AI-Enhanced English Language Teaching in K–12 Education: A Focus on Four Skills, Vocabulary, and Grammar*

K–12 Eğitiminde Yapay Zekâ Destekli İngilizce Dil Öğretimi: Dört Beceri, Kelime ve Dilbilgisi Odaklı Bir Yaklaşım

Sorumlu Yazar
Nilgün Korkut
Yüksek Lisans Öğrencisi, İstanbul/Türkiye, İstanbul Aydın Üniversitesi, İngiliz Dili Eğitimi Anabilim Dalı

nilgunkorkut@stu.aydin.edu.tr

orcid: 0009-0007-8906-3145

Öz

Bu çalışma, yapay zekâ (YZ) araçlarının K–12 düzeyindeki İngilizce dil eğitiminde nasıl kullanıldığını ve bu araçların dinleme, konuşma, okuma, yazma, kelime bilgisi ve dilbilgisi gibi altı temel beceriyi nasıl desteklediğini incelemektedir. 2015–2024 yılları arasında yayımlanmış 54 akademik çalışmanın kavramsal bir derlemesine dayanan bu araştırma, kullanılan YZ araçlarının türlerini, pedagojik katkılarını ve öğretmenler ile öğrencilerin karşılaştığı zorlukları ele almıştır. Bulgular, YZ araçlarının en çok yazma, dilbilgisi ve kelime öğretiminde tercih edildiğini; bunun da gerçek zamanlı geri bildirim sunma, öğrenci özerkliğini destekleme ve motivasyonu artırma özelliklerinden kaynaklandığını göstermektedir. Ayrıca, uyarlanabilir içerik ve çok modlu özellikler sayesinde okuma ve dinleme anlama süreçleri desteklenmiş; oyunlaştırma ve ilerleme takibi gibi unsurlar sürekli katılımı teşvik etmiştir. Ancak öğretmen eğitiminin yetersizliği, altyapı eksiklikleri ve veri gizliliği ile algoritmik önyargı gibi etik sorunlar, uygulamada çeşitli sınırlamalar yaratmaktadır. Bu bağlamda, YZ araçlarının etkili kullanımı için öğretmen rehberliği ve pedagojik amaçlarla uyumlu entegrasyon büyük önem taşımaktadır. Gelecek araştırmalarda, yalnızca bilişsel kazanımlar değil; aynı zamanda YZ araçlarının öğrencilerin duygusal ve sosyal gelişimlerine etkisi de incelenmeli ve yerel K–12 bağlamına özgü ampirik çalışmalar önceliklendirilmelidir.

Anahtar Sözcükler: yapay zekâ, dil öğrenimi, K–12 eğitimi, kelime öğretimi, dilbilgisi geri bildirimi, yazma araçları, YZ etiği, öğretmen eğitimi

Abstract

This study explores how artificial intelligence (AI) tools are currently used to support English language learning in K–12 classrooms, with a focus on the development of six core areas: listening, speaking, reading, writing, vocabulary, and grammar. Based on a conceptual review of 54 academic sources published between 2015 and 2024, the study analyses the types of AI tools in use, their pedagogical contributions, and the challenges teachers and learners face in implementing them. Findings suggest that AI tools are most adopted in writing, grammar, and vocabulary instruction due to their ability to provide real-time feedback, enhance learner autonomy, and promote motivation. Tools also support reading and listening comprehension through adaptive input and multimodal features, while gamification and progress tracking encourage sustained engagement. However, challenges such as lack of teacher training, infrastructure limitations, and ethical concerns—including data privacy and algorithmic bias—continue to affect implementation. The study highlights the importance of thoughtful integration, teacher guidance, and contextual sensitivity in the effective use of AI. It recommends that future research prioritize empirical studies in national K–12 settings and examine not only cognitive outcomes but also the emotional and social dimensions of AI-supported learning.

Keywords: artificial intelligence, language learning, K–12 education, vocabulary instruction, grammar feedback, writing tools, AI ethics, teacher training

1. Introduction

Artificial intelligence is no longer just a futuristic concept; it has become part of language classrooms around the world. In recent years, teachers have started to explore how tools such as automated writing assistants, speech recognition systems, chatbots, and intelligent tutoring applications can support English language learning in schools. These technologies provide personalised feedback, adaptable pacing, and interactive practice opportunities, offering strong support for learner autonomy, motivation, and language accuracy (Nurtazina and Nurseitov, 2024; Ibrahim and Bilquise, 2024; Wang and Shi, 2021).

Traditional classroom instruction, although grounded in sound pedagogy, often cannot offer immediate and individualised feedback, particularly in large groups. AI tools can help bridge this gap by giving learners instant input, correction, and varied forms of support. However, using these tools with children and adolescents requires careful planning. Younger learners need emotional guidance, structure, and ethical supervision—elements that technology on its own cannot guarantee. It is therefore important to consider not only what these tools offer, but also what they might lack.

Although AI tools are becoming more common in education, most research still centres on adults and university-level learners. This leaves a gap in understanding how such tools function in primary and secondary classrooms, where cognitive and emotional needs differ. Many existing studies also focus on individual skills like grammar or writing. But in real classrooms, language skills are not separate. Speaking relies on listening and vocabulary. Writing depends on grammar and reading. For this reason, a broader perspective is needed—one that recognises how language learning is interconnected (Chen, Huang, Chang, & Liou, 2015; Grubaugh et al., 2023).

This paper aims to explore how AI tools support six central areas of language learning: listening, speaking, reading, writing, vocabulary, and grammar. It does not focus on just one level or tool but rather draws from different contexts to highlight common findings. These results are then interpreted through several educational theories to better understand why certain tools work effectively in classrooms.

Cognitive Load Theory helps explain how AI can reduce mental pressure by presenting tasks and instructions in a clear and manageable way (Sweller, 1988). Social Cognitive Theory sheds light on how students learn from feedback and modelling (Bandura, 1986). Krashen's theory of language acquisition highlights the value of comprehensible input and emotional comfort (Krashen, 1981). Finally, the TPACK framework reminds educators that the meaningful use of technology requires it to be linked closely with content knowledge and pedagogy (Mishra and Koehler, 2006).

The purpose of this study is to offer a well-rounded understanding of how AI tools are influencing English language learning in school settings. Through a blend of theoretical

insight and practical evidence, it aims to support teachers, researchers, and school leaders in making informed decisions about how to use these technologies in responsible and effective ways.

2. Literature Review

The use of artificial intelligence (AI) in language education has gone through several changes over the years. Early systems like PLATO were more mechanical and followed fixed patterns. They didn't offer much flexibility or adapt to students' needs (Harrell, 1998). As technology developed, researchers started to look for more interactive and student-centered ways to support learning. This led to the development of intelligent tutoring systems (ITS) that could respond to learners' input and adjust the instruction accordingly (Nwana, 1990; VanLehn, 2011).

Today, AI tools in language education are much more advanced and diverse. Thanks to developments in natural language processing (NLP), machine learning (ML), and deep learning, many new applications have been created to support different skills. For example, some tools give feedback on speaking and pronunciation, while others help students improve their writing or expand their vocabulary (Lan et al., 2024; Alhawiti, 2014). Popular platforms like Duolingo or Grammarly adjust their content based on how students perform, which helps learners stay motivated (De La Vall & Araya, 2023)

Some tools even use AI to grade essays or detect grammar mistakes automatically. These features save time for teachers and make it possible for students to get feedback quickly (Attali & Burstein, 2006). In addition, machine learning algorithms help these systems become smarter over time. They analyze how learners interact with the tools and use that data to improve the learning process (Shah et al., 2024; Zawacki-Richter et al., 2019). This makes AI a useful support system, especially when teachers have to deal with large classrooms.

Research shows that AI-supported environments can help students develop their language skills more effectively. In particular, gains in vocabulary, reading comprehension, and grammar accuracy are often mentioned (Song & Song, 2023; Wei, 2023). Students also report that they feel more engaged and motivated when they use interactive tools (Palliyalil & Mukherjee, 2020). However, it's also important to mention the limits of these tools. They are not a replacement for human interaction, and sometimes they may show bias or misunderstand learners' needs (Jose, 2024; De La Vall & Araya, 2023).

In K–12 classrooms, these issues can be even more serious. Many schools still struggle with limited access to technology or internet connection. Also, some students may not have enough digital literacy skills to use AI tools effectively. Emotional and social aspects of learning should also be considered, especially when students are very young (Kumar et al., 2024). Teachers play a key role in guiding the process and making sure that the use of AI is meaningful.

As can be seen in the literature, there is a strong interest in AI-supported language learning, but the results are mixed, and there is still much to explore. Most studies focus on specific tools or single skills. This study, therefore, tries to fill a gap by asking broader questions that combine different language skills and examine how AI works in real classroom settings with younger learners.

Teachers play a key role in guiding the process and making sure that the use of AI is meaningful.

Although there is growing interest in AI-supported language learning, most of the existing studies are limited in scope. Many of them focus on specific tools or target adult learners. There is still a need for broader and more inclusive research that looks at different skill areas and includes younger learners. In response to this gap, the present study aims to explore how AI tools are used in K–12 language classrooms and what kinds of outcomes they bring. Based on this purpose, the study tries to answer the following research questions:

Which AI tools are commonly used in K–12 language teaching to support listening, speaking, reading, writing, vocabulary, and grammar skills?

How do these tools affect student participation, understanding, and skill development in real classroom settings?

What are the benefits, challenges, and limitations of using AI tools in K–12 classrooms from a pedagogical perspective?

3. Methodology

This study was designed as a conceptual literature review to explore how artificial intelligence (AI) tools are used in K–12 English language education and what types of learning outcomes they promote. Rather than collecting original data, the study draws upon existing academic sources to examine the types of AI tools currently in use, their reported pedagogical benefits, and the challenges they may present in real classroom settings. A conceptual review was considered appropriate for two main reasons: first, the number of empirical studies that focus specifically on school-aged learners remains limited; and second, including a broader range of academic literature makes it possible to construct a more comprehensive, theory-informed understanding of this evolving field.

To ensure academic rigour, a systematic literature search was carried out using major databases, including Scopus, ScienceDirect, EBSCOhost, and Google Scholar. Keyword combinations included general terms such as "AI in K–12 language education" and "artificial intelligence in ELT," along with skill-specific phrases like "AI tools for listening," "AI for speaking practice," "AI-supported reading instruction," "writing with AI," "AI for vocabulary learning," and "grammar checkers in education." Boolean operators (AND, OR) were used to refine and expand search

results where appropriate.

The initial search yielded approximately 210 records. After removing duplicates and screening abstracts for relevance, 87 studies were selected for full-text review. Based on predefined criteria, 54 sources were ultimately included in the final synthesis. The inclusion criteria were as follows: the study had to be published between 2015 and 2024, written in English, and focus on the application of AI tools in at least one language skill area—listening, speaking, reading, writing, vocabulary, or grammar. While the primary interest was in K–12 contexts, relevant findings from higher education were included when their implications could be reasonably applied to school settings, particularly in areas such as learner motivation, tool design, and instructional integration.

Once the sources were selected, a thematic analysis was conducted based on the framework proposed by Braun and Clarke (2006). An inductive coding approach was used, allowing themes to emerge from the content itself rather than being based on pre-set categories. Recurring patterns were identified and grouped into key themes such as AI tools used for language practice, support for specific skills, and common implementation challenges, including accessibility, teacher training, ethical concerns, and learner readiness.

To improve consistency and transparency, the sources were reviewed multiple times, and categories were refined through an iterative process. As the coding was performed by a single researcher, efforts were made to minimise subjectivity by returning to the data frequently and cross-checking thematic groupings. However, it is acknowledged that some level of researcher interpretation is inherent to qualitative synthesis, and this may influence theme construction to a certain extent.

In terms of limitations, this review is based entirely on published literature, meaning that grey literature or unpublished work, such as theses or internal school reports, were not included. As a result, the study may not fully capture all AI-related practices in less formal or local educational contexts. Moreover, while thematic analysis provides rich qualitative insights, it inevitably involves subjective judgement during theme formation and interpretation. These methodological limitations have been considered throughout the study and are addressed with caution in the interpretation of results.

Although no human participants were involved, ethical considerations were taken into account when reviewing the selected sources. Special attention was given to research that addressed issues such as data privacy, informed consent, and algorithmic fairness—particularly important when evaluating AI tools designed for use with children (Ferrara, 2023; Klimova et al., 2023).

In sum, this methodological approach provided a structured but flexible

framework for synthesising insights from a diverse set of studies. The systematic literature selection, careful thematic analysis, and attention to ethical considerations together offer a reliable foundation for exploring the pedagogical potential of AI-supported language learning in K–12 settings.

4. Findings

This section presents the findings of the conceptual literature review conducted for this study. The selected studies were examined in terms of how AI tools are currently used to support different areas of language learning, what benefits have been reported in the literature, and what kinds of pedagogical challenges may arise in classroom implementation. Based on thematic analysis, the results are presented under three main headings: AI Tools Used Across Language Skills, Reported Benefits for Learners, and Pedagogical Challenges and Limitations.

4.1 AI Tools Used Across Language Skills

The review revealed that AI tools are widely used across all major areas of language learning, including speaking, listening, reading, writing, grammar, and vocabulary. While some tools are designed for a single skill, many support multiple areas simultaneously. The studies reviewed include both K–12 and higher education contexts, and findings have been noted accordingly where relevant.

In speaking instruction, tools such as ELSA Speak, Mondly, and Speak and Improve provide real-time pronunciation feedback and fluency support. Studies involving K–12 learners (e.g., Kazu and Kuvvetli, 2023) show that these tools help reduce anxiety and improve oral fluency. Similarly, AI chatbots like ChatGPT and Replika simulate conversation and assist with vocabulary recall in spoken contexts. These findings are mostly drawn from higher education settings (Zou et al., 2023; De La Vall and Araya, 2023), though their adaptive functions suggest potential for younger learners as well.

For listening, platforms such as BBC Learning English, ESLPod, and TED-Ed offer authentic input across a range of accents and speech rates. Tools like Google Voice Typing and Otter.ai support transcription and help learners process audio content. These tools have been evaluated mostly in university contexts (Jeon, Lee, and Choe, 2023), but their ability to link listening with visual input may also benefit younger learners in guided settings.

In reading development, tools such as Newsela, ReadTheory, and LingQ provide adaptive texts suited to students' levels. In a study involving K–12 learners, ReadTheory and Rewordify were shown to enhance reading fluency and comprehension by simplifying complex input (Daweli and Mahyoub, 2024). Tools like Microsoft Immersive Reader and NaturalReader further combine visual and auditory support, helping scaffold reading development across age groups (Yu and

Wen, 2023).

Writing skills are strongly supported through AI-powered writing assistants such as Grammarly, QuillBot, and Write and Improve. These tools, which have been evaluated primarily in higher education settings (Lingaiah et al., 2024; Özçelik and Ekşi, 2024), offer grammar feedback and help improve coherence and structure. Although research with younger learners is limited, some of these tools can be adapted for scaffolded writing activities in school settings.

Grammar instruction is enhanced by platforms like Grammarly, ProWritingAid, and LanguageTool, which provide real-time feedback on syntax and usage. These tools have been studied mostly in university contexts (Schmidt-Fajlik, 2023; Mohammad et al., 2024), though their corrective features could be introduced in simplified form for use in upper primary or secondary classrooms.

For vocabulary learning, tools such as Quizlet, Anki, Memrise, Wordtune, Rewordify, and ARCHe support recall and usage through features like spaced repetition, contextual examples, and gamified tasks. Some of these findings are based on K–12 studies, including those conducted with younger learners (Wen et al., 2024; Jomaa et al., 2024), and show strong potential for early vocabulary retention.

Gamified tools like Duolingo, Kahoot, and Night Zookeeper are widely used to sustain engagement. These platforms promote language practice through game-like elements and interactive tasks and are particularly effective in K–12 settings where sustained attention and motivation are key.

Finally, AI chatbots such as ChatGPT, WriteSonic, and Replika continue to function across multiple skills, encouraging contextual language production and offering flexible, learner-centred practice (Belda-Medina and Calvo-Ferrer, 2022). While much of the research has been conducted in adult education, these tools are being increasingly explored for school use when paired with teacher mediation.

4.2 Reported Benefits for Learners

A central benefit of AI tools is the provision of immediate, personalised feedback. In writing, tools like Grammarly and Write and Improve help learners revise grammar, syntax, and cohesion. These findings are mostly based on studies conducted in higher education contexts (Lalira et al., 2024; Mohammad et al., 2024), where university students reported significant gains in sentence-level accuracy and coherence. Although K–12-specific data on these tools is limited, their simplified use in classroom-based writing activities may offer similar advantages for school-aged learners.

In speaking, tools such as ELSA Speak and Speak and Improve provide real-time pronunciation correction, which enhances fluency and self-confidence. This is especially evident in K–12 contexts, where learners benefit from low-anxiety

environments to practise speaking (Kazu and Kuvvetli, 2023). These results are further supported by university-level studies showing that AI-powered speech recognition tools reduce learners' pronunciation errors and speaking anxiety (Dennis, 2024).

Increased motivation is another widely reported advantage. Gamified platforms like Duolingo and Quizizz encourage regular practice through rewards and visual progress tracking. Research with school-aged learners indicates that these features help maintain attention and create a positive classroom atmosphere (Wen et al., 2024; Wei-Xun and Jia-Ying, 2024). In particular, vocabulary retention is strengthened when tools include spaced repetition and contextual examples—a benefit seen in both K–12 and higher education studies (Fu et al., 2021).

AI tools also support reading comprehension by simplifying complex input. For instance, ReadTheory and Rewordify offer adapted texts that reduce cognitive load and encourage deeper understanding, especially among younger learners (Daweli and Mahyoub, 2024). In listening tasks, tools like Otter.ai assist students in connecting spoken language with written forms, which supports both listening accuracy and spelling. This benefit has primarily been demonstrated in university contexts (Jeon, Lee, and Choe, 2023), though its visual-verbal pairing can be helpful for younger learners when guided appropriately.

Learner autonomy is further supported by platforms such as LingQ, ARCHe, and WriteSonic. These tools allow users to choose content, receive tailored feedback, and control their own pace, contributing to metacognitive awareness. This function has been observed in both age groups. For example, Wen et al. (2024) report that primary school students using AI-supported vocabulary tools became more aware of their learning progress, while Syahnaz and Fithriani (2023) found that university learners appreciated the ability to monitor and revise their writing independently.

Writing assistants and grammar checkers also contribute to learner independence by helping students notice recurring mistakes and revise texts without constant teacher input. Although such tools are primarily tested in higher education settings, their simplified application in school classrooms holds potential for promoting reflective practice among younger learners.

4.3 Pedagogical Challenges and Limitations

Despite their advantages, AI tools also pose important pedagogical and technical challenges. One key issue is insufficient teacher training. Many educators, particularly in school contexts, report difficulty in evaluating the effectiveness of AI tools or integrating them meaningfully into instruction (Kumar et al., 2024). In K–12 settings, this challenge is often more pronounced due to time constraints and a lack of professional development focused on educational technologies. Ethical analyses

also highlight that without adequate training, teachers may rely on surface-level tool use without linking it to pedagogical goals (Klimova et al., 2023).

Access to infrastructure remains another concern, especially in under-resourced K–12 schools, where limited devices, low bandwidth, or lack of software licences prevent full AI integration. These access issues not only hinder individual learners but also contribute to digital inequality across school populations (Kumar et al., 2024). Although most comprehensive reviews of AI access have been conducted in higher education (Zawacki-Richter et al., 2019), similar patterns of inequality are increasingly observed at the primary and secondary levels.

Some tools also present limitations in language recognition and feedback quality. For instance, pronunciation tools may misrecognise regional or non-native accents, and grammar checkers occasionally fail to detect nuanced errors or offer appropriate stylistic suggestions. These limitations have been documented mainly in higher education research (Shah et al., 2024; Jose, 2024), yet their implications are equally relevant in school settings, where learners are still developing foundational linguistic competence.

Another pedagogical concern is passive use. When learners accept AI-generated suggestions without understanding the reasoning behind them, their language development becomes superficial. This issue has been especially noted in studies with university students (Kim and Song, 2024), but it carries even greater risk in K–12 contexts, where metacognitive strategies are still forming. To address this, teachers are encouraged to guide students through reflective activities, peer editing, and discussions around tool-generated feedback.

Ethical concerns such as data privacy, algorithmic transparency, and content ownership are particularly critical in K–12 environments. School-aged learners may not fully understand how their data are collected or used. If consent is not obtained appropriately or if algorithms reinforce bias, the result may be diminished equity and trust in learning technologies (Ferrara, 2023). These risks underline the importance of establishing clear ethical guidelines for AI use in schools and ensuring that privacy is protected at all levels of implementation.

In summary, while AI tools hold significant potential to enhance language learning across multiple skill areas, their success depends on thoughtful implementation, teacher support, and ethical awareness. These findings confirm the value of integrating AI into language instruction, while also highlighting the need for critical pedagogy, professional development, and equitable infrastructure—especially in K–12 classrooms where students are still building the cognitive and emotional foundations of learning.

Table 1. Overview of AI Tools Categorised by Language Skill Area and Reported Use

Language Skill	AI Tool	Function / Use
Speaking	ELSA Speak	Pronunciation and fluency practice
Speaking	Mondly	Speech recognition and speaking feedback
Speaking	Speak and Improve	Spoken English fluency
Speaking	ChatGPT	Conversational practice and vocabulary reinforcement
Speaking	Replika	Contextual language engagement
Speaking	WriteSonic	Fluency and real-time interaction
Writing	Grammarly	Grammar correction and sentence restructuring
Writing	QuillBot	Paraphrasing and style improvement
Writing	Write and Improve	Feedback and revision support
Writing	ChatGPT	Content generation and structural feedback
Writing	Replika	Contextual written dialogue
Reading	Newsela	Adapted texts and reading comprehension
Reading	ReadTheory	Comprehension practice and adaptive texts
Reading	LingQ	Vocabulary in context and real-world text exposure
Reading	Microsoft Immersive Reader	Text-to-speech for reading support
Reading	NaturalReader	Text-to-speech for processing support
Listening	ESLPod	Authentic spoken English input
Listening	BBC Learning English	Real-life listening practice

Listening	TED Talks	Exposure to academic and authentic speech
Listening	Google Voice Typing	Speech-to-text for comprehension and writing
Listening	Otter.ai	Transcription and analysis of speech
Vocabulary	Quizlet	Flashcards and spaced repetition
Vocabulary	Anki	Personalized flashcard learning
Vocabulary	Wordtune	Synonyms and rephrasing
Vocabulary	Rewordify	Simplified text and vocabulary support
Vocabulary	ARCHe	Personalized vocabulary tracking
Vocabulary	Duolingo	Gamified vocabulary practice
Vocabulary	Memrise	Engaging repetition-based learning
Grammar	Grammarly	Grammar checking and writing suggestions
Grammar	ProWritingAid	Advanced grammar and style analysis
Grammar	LanguageTool	Multilingual grammar support

5. Discussion

The findings of this review indicate that artificial intelligence tools are becoming increasingly visible in school-based language education, particularly at the primary and secondary levels. While many existing studies originate from higher education contexts, they still provide useful implications for K–12 learners when appropriately adapted. However, it is important to acknowledge that the review's scope was limited to published literature, which introduces inherent constraints. Since most K–12-focused empirical studies are still emerging, many findings were drawn from older students, and this affects how directly the conclusions can be applied to younger learners. In addition, the thematic analysis was conducted by a single researcher, which, while carefully carried

out, carries a degree of subjectivity in identifying and interpreting patterns.

Unlike adults, younger learners are in active stages of cognitive and emotional development. Their attention spans are shorter, reasoning skills are still emerging, and they often require structured routines and external regulation. Emotionally, they benefit more from encouragement, peer interaction, and teacher feedback to sustain motivation. These developmental traits vary significantly across age groups within K–12. For instance, early primary learners require more guided scaffolding and simplified language, while upper-secondary students can manage autonomous tasks with AI tools more independently. This age-based variation influences how AI tools should be selected, designed, and implemented in real school settings.

One of the most visible trends is the widespread use of AI tools in writing, grammar, and vocabulary instruction. Applications such as Grammarly, Write and Improve, and QuillBot provide learners with real-time feedback on accuracy, coherence, and style. These tools enable students—particularly in secondary levels—to revise independently, helping to build fluency and grammatical awareness (Attali and Burstein, 2006; Wang and Shi, 2021). Increased engagement and time efficiency are also frequently reported outcomes.

From the perspective of Cognitive Load Theory, these tools reduce extraneous mental effort by offering manageable input and direct guidance (Sweller, 1988; Hornay, 2021). For younger learners, simplified interfaces and visual cues are especially helpful. QuillBot's paraphrasing feature, for example, allows upper-primary or lower-secondary students to reorganise sentences while maintaining meaning. Grammarly supports long-term grammar development by reinforcing correct forms through repetition and visual highlighting.

In speaking and listening instruction, tools like Replika and ELSA Speak offer low-pressure environments for repeated oral practice. These platforms help younger adolescents take risks in using language without fear of peer judgement. In line with Krashen's affective filter hypothesis (1981), such environments reduce anxiety and enhance fluency. Listening tools like TED-Ed and ESLPod expose learners to a variety of accents and authentic speech, supporting older K–12 learners in building global listening comprehension.

For reading, tools like ReadTheory and Rewordify simplify complex texts while preserving core meanings. These platforms are especially helpful for middle school students who are transitioning from basic decoding to more analytical reading. They scaffold the reading process through embedded vocabulary support and manageable steps, reducing overload while improving comprehension.

Despite these advantages, applying AI tools in K–12 settings demands careful adaptation. Many operate in standardised formats and lack the flexibility and warmth

of human interaction. For instance, a grammar checker may correct an error, but only a teacher can explain the reasoning behind it, link it to previous lessons, and invite deeper reflection. Social Cognitive Theory (Bandura, 1986) highlights the importance of modelling and interactive feedback—elements often missing in current AI designs. This is especially critical for younger learners who rely heavily on adult guidance to internalise new language forms.

Ethical concerns are particularly relevant in school environments. Children may not fully grasp consent procedures or understand the long-term implications of sharing personal data. Yet many platforms collect usage information to deliver personalised suggestions. This raises essential questions about privacy, bias, and the transparency of algorithms—particularly when AI tools are used with minors (Ferrara, 2023; Klimova et al., 2023). Moreover, pronunciation tools may penalise learners with regional or multilingual accents, risking a decline in self-confidence and participation.

Comparing AI-supported instruction with traditional methods reveals both potential and limitations. AI excels in providing immediate, consistent feedback and is particularly effective for repetitive skill-building tasks. However, it lacks the pedagogical sensitivity, encouragement, and contextual judgement that teachers bring. According to the TPACK framework (Mishra and Koehler, 2006), true educational value emerges when technology is blended thoughtfully with pedagogy and content. For example, a teacher might introduce AI grammar feedback in a whole-class lesson, then follow it up with peer review or group revision tasks that add emotional and social value to the learning experience.

Teachers remain central to this integration. They help learners interpret AI feedback, pose reflective questions, and design follow-up activities. A vocabulary item suggested by LingQ can be transformed into a creative sentence-building challenge in primary school or a contextualised debate prompt in secondary school. However, these instructional moves require professional training. As Agustini (2023) notes, many teachers express uncertainty about how to use AI tools meaningfully without structured guidance or peer support.

AI tools also foster motivation and autonomy, especially when paired with teacher mediation. Gamified platforms such as Duolingo and Quizizz engage learners through progress rewards, while tools like Anki and Write and Improve allow them to track growth over time. These features support self-regulated learning, but younger learners may need more modelling and encouragement to use them effectively.

Still, it is important not to overstate the role of AI. These tools are not designed to replace teachers. Their value lies in how they are integrated into purposeful learning routines. The most successful outcomes occur when AI tools are used alongside teacher facilitation, peer collaboration, and reflective activities (Agustini, 2023; Grubaugh

et al., 2023; Mishra and Koehler, 2006). Furthermore, future research should move beyond surface-level usage and examine how AI affects students' emotional well-being, confidence, and classroom interaction, especially across different K–12 age groups.

In summary, AI tools offer strong potential to enrich language learning in K–12 settings. Yet their effectiveness depends not only on their technical features but also on how thoughtfully they are aligned with age-appropriate pedagogy, ethical safeguards, and teacher involvement. By combining digital innovation with professional insight, educators can help nurture confident, motivated, and resilient language learners— starting from early grades and extending through adolescence.

6. Conclusion

This study set out to examine how artificial intelligence tools are currently used in K12 English language education, with a particular focus on their role in supporting the development of core language skills, vocabulary, and grammar. Drawing on a conceptual review of over eighty academic studies, the findings pointed to clear trends in how these tools are being adopted in classrooms, the benefits they offer learners, and the pedagogical challenges they present. AI-supported applications for writing, grammar, and vocabulary emerged as the most implemented, primarily because of their ability to offer real-time feedback, support individual learning pathways, and enhance student autonomy.

The review also showed that learners benefit not only cognitively but also emotionally when AI tools are used in thoughtful, teacher-guided ways. Increased motivation, personalized learning, and improved learner engagement were consistently reported across studies. Students appeared more willing to practise language skills independently when supported by adaptive platforms, especially in writing and speaking tasks. Additionally, AI's ability to simplify complex texts and scaffold learner input contributed positively to reading comprehension and vocabulary acquisition. Features like gamification and progress tracking further encouraged sustained practice, while metacognitive growth was promoted through feedback analysis and self-reflection.

However, this study also recognizes several important limitations. Many of the reviewed studies were conducted in higher education or international contexts, meaning that their findings may not fully represent the realities of local K12 classrooms. Although the theoretical rationale for including these studies was outlined in the methodology, it remains important to acknowledge the need for more empirical work that directly reflects the needs, conditions, and policies of national school systems. Additionally, access to digital infrastructure, teacher training, and alignment with curriculum goals continue to pose challenges for the widespread adoption of AI tools in language teaching.

Ethical concerns, particularly around data privacy, algorithmic bias, and equitable access—must also be addressed. AI applications that collect and process learner data

should be carefully evaluated by educators and institutions, especially when used with younger learners who may not fully understand their rights or the implications of data sharing. These concerns highlight the ongoing need for responsible, transparent implementation.

Based on these findings, several recommendations can be made. Educators should select AI tools not only for their features but for how well they support specific instructional goals. School leaders and policymakers should invest in teacher training programmes that focus on practical, pedagogically sound integration of AI into language education. Furthermore, future research should prioritise studies situated in K12 settings, especially within underrepresented national contexts—while also exploring the emotional and social dimensions of AI use in the classroom. This includes examining how AI tools affect learner confidence, identity, and collaboration.

In conclusion, artificial intelligence tools are not a substitute for human teachers, but they offer meaningful support when used purposefully. Their greatest value lies in how they are woven into rich learning experiences—where technology amplifies, rather than replaces, the role of the teacher. With continued research, ethical awareness, and professional development, AI can help create more accessible, engaging, and responsive language learning environments for young learners.

References

Agustini, N. (2023). Examining the role of ChatGPT as a learning tool in promoting students' English language learning autonomy relevant to Kurikulum Merdeka Belajar. *EDUKASIA: Jurnal Pendidikan dan Pembelajaran.* https://doi.org/10.62775/edukasia.v4i2.373

Alhawiti, K. (2014). Natural language processing and its use in education. *International Journal of Advanced Computer Science and Applications, 5*(12), 90–93. https://doi.org/10.14569/IJACSA.2014.051210

Attali, Y., & Burstein, J. (2006). Automated essay scoring with e-rater® V.2. *Journal of Technology, Learning, and Assessment, 4*(3), 3–29. https://doi.org/10.1002/j.2333-8504.2004.tb01972.x

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Belda-Medina, J., & Calvo-Ferrer, J. (2022). Using chatbots as AI conversational partners in language learning. *Applied Sciences, 12*(17), 8427. https://doi.org/10.3390/app12178427

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chen, M.-H., Huang, S.-T., Chang, J. S., & Liou, H.-C. (2015). Developing a corpus-based paraphrase tool to improve EFL learners' writing skills. *Computer Assisted Language Learning, 28*(1), 22–40. https://doi.org/10.1080/09588221.2013.783873

Daweli, T. W., & Mahyoub, R. A. M. (2024). Exploring EFL learners' perspectives on using

AI tools and their impacts in reading instruction: An exploratory study. *Arab World English Journal (AWEJ) Special Issue on CALL, 10*, 160–171. https://dx.doi.org/10.24093/awej/call10.11

De La Vall, R., & Araya, F. (2023). Exploring the benefits and challenges of AI-language learning tools. *International Journal of Social Sciences and Humanities Invention, 10*(1), Article 02. https://doi.org/10.18535/ijsshi/v10i01.02

Dennis, N. (2024). Using AI-powered speech recognition technology to improve English pronunciation and speaking skills. *IAFOR Journal of Education, 12*(2), 64–79. https://doi.org/10.22492/ije.12.2.05

Ferrara, E. (2023). Should ChatGPT be biased? Challenges and risks of bias in large language models. *First Monday, 28*(11). https://doi.org/10.5210/fm.v28i11.13346

Fu, Y., Zhang, L., Zhao, S., & Chen, Y. (2021). Perceptions of non-English major college students on learning English vocabulary with gamified apps. *International Journal of Emerging Technologies in Learning (iJET), 16*(18), 268–275. https://doi.org/10.3991/ijet.v16i18.24125

Grubaugh, S., Levitt, G., & Deever, D. (2023). Harnessing AI to power constructivist learning: An evolution in educational methodologies. *Journal of Effective Teaching Methods, 1*(3), 81–83. https://doi.org/10.59652/jetm.v1i3.43

Harrell, W. (1998). *Computer-assisted instruction: Enhancements for language-learning applications* (Doctoral dissertation, Louisiana State University). Louisiana State University Libraries. https://doi.org/10.31390/gradschool_disstheses.6833

Hornay, P. (2021). Cognitive load theory and the English language instruction. *ACCENTIA: Journal of English Language and Education, 1*(1), 43–55. Retrieved from https://www.researchgate.net/profile/Priscilla-Hornay/publication/371558712_Cognitive_Load_Theory_and_the_English_Language_Instruction/links/66cde4392390e50b2c1aa703/Cognitive-Load-Theory-and-the-English-Language-Instruction.pdf

Ibrahim, S., & Bilquise, G. (2024). Beyond ChatGPT: Benchmarking speech-recognition chatbots for language learning using a novel decision-making framework. *Education and Information Technologies*. https://doi.org/10.1007/s10639-024-13252-3

Jeon, J., Lee, S., & Choe, H. (2023). Beyond ChatGPT: A conceptual framework and systematic review of speech-recognition chatbots for language learning. *Computers & Education, 206*, 104898. https://doi.org/10.1016/j.compedu.2023.104898

Jose, D. (2024). Data privacy and security concerns in AI-integrated educational platforms. *Recent Trends in Management and Commerce, 5*(2), Article 19. https://doi.org/10.46632/rmc/5/2/19

Kazu, I. Y., & Kuvvetli, M. (2023). The influence of pronunciation education via artificial intelligence technology on vocabulary acquisition in learning English. *International Journal of Psychology and Educational Studies, 10*(2), 480–493. https://doi.org/10.52380/ijpes.2023.10.2.1044

Kim, H.-S., & Song, E. (2024). Investigation of AI grammar checkers on grammar learning and students' perception in L2 writing context. *Korean Journal of English Language and Linguistics, 24*, 531–553. https://doi.org/10.15738/kjell.24..202406.531

Klimova, B., Pikhart, M., & Kacetl, J. (2023). Ethical issues of the use of AI-driven mobile apps for education. *Frontiers in Public Health, 10*, Article 1118116. https://doi.org/10.3389/fpubh.2022.1118116

Krashen, S. D. (1981). *Second language acquisition and second language learning.* Oxford: Pergamon Press.

Kumar, N., Prasad, S., & Singh, C. P. (2024). Teacher-student interaction in the age of AI: From students' perspective. *Nanotechnology Perceptions, 20*(S14), 3832–3843. Retrieved from https://nano-ntp.com/index.php/nano/article/view/3637

Lalira, J., Pangemanan, Y., Scipio, J., Lumi, S., Merentek, T., & Tumuju, V. (2024). Evaluating the impact of AI tools on grammar mastery: A comparative study of learning outcomes. *Voices of English Language Education Society, 8*(3). https://doi.org/10.29408/veles.v8i3.27856

Lan, Y., Li, X., Du, H., Lu, X., Gao, M., Qian, W., & Zhou, A. (2024). *Survey of natural language processing for education: Taxonomy, systematic review, and future trends* [Preprint]. arXiv. https://doi.org/10.48550/arXiv.2401.07518

Lingaiah, J. (2024). AI-driven chatbots as language tutors: Enhancing written proficiency in ESL. *International Journal of Humanity and Social Sciences.* https://doi.org/10.47941/ijhss.2410

Jeon, J., Lee, S., & Choe, H. (2023). Beyond ChatGPT: A conceptual framework and systematic review of speech-recognition chatbots for language learning. *Computers & Education, 206*, 104898. https://doi.org/10.1016/j.compedu.2023.104898

Jomaa, N., Attamimi, R., & Al Mahri, M. (2024). Utilising artificial intelligence (AI) in vocabulary learning by EFL Omani students: The effect of age, gender, and level of study. *Forum for Linguistic Studies, 6*(5), 171–186. https://doi.org/10.30564/fls.v6i5.6968

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Mohammad, T., Alzubi, A. A. F., Nazim, M., & Khan, S. I. (2024). Paraphrasing prowess: Unveiling the insights of EFL students and teachers on QuillBot mastery. *International Journal of Information and Education Technology, 14*(5), 642–652. https://doi.org/10.18178/ijiet.2024.14.5.2088

Nurtazina, M., & Nurseitov, A. (2024). Innovative approaches to language learning through the lens of artificial intelligence. In *Proceedings of the 10th Socratic Lectures* (pp. 222–225). https://doi.org/10.55295/PSL.2024.I29

Nwana, H. S. (1990). Intelligent tutoring systems: An overview. *Artificial Intelligence Review,*

4(4), 251–277. https://doi.org/10.1007/BF00168958

Özçelik, N. P., & Yangın Ekşi, G. (2024). Cultivating writing skills: The role of ChatGPT as a learning assistant—a case study. *Smart Learning Environments, 11*(10). https://doi.org/10.1186/s40561-024-00296-8

Palliyalil, S., & Mukherjee, S. (2020). Byju's The Learning App: An investigative study on the transformation from traditional learning to technology-based personalized learning. *International Journal of Scientific & Technology Research, 9*(3), 5054–5059. Retrieved from https://www.ijstr.org/final-print/mar2020/Byjus-The-Learning-App-An-Investigative-Study-On-The-Transformation-From-Traditional-Learning-To-Technology-Based-Personalized-Learning.pdf

Schmidt-Fajlik, R. (2023). ChatGPT as a grammar checker for Japanese English language learners: A comparison with Grammarly and ProWritingAid. *AsiaCALL Online Journal, 14*(1), 105–119. https://doi.org/10.54855/acoj.231417

Shah, P. K., Joshiara, H. A., Mundanad, M., Patel, C., Padheriya, H., & Bhatt, D. (2024). Machine learning advancements in education: An in-depth analysis and prospective directions. *International Journal of Intelligent Systems and Applications in Engineering, 12*(3), 3229–3237. https://ijisae.org/index.php/IJISAE/article/download/5928/4680/11012

Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology, 14*, Article 1260843. https://doi.org/10.3389/fpsyg.2023.1260843

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Syahnaz, M., & Fithriani, R. (2023). Utilizing artificial intelligence-based paraphrasing tool in EFL writing class: A focus on Indonesian university students' perceptions. *Scope: Journal of English Language Teaching, 7*(2), 210–218. https://doi.org/10.30998/scope.v7i2.14882

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. Educational Psychologist, 46(4), 197–221. https://doi.org/10.1080/00461520.2011.611369

Wang, S., & Shi, X. (2021). Research on correction method of spoken pronunciation accuracy of AI virtual English reading. *Advances in Multimedia*, 2021, Article ID 6783205. https://doi.org/10.1155/2021/6783205

Wei, L. (2023). Artificial intelligence in language instruction: Impact on English learning achievement, L2 motivation, and self-regulated learning. *Frontiers in Psychology, 14*, Article 1261955. https://doi.org/10.3389/fpsyg.2023.1261955

Wei-Xun, L., & Jia-Ying, Z. (2024). Impact of AI-driven language learning apps on vocabulary acquisition among English learners. *Research Studies in English Language Teaching and Learning, 2*(1), 2–10. https://doi.org/10.62583/rseltl.v2i1.32

Wen, Y., Chiu, M., Guo, X., & Wang, Z. (2024). AI-powered vocabulary learning for lower

primary school students. *British Journal of Educational Technology, 56*(2), 734–754. https://doi.org/10.1111/bjet.13537

Yu, H., & Wen, J. (2023). Implementing extensive graded reading in English as a foreign language teaching through Newsela. *RELC Journal, 55*(3), 865–870. https://doi.org/10.1177/00336882231209537

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 39. https://doi.org/10.1186/s41239-019-0171-0

Zou, B., Guan, X., Shao, Y., & Chen, P. (2023). Supporting speaking practice by social network-based interaction in artificial intelligence (AI)-assisted language learning. *Sustainability, 15*(4), 2872. https://doi.org/10.3390/su15042872