The final stage involved the coding and thematic synthesis of empirical findings, enabling the identification of recurring patterns and pedagogical conditions associated with effective CALL implementation.

Throughout the review process, transparency and replicability were prioritized in accordance with best practices in qualitative evidence synthesis (Gough, Oliver, and Thomas, 2012). The systematic procedures for study selection, evaluation, and synthesis supported the development of a comprehensive and analytically grounded understanding of CALL's impact on EFL learning.

Data Collection and Sources

Data collection was conducted through a systematic search of peer reviewed literature across multiple academic databases, including Scopus, ERIC, and Google Scholar. The search targeted empirical studies published between 1991 and 2025 that examined the effectiveness of computer assisted language learning in EFL contexts. A combination of keywords related to CALL, EFL learning, language skills development, learner motivation, learner autonomy, and technology enhanced pedagogy was employed to ensure comprehensive coverage of the relevant literature.

Study selection was guided by predefined inclusion and exclusion criteria. Only empirical studies employing quantitative, qualitative, or mixed methods designs and reporting on learning outcomes or pedagogical processes were considered. Conceptual papers, opinion pieces, and studies not situated within EFL contexts were excluded. Following the initial search, titles and abstracts were screened for relevance, after which full text articles were assessed to confirm methodological rigor and alignment with the review focus.

To enhance transparency and replicability, the selection process was documented systematically, and the methodological quality of the included studies was appraised prior to synthesis. The final corpus of studies constituted the empirical basis for subsequent coding and thematic analysis, allowing for a structured and evidence informed synthesis of CALL research in EFL learning.

A summary table of the reviewed studies—listing publication year, focus area, methodology, tools investigated, and key findings—has been included as a supplementary visual to enhance transparency (Table 1), as recommended by synthesis guidelines (PRISMA; Moher et al., 2009).

Table 1. Summary of Empirical CALL Studies Included in the Review

Citation	Focus Area	Methodology	Key CALL Tool/Finding
Abbasi (2022)	CALL integration	Quantitative	CALL modules improved access and participation in low-resource contexts.
AbuSahyon et al. (2023)	AI/chatbots	Review of empirical studies	Chatbots supported oral practice and grammar feedback.
Adara & Haqiyah (2021)	Motivation	Quantitative	CALL increased learner motivation and positive attitudes.
Al-Seghayer (2001)	Vocabulary	Experimental	Multimedia annotations improved retention compared with text-only.
Albiladi & Alshareef (2019)	Blended learning	Review	Blended CALL enhanced engagement and flexible learning.
Algraini (2014)	Writing	Case study	Padlet enhanced collaborative drafting and

Author	Topic	Method	Finding	Author	Topic	Method	Finding
Alian et al. (2018)	Grammar	Experimental	revision CALL grammar tasks outperformed traditional practice.	Chaudhary & Devi (2019)	CALL benefits	Empirical	Documented increased engagement through multimedia CALL.
Alqahtani (2015)	Vocabulary	Empirical	Highlighted the need for multimodal vocabulary support in CALL.	Choo & Too (2012)	Grammar tasks	Qualitative	Task-based CALL promoted contextualized grammar use.
Amaliah (2020)	Listening	Case study	Edpuzzle improved detailed listening comprehension.	Cong-Lem (2018)	Speaking	Review	Web-based instruction supported speaking development.
Amin (2024)	Pronunciation	Qualitative	Text-to-Speech apps supported intelligibility and confidence.	Damayanti & Azizah (2024)	Writing	Case	Grammarly improved accuracy and revision processes.
Andriani et al. (2024)	Reading	Quasi-experimental	Newsela improved reading fluency and comprehension	Deni & Zainal (2015)	Writing	Empirical	Padlet improved participation and peer feedback.
Bashir et al. (2025)	Motivation/WTC	Quantitative	Multimodal CALL increased willingness to communicate.	Dennis (2024)	Pronunciation	Experimental	ASR tools improved pronunciation accuracy.
Bashori et al. (2021)	Speaking (ASR)	Mixed	ASR reduced anxiety and increased vocabulary gains.	Derakhshan et al. (2015)	CALL pedagogy	Review	Emphasized alignment between CALL and instructional goals.
Bataineh et al. (2019)	Grammar	Mixed	Moodle blended instruction improved grammar accuracy.	Deris et al. (2015)	Collaboration	Empirical	Online forums enhanced interaction and peer support.
Beatty (2003)	CALL overview	Conceptual	Defined core CALL frameworks.	Deterding et al. (2011)	Gamification	Conceptual	Identified key gamification design elements.
Blake (2008)	Speaking	Empirical	Synchronous online tasks improved spoken accuracy.	Ding (2024)	Speaking anxiety	Mixed	VR reduced anxiety and supported oral performance.
Bsharat & Behak (2020)	Online teaching	Quantitative	MS Teams supported grammar learning during remote teaching	Dinh et al. (2024)	Blended learning	Mixed	Blended CALL effective but required teacher training.
Chapelle (2001)	CALL evaluation	Theoretical	Established CALL evaluation criteria.	Dizon & Gold (2023)	Writing	Empirical	Grammarly supported autonomy and reduced writing anxiety.
				Egilistiani & Prayuana (2021)	Listening	Quantitative	Edpuzzle improved comprehensio

Author (Year)	Focus	Method	Findings
			n through interactive video.
Ekinci & Ekinci (2021)	Grammar	Quantitative	Synchronous CALL feedback improved grammar scores.
Enayati & Gilakjani (2020)	Vocabulary	Experimental	CALL vocabulary modules improved retention and recall.
Fathali & Okada (2018)	Motivation	Theoretical/empirical	Self-determination elements enhanced CALL motivation.
Floriasti & Khoirunisa (2023)	Reading	Case	AR games increased motivation and reading engagement.
Fuchs (2014)	Collaboration	Case	Padlet facilitated idea sharing and peer interaction.
García (2015)	Listening	Empirical	LyricsTraining improved listening precision and vocabulary.
Garrett (2009)	CALL evolution	Review	Identified historical challenges and research gaps.
Gass et al. (2019)	Multimedia	Experimental	Captioning supported vocabulary learning.
Grossu (2021)	Annotation	Case	Hypothesis improved collaborative online reading.
Han (2020)	CALL pedagogy	Review	Called for theory-driven CALL design.
Harisha et al. (2024)	Chatbots	Empirical	Chatbots supported guided speaking and grammar practice.
Hosseini & Amirkhani (2024)	Vocabulary	Experimental	CALL significantly outperformed traditional vocabulary teaching.
Hovakimyan (2015)	Listening	Empirical	TED Talks enhanced listening comprehension.
Hubbard (2008)	Teacher education	Conceptual	Highlighted teacher preparation for successful CALL.
Hubbard (2009)	CALL foundations	Edited volume	Provided central concepts for CALL research.
Hubbard & Levy (2014)	Research agendas	Proceedings	Emphasized linking CALL innovation with pedagogy.
Iqbal (2024)	Pronunciation	Experimental	ASR progressive web apps improved pronunciation.
Irzawati (2023)	MALL	Case	Duolingo enhanced independent vocabulary learning.
Jeong (2017)	Flipped learning	Empirical	Moodle flipped classrooms improved participation.
Jordán et al. (2023)	Listening	Empirical	Edpuzzle supported comprehension through embedded questions.
Kessler et al. (2023)	Apps	Experimental	Babbel/Duolingo improved receptive skills.
Kholis (2021)	Digital literacy	Conceptual	Highlighted 4.0-era literacy demands for EFL learners.
Koo (2006)	Reading	Quantitative	Online reading programs enhanced comprehension.
Kristiawan et al. (2024)	AI tools	Systematic review	AI tools showed promise in personalized language support.
Lai & Le (2025)	Blended learning	Empirical	Reported strong learning benefits with

Author	Focus	Type	Findings
Levy (1997)	CALL theory	Book	logistical challenges. Early framing of CALL as interdisciplinary.
Levy & Stockwell (2006)	CALL dimensions	Book	Provided key typologies for CALL tools.
Li & Ranieri (2010)	Digital skills	Empirical	Showed variation in "digital native" competencies.
Loewen et al. (2020)	App learning	Empirical	App-based learning improved receptive and oral skills.
Lolita et al. (2020)	Vocabulary	Empirical	CALL enhanced vocabulary through multimodal exposure.
Lu & Deng (2013)	Reading	Empirical	Digital annotation improved reading analysis.
Luu et al. (2021)	Pronunciation	Mixed	ELSA Speak improved segmental accuracy.
Manaoat (2024)	Annotation	Review	Highlighted annotation for metacognitive reading.
Mardhiah et al. (2024)	Speaking	Empirical	AI applications improved speaking confidence and accuracy.
Marlinda & Huda (2024)	Pronunciation	Empirical	ELSA Speak improved pronunciation and attitudes.
Mawaddah et al. (2022)	Listening	Empirical	Edpuzzle enhanced comprehension.
Mayer (2009)	Multimedia	Book	Underlined dual-channel principles relevant to CALL design.
Mehall (2020)	Online interaction	Review	Identified principles of student interaction in online learning.
Mili & Ahmad (2019)	CALL in Bangladesh	Empirical	CALL improved engagement but faced contextual barriers.
Muamar (2022)	Pronunciation	Empirical	ELSA facilitated pronunciation improvement.
Nagata (1996)	Grammar	Experimental	Computer-based drills outperformed workbook practice.
Nakamura et al. (2024)	ASR videos	Mixed	ASR-supported videos improved speaking competence.
Nation (2001)	Vocabulary	Book	Spaced repetition principles supported CALL vocabulary design.

The selected studies were analyzed through a thematic synthesis approach, drawing on principles of qualitative thematic analysis and meta synthesis (Braun and Clarke, 2006; Noblit and Hare, 1988). Analysis involved an iterative process of coding, constant comparison, and pattern identification to generate analytically meaningful themes across the reviewed literature.

Initially, each study was coded according to its primary analytical focus, including language skills development, learner motivation, learner autonomy, and technology enhanced pedagogical practices. This thematic categorization provided an organizing framework for synthesizing diverse research outcomes. Subsequently, studies were examined in relation to the types of CALL technologies

employed, such as automatic speech recognition systems, learning management platforms, virtual and augmented reality environments, mobile applications, and digital annotation tools. This comparative analysis enabled the identification of differential pedagogical impacts associated with distinct technological affordances.

To further strengthen the synthesis, empirical findings were compared across educational contexts, proficiency levels, and conditions of technological access. This cross-contextual integration facilitated the identification of moderating factors, including issues related to digital inequality and variations in teacher readiness, that shaped the effectiveness of CALL implementation across settings.

Scope and Limitations

The review focuses on empirical studies related to language skills development, motivation, autonomy, and technology-enhanced pedagogy. The scope excludes descriptive papers, theoretical essays, and research outside EFL contexts.

Older studies (pre-2005) were retained because they provide essential foundational insights into multimedia CALL, early human-computer interaction, and feedback mechanisms—concepts still shaping AI-mediated instructional design today. Removing them would risk erasing the conceptual trajectory of CALL development.

At the same time, very recent technological developments emerging from late 2025 onward, including generative artificial intelligence, immersive virtual reality, and adaptive instructional frameworks, were not incorporated into the present review. This exclusion reflects the early stage of adoption of these technologies within educational settings, where empirical evidence remains limited and uneven. In addition, much of the post 2025 literature remains conceptual or exploratory in nature, with relatively few studies demonstrating methodological rigor sufficient for systematic synthesis. Including such studies at this stage would therefore reduce analytical consistency and compromise comparability with more established CALL frameworks that form the core of the present review. Future systematic reviews should revisit these emerging technologies once sufficient empirical evidence accumulates.

RESULTS AND DISCUSSION
Improving Learners' Motivation and Achievement

Across the reviewed studies, CALL consistently enhances learners' motivation, engagement, and overall academic performance. Quantitative findings from Adara & Haqiyah (2021) and Bashori et al. (2021) show statistically significant increases in motivation and enjoyment after CALL integration, while Bashir et al. (2025) demonstrate that multimodal CALL tasks improve willingness to communicate among university EFL students. These motivational gains stem from CALL's multimedia affordances—videos, animations, audio prompts—which make

learning more interactive and reduce affective barriers such as anxiety (Chaudhary & Devi, 2019; Lolita, Boeriswati, & Lustyantie, 2020).

Gamification features such as points, badges, and progress bars also strengthen intrinsic motivation, as supported by evidence from Deterding et al. (2011), Loewen, Isbell, & Sporn (2020), and mobile-app studies by Irzawati (2023) and Nushi & Eqbali (2017). These studies show that learners respond positively to game-like structures that provide clear goals and feedback loops.

The motivational effects of CALL can be meaningfully interpreted through the lens of Self Determination Theory (Ryan and Deci, 2000). Empirical evidence indicates that CALL environments support learners' sense of autonomy by enabling greater control over learning pace and content selection, as documented in studies by Firnanda et al. (2021), Sun (2009), and Bashori et al. (2021). In addition, CALL tools that provide immediate and adaptive feedback, including AI mediated writing support systems such as Grammarly and Write and Improve, have been shown to enhance learners' perceived competence by making learning progress more visible and attainable (Dizon and Gold, 2023; Damayanti and Azizah, 2024). Furthermore, the use of collaborative digital platforms, such as Padlet, Google Docs, and Microsoft Teams, contributes to the satisfaction of learners' relatedness needs by facilitating social interaction, peer collaboration, and shared meaning-making

within technology-enhanced learning environments (Ekinci and Ekinci, 2021; Deris, Koon, and Salam, 2015).

Taken together, this body of evidence suggests that CALL extends beyond increasing learner motivation to reshaping learning behaviors more broadly, fostering greater self-regulation and more sustained forms of engagement over time (Zimmerman and Schunk, 2011).

Enhancing Vocabulary Acquisition

Vocabulary development is one of the most thoroughly supported benefits of CALL. Foundational studies such as Al-Seghayer (2001) and Plass et al. (1998) confirm that multimodal annotations—images, audio, and video—improve vocabulary retention. These findings are reinforced by more recent work showing that multimedia enhances dual-channel processing (Mayer, 2001, 2009), helping learners form deeper semantic connections.

Adaptive platforms like Quizlet and Memrise have likewise shown effectiveness through spaced repetition and personalized review cycles (Nation, 2001; Enayati & Gilakjani, 2020). CALL also strengthens vocabulary knowledge through peer collaboration, as seen in Padlet-based studies (Deni & Zainal, 2015; Firnanda et al., 2021) and online glossaries that promote shared knowledge construction (Zhi & Su, 2016).

Incidental vocabulary learning is well supported by studies examining engagement with authentic online materials—blogs, articles, industry-specific

media (Lolita et al., 2020; Andriani et al., 2024). For vocational learners, domain-specific vocabulary acquisition is enhanced through tasks embedded in real-world contexts, such as fashion blogs or workplace simulations.

Emerging studies show strong effects for VR-mediated vocabulary learning. VR environments allow learners to encounter vocabulary naturally within immersive tasks (Meskill, 2005; Wang & Vásquez, 2012; Levy & Stockwell, 2006), with Ding (2024) and Weng et al. (2024) confirming improved spontaneous vocabulary use in situational speaking tasks.

Increasing Grammar Learning

A substantial body of research has documented the effectiveness of computer assisted language learning in grammar instruction across multiple decades. Early empirical work by Nagata (1996) demonstrated that computer based grammar instruction yielded greater gains in grammatical accuracy than traditional workbook based exercises. More recent studies have further underscored the pedagogical value of automated and real time feedback in grammar learning. In particular, research on AI mediated writing support systems such as Grammarly and other automated writing evaluation tools indicates significant improvements in learners' grammatical accuracy and overall writing quality (O'Neil and Russell, 2019; Dizon and Gold, 2023; Damayanti and Azizah, 2024). Similarly, studies examining mobile assisted grammar learning,

including platforms such as Duolingo, suggest that micro learning activities combined with immediate corrective feedback can enhance learners' grammatical awareness and accuracy over time (Li and Ranieri, 2010; Irzawati, 2023).

CALL also supports both asynchronous and synchronous instruction. Asynchronous modules (Alian, Khodabandeh, & Soleimani, 2018) allow learners to progress at their own pace, while synchronous online classes (Ekinci & Ekinci, 2021; Bsharat & Behak, 2020) facilitate immediate clarification and teacher mediation.

Contextualized grammar practice is highly effective. Studies using task-based and communicative CALL tasks (Meskill, 2005; Choo & Too, 2012) show that when learners use target forms in simulated or real interactions, grammar accuracy improves substantially.

AI-driven chatbots and ASR-powered systems (AbuSahyon et al., 2023; Waziana et al., 2024; Nakamura, Spring, & Sakurai, 2024) provide contextual grammar feedback, helping learners internalize patterns through repeated dialogic practice.

Sharpening Listening, Speaking, and Communication Skills

Empirical evidence overwhelmingly supports the effectiveness of CALL in strengthening listening and speaking skills. *Listening*

Authentic listening input—podcasts, videos, interviews—significantly improves comprehension (Wang & Chen, 2009; Sun,

2009). Tools like Edpuzzle and interactive video platforms enhance strategic listening by embedding comprehension tasks (Meisterheim, 2016; Shelby & Fralish, 2021; Amaliah, 2020). Studies such as Hovakimyan (2015) and García (2015) demonstrate that learners exposed to authentic, multimodal input develop stronger auditory discrimination and cultural awareness.

Speaking

A growing body of empirical evidence indicates that speech recognition and AI-driven pronunciation technologies play a significant role in supporting oral language development in EFL contexts. Studies examining pronunciation-focused applications such as ELSA Speak consistently report improvements in learners' articulation, stress patterns, and rhythmic control (Tran, 2019; Luu et al., 2021; Muamar, 2022). In addition, research on automatic speech recognition-based platforms suggests that real-time evaluative feedback can contribute to reduced speaking anxiety and enhanced oral fluency by allowing learners to practice in low-pressure environments (Bashori et al., 2021; Nakamura et al., 2024; Dennis, 2024).

Complementing these findings, studies on conversational chatbots indicate that AI mediated interaction supports the development of spontaneous speech production and grammar use in context, particularly by providing opportunities for repeated practice and immediate response

(AbuSahyon et al., 2023; Qassrawi et al., 2024). Moreover, synchronous communication tools such as Google Meet and Zoom have been shown to facilitate fluency development and interactional competence, with early work by Blake (2008) demonstrating substantial gains in second language oral performance through online communicative exchanges.

Enhancing Reading and Writing Skills

CALL supports reading by providing adaptive, interactive, and multimodal texts. Newsela's level-adjusted articles (Nushi & Fadaei, 2020; Patel & Shah, 2024) improve comprehension across proficiency levels. Annotation tools like Hypothesis, Diigo, and Perusall deepen comprehension and critical analysis (Lu & Deng, 2013; Grossu, 2021; Zhang, 2024).

In writing, CALL fosters process-based composition and reflection. Google Docs and Microsoft Word Online support collaborative drafting and peer feedback (Mehall, 2020; Suryani et al., 2024). Automated writing evaluation tools (Grammarly, Write & Improve) consistently improve accuracy, coherence, and mechanics (O'Neil & Russell, 2019; Dizon & Gold, 2023). Multimodal writing tasks—blogs, video essays, digital storytelling—increase engagement and creativity (Yeh, Heng, & Tseng, 2020; Sari et al., 2024).

Padlet-based studies (Fuchs, 2014; Deni & Zainal, 2015; Firnanda et al., 2021) show clear gains in organization,

elaboration, grammar, and vocabulary in student writing.

Other Positive Impacts of CALL

CALL addresses broader educational challenges, including limited resources and digital inequality. Studies by Mili & Ahmad (2019) and Abbasi (2022) show that free or low-cost CALL tools reduce barriers to participation. Mobile-assisted platforms (Duolingo, Babbel, ELSA) support independent learning across diverse contexts (Irzawati, 2023; Loewen et al., 2020; Kessler et al., 2023). Immersive technologies such as AR and VR enhance experiential learning and situational language use (Xin, 2023; Weng et al., 2024; Ding, 2024). Peer-support features and online communities foster collaboration and intercultural communication (Deris et al., 2015; Floriasti & Khoirunisa, 2023).

Discussion and Implications

The findings of this review show that CALL has a consistently positive and multifaceted impact on EFL learning, with evidence spanning motivation, language skill development, learner autonomy, and technology-enhanced pedagogy. A key pattern across the reviewed studies is that CALL works not merely because it introduces technology into the classroom, but because it provides multimodal input, adaptive feedback, collaborative interaction, and personalized learning pathways that traditional instruction alone cannot offer. These mechanisms help explain why CALL repeatedly outperforms or enhances conventional EFL instruction across diverse contexts.

A coherent trend emerging from the analysis is that motivation and autonomy function as mediating factors in CALL effectiveness. Studies on multimedia learning (Al-Seghayer, 2001; Plass et al., 1998; Mayer, 2001, 2009) and gamification (Deterding et al., 2011; Adara & Haqiyah, 2021; Bashiri et al., 2025) demonstrate that engaging interfaces and interactive tasks reduce anxiety and increase enjoyment, which in turn promote higher levels of task persistence. Learners' ability to regulate their own learning—through dashboards, progress tracking, and instant feedback—further amplifies these motivational benefits (Zimmerman & Schunk, 2011; Firnanda et al., 2021). This interplay aligns with Self-Determination Theory (Ryan & Deci, 2000) and helps explain why CALL is particularly effective in sustaining engagement across skill areas such as vocabulary, writing, and pronunciation.

Another recurring pattern across the literature is the centrality of feedback. CALL-supported feedback is immediate, individualized, and often multimodal—available in grammar correction tools (Dizon & Gold, 2023; Damayanti & Azizah, 2024), pronunciation applications (Muamar, 2022; Luu et al., 2021; Nakamura et al., 2024), and reading/writing platforms (O'Neil & Russell, 2019; Suryani et al., 2024). Such feedback accelerates learning by helping learners notice and correct errors in real time, a process not always feasible in face-to-face instruction. The

reviewed studies consistently show that the more responsive and adaptive the feedback system, the greater the improvement in linguistic performance.

The synthesis also highlights a strong influence of authenticity and contextualization in CALL activities. Learners exposed to real-world input—fashion blogs, workplace simulations, VR environments, video-based listening tasks—demonstrate higher retention, deeper comprehension, and better transfer to actual communication (Weng et al., 2024; Ding, 2024; Andriani et al., 2024; Wang & Vásquez, 2012). Authenticity makes learning meaningful, especially for vocational EFL learners whose goals are tied to professional language use. CALL's capacity to simulate real communicative situations, therefore, directly enhances both relevance and skill development.

Despite these benefits, the studies also indicate that CALL effectiveness is highly dependent on pedagogical alignment. Research on blended learning (Tran, 2024; Dinh et al., 2024; Lai & Le, 2025) consistently shows that technology alone does not produce learning gains unless teachers scaffold activities, sequence tasks purposefully, and integrate CALL tools with clear instructional objectives. Poorly aligned CALL activities can lead to cognitive overload or superficial engagement. Thus, teachers' digital pedagogical competence is a critical determinant of success, reinforcing the need for targeted professional development

(Zou & Wang, 2024; Nurhidayat et al., 2024).

Institutional and infrastructural factors also shape CALL outcomes. Digital inequality—limited access to devices, unstable internet, or low digital literacy—creates disparities in participation and performance (Mili & Ahmad, 2019; Abbasi, 2022). These challenges were especially pronounced in rural and under-resourced contexts. Ensuring equitable access requires coordinated initiatives—hardware support, internet provision, digital literacy programs, and ongoing training for both teachers and learners.

The review also identifies substantial implications for future research. First, although numerous studies highlight the effectiveness of CALL, fewer explore how specific design features (e.g., adaptive sequencing, AI-driven personalization, multimodal scaffolding) influence learning processes. Second, as innovations such as generative AI, immersive VR, AR, and intelligent tutoring systems expand rapidly, there is a pressing need for longitudinal and experimental research that measures not only short-term gains but sustained learning outcomes. Third, vocational and ESP contexts remain underexplored relative to general EFL environments, despite increasing demand for domain-specific digital literacy and communication skills.

Overall, this review suggests that CALL is most effective when embedded within pedagogically principled, learner-centered, and contextually responsive

instructional frameworks. The evidence clearly positions CALL not as a technological add-on but as a transformative component of modern EFL education—one that integrates multimodal input, adaptive support, collaborative opportunities, and authentic engagement to cultivate confident, autonomous, and proficient English users.

Taken together, these findings illustrate that CALL's impact extends well beyond the enhancement of discrete language skills, shaping learners' motivation, autonomy, and overall engagement with English in meaningful ways. At the same time, the effectiveness of CALL depends on thoughtful pedagogical integration, equitable access, and ongoing teacher preparedness—factors that mediate how technological tools translate into learning gains across diverse EFL contexts. As the rapid evolution of AI, AR/VR, and intelligent tutoring systems continues to reshape the digital learning landscape, the implications of these results point toward the need for sustained innovation, capacity building, and context-sensitive implementation strategies.

CONCLUSION

This literature review examined more than three decades of empirical research on the effectiveness of CALL in EFL education, drawing on studies that addressed language skills development, learner motivation and autonomy, and technology-enhanced pedagogy. The synthesized findings collectively demonstrate that CALL has become an indispensable component of modern EFL instruction, offering a wide range of technological affordances that enhance linguistic proficiency, foster sustained engagement, and promote personalized learning experiences. Evidence consistently shows that interactive, multimodal, and adaptive digital tools not only improve vocabulary, grammar, listening, speaking, reading, and writing outcomes, but also strengthen learners' affective variables such as motivation, enjoyment, and confidence—key determinants of long-term language success.

Importantly, this review highlights that CALL's effectiveness is not inherent in the technology itself but emerges through its pedagogically informed integration. Tools that provide meaningful interaction, scaffolded practice, immediate feedback, and authentic communication opportunities are most likely to yield measurable gains. The findings also underscore the importance of aligning CALL use with sound instructional principles, including task-based learning, multimodal input processing, and opportunities for learner autonomy. When CALL is embedded within well-designed pedagogical frameworks—such as blended learning models or project-based activities—it can significantly enrich the learning environment and extend language practice beyond the classroom.

At the same time, this review identifies persistent challenges that influence CALL implementation across

contexts. Digital inequality continues to limit access for learners in under-resourced settings, while rapid technological advancements demand ongoing teacher training and institutional support. Many teachers still struggle with technology integration due to limited digital literacy, insufficient infrastructure, or a lack of professional development opportunities. Without efforts to address these systemic issues, CALL's potential remains unevenly realized. Furthermore, the speed at which new technologies—particularly AI-driven tools, immersive VR platforms, and intelligent speech-recognition systems—enter the educational landscape necessitates continuous evaluation to ensure their pedagogical relevance, ethical use, and alignment with learner needs.

Overall, the review affirms that CALL holds substantial promise for transforming EFL education when its use is intentional, equitable, and guided by clear pedagogical objectives. To fully harness its benefits, future research should prioritize context-sensitive investigations, longitudinal designs, and comparative studies that examine the conditions under which CALL is most effective. Research should also explore how emerging technologies can support not only linguistic competence but also critical digital literacy, collaboration, and real-world communication skills. Institutions and policymakers must invest in teacher training, infrastructure development, and curriculum innovation to create sustainable ecosystems where CALL can thrive.

In conclusion, the integration of CALL in EFL learning represents a pivotal shift toward more dynamic, inclusive, and future-ready language education. By thoughtfully blending digital tools with pedagogical expertise, educators can create meaningful learning experiences that support diverse learners and prepare them for the increasingly complex communicative demands of an interconnected world.

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recommendations. All authors reviewed and approved the final manuscript.

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