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The Use of AI-Based Applications to Enhance Students' Writing Skills in Vocational High Schools: A Systematic Literature Review

Warsidi Fatmawati[1], Sultan Baa[2]
Universitas Negeri Makassar

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Corresponding Author:
bipfatma@gmail.com
Universitas Negeri Makassar

Abstract

The rapid advancement of Artificial Intelligence (AI) technology has catalyzed transformative shifts across the educational landscape, particularly within English as a Foreign Language (EFL) instruction. This study systematically examines the integration and efficacy of AI-based applications in developing the English writing skills of Vocational High School students. Employing a qualitative library research design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, this study synthesizes empirical evidence, theoretical frameworks, and academic publications spanning from 2015 to 2025. The findings indicate that AI-powered tools—ranging from automated grammar checkers and text generators to adaptive feedback platforms—offer substantial scaffolding during the writing process. These applications significantly improve students' grammatical accuracy, vocabulary acquisition, and syntactic variety, while simultaneously bolstering learning autonomy and motivation. However, the analysis also highlights critical challenges, including potential technology over-reliance, digital divide disparities, and the necessity of aligning generic AI capabilities with the specialized English for Specific Purposes (ESP) demands of vocational curricula. Ultimately, this study underscores that while AI serves as a powerful pedagogical aid, its successful implementation depends on strategic teacher mediation to ensure it enhances, rather than replaces, critical cognitive processing.

1. Introduction

The development of digital technology in the modern era has brought significant changes to the world of education, especially in the language learning process. The integration of technology into learning is no longer merely a tool, but has become a crucial part of improving the quality of learning and student skills.According to AlBlooshi (2026), one technological innovation increasingly used currently in education is Artificial Intelligence (AI). Schmidt & Huang (2022) believe that AI technology can provide various conveniences in the learning

process, including in English language learning, especially writing skills.

According to Nunan (2003), writing is considered one of the most complex language skills compared to other language skills because it requires the integration of multiple cognitive, linguistic, and organizational abilities at the same time. Javadi-Safa (2018) adds that writing is considered as a difficult task, even for native speakers though it is much more intimidating for non-natives, especially EFL learners. In addition, Krashen (1984) believes that writing not only involves the ability to construct words and sentences grammatically, but also requires critical thinking, organizing ideas, and using appropriate vocabulary. For vocational high school students, English writing skills are crucial because they relate to academic needs and their readiness to face an increasingly competitive and global workforce.

However, in classroom practice, vocational high school students' writing skills still face various challenges, especially in academic writing (Chuikova, 2020). Many students struggle to develop ideas, use correct grammar, and construct coherent paragraphs (Deane, 2018). In addition, Smith (2016) argues that writing as literacy, serves as both the foundation and the driving force behind students' writing development in further and vocational education. It supports their ability to communicate effectively, engage with knowledge, and prepare for real-world demands. Through continuous practice, guidance, and meaningful application, literacy transforms writing from a challenging task into a powerful tool for learning and professional growth.

Brown (2001) added that limited learning time and a lack of prompt feedback from teachers are contributing factors to students' poor writing skills. This situation demands innovation in learning strategies that can help students develop writing skills more effectively and independently. In this context, the use of Artificial Intelligence (AI)-based applications offers significant potential in supporting writing learning.

According to Aini & Basthomi (2025), various AI-based applications, such as grammar checkers, writing idea generators, and automated feedback systems, can help students improve sentence structure, enrich their vocabulary, and enhance the quality of their writing. Furthermore, AI technology also enables students to receive immediate and continuous feedback, making the learning process more interactive and adaptive to individual needs.

Several studies conducted previously have shown that integrating AI into language learning can improve student motivation, independency in learning, and writing quality (Hidayati, Dewanti, & Rasyid, 2021; Deep & Chen, 2025; Sari, Zhang, & Abdullah, 2025). AI-based applications can function as digital tutors, assisting students in the planning, writing, and revision processes. This provides opportunities for students to learn more independently while gradually improving their writing skills

However, several research gaps remain that need to be addressed. First, most studies focus on university or general high school students, while studies

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specifically examining the use of AI-based applications among vocational high school students are limited. According to Jiang et al. (2024), Caleb et al. (2025), and Saputra et al. (2025), AI could be very beneficial. However, caution is required to address risks such as data privacy and algorithmic bias, could raise dependency to the technology, and a huge gap in digital access among the students. Andi Asrifan (2025) also added that high school students have distinct learning characteristics because they are prepared for the demands of the workplace and require more practical writing skills, such as writing reports, professional emails, or work documents.

Secondly, many previous studies have emphasized the effectiveness of AI technology in general, but not many have specifically explored how the integration of AI applications in the writing learning process in the classroom can support the development of students' writing skills gradually, starting from the planning stage, drafting, to revising writing.

Third, research that discusses the use of AI in writing learning often focuses on improving the final writing results, while studies that highlight the process of learning to write with the help of AI, including how students utilize feedback from AI to improve their writing, are still relatively limited.

Therefore, the use of AI-based applications in writing instruction, particularly in vocational education contexts such as vocational high schools, still requires more comprehensive study. Various studies have addressed the use of AI in language learning, but these findings are scattered across various scientific publications and have not been systematically summarized. Therefore, a study that thoroughly examines the results of previous research related to the use of AI-based applications in developing students' writing skills is needed.

Based on the above description, this study aims to review and analyze various scientific literature related to the use of AI-based applications in writing learning, specifically in the context of vocational high school students. Through a literature review approach, this study is expected to provide a comprehensive overview of the effectiveness, benefits, and challenges of using AI applications in developing students' writing skills. The results of this study are expected to serve as a reference for educators, researchers, and learning developers in optimally utilizing AI technology in English learning in vocational education

2. Method

Research design

This study utilized a qualitative library research design executed through a Systematic Literature Review (SLR) approach. A qualitative library research framework was deemed most appropriate because it facilitates the systematic gathering, critical appraisal, and thematic synthesis of fragmented empirical evidence concerning an emerging technological phenomenon (Snyder, 2019). By shifting away from a narrative summary, the SLR approach utilizes a highly

structured protocol to map the existing literature, identify conceptual boundaries, and minimize researcher bias. The architectural execution of this review was guided by the PRISMA framework, which provides a transparent, multi-stage screening protocol to ensure that only high-quality, methodologically sound studies are included in the final synthesis pool.

Data and data collection

The data for this study consisted entirely of secondary data, comprising peer-reviewed journal articles, conference proceedings, and academic publications. Data collection was performed through comprehensive electronic searches across leading national and international bibliometric databases, specifically Scopus and Google Scholar. To capture the rapid evolution of educational AI technologies—spanning analytical grammar tools to generative large language models (LLMs)—the temporal scope of the publication search was strictly limited to a ten-year window from 2015 to 2025.

Data analysis

The finalized corpus of literature was analyzed using a qualitative thematic synthesis technique, adapted from the thematic analysis framework proposed by Braun and Clarke (2006). This analytical technique allows the researcher to deconstruct heterogeneous qualitative text and extract overarching conceptual dimensions across different empirical contexts.

3. Result

The. Based on the initial database execution across Scopus and Google Scholar using the predefined Boolean search strings, a total of 145 raw records were identified. After removing duplicates (n = 42), the remaining 103 articles underwent a rigorous title and abstract screening process against the basic linguistic and educational criteria. This phase led to the exclusion of 68 articles due to thematic irrelevance (e.g., studies focusing on general computer literacy or non-EFL contexts).

Consequently, 35 full-text articles were carefully evaluated for eligibility against the strict inclusion and exclusion protocol. Ultimately, 20 high-quality peer-reviewed papers published between 2015 and 2025 met all criteria and were included in the final synthesis matrix for qualitative thematic analysis. To maintain methodological transparency, the included studies were mapped based on their core bibliographic data. Table 1 provides a comprehensive synthesis matrix of the foundational literature driving this systematic review, detailing the authors, geographical or educational context, specific AI tools investigated, and key writing parameters observed.

The descriptive synthesis of the selected corpus indicates that the AI software utilized in modern language learning environments can be categorized into three operational typologies based on their primary pedagogical functions: Analytical AI

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Tools (Automated Writing Evaluation - AWE): Applications such as Grammarly and Write & Improve fall into this category. These tools leverage natural language processing (NLP) to perform automated syntax analysis, identify spelling or mechanical errors, and provide instantaneous, surface-level corrective feedback. Generative AI Platforms (Large Language Models): Utilities like ChatGPT and related chatbot applications function as interactive dialogue partners. Rather than merely correcting errors, these tools generate textual options, suggest contextual vocabulary synonyms, and provide structured writing outlines or customized prompts. Adaptive and Rewriting Systems: Software such as QuillBot and Wordtune focus on sentence-level restructuring and paraphrasing. These applications allow students to manipulate sentence variety, adjust tone (formal/informal), and improve paragraph transitions.

The data reveal that while analytical tools dominate the earlier years of the reviewed timeline (2015–2020), there is a sharp increase in the investigation of generative AI platforms in more recent publications (2021–2025), reflecting rapid technological transformations in educational settings.

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4. Discussion

The

The findings demonstrate that analytical AI tools (such as Grammarly) and adaptive rewriting platforms (such as QuillBot) provide significant cognitive scaffolding for language mechanics. By leveraging automated writing evaluation (AWE), these applications drastically minimize surface-level grammatical errors, punctuation anomalies, and syntactic structural flaws. This automated baseline correction aligns with the perspectives of Sari et al. (2025) and Mudhsh et al. (2025), who note that real-time error identification helps language learners notice structural gaps in their writing.

Furthermore, the integration of generative large language models (LLMs) and sentence-level paraphrasing tools allows students to expand their lexical range and improve textual coherence. Rather than relying on repetitive vocabulary, students can explore contextual synonyms and alternative stylistic pathways, thereby increasing the lexical density of their drafts (Mudhsh et al., 2025). From a process-oriented perspective, this immediate, non-judgmental formative feedback loop encourages students to engage in multiple, recursive revision cycles (Al-Obaydi & Pikhart, 2025; Mekheimer, 2025). This iterative text-refinement behavior significantly shortens the feedback delays inherent in traditional, teacher-centered essay corrections (Brown, 2001).

Beyond linguistic metrics, the literature highlights substantial affective and psychological benefits. Foreign language writing anxiety often acts as a major affective filter that paralyzes low-achieving writers, a common characteristic

observed among vocational students struggling with academic English. By interacting with private, objective AI interfaces, students experience reduced performance anxiety and feel more secure when making and correcting linguistic mistakes. This shift increases learner motivation and builds writing confidence (Song & Song, 2023).

Crucially, because these digital applications are highly accessible via portable devices and web interfaces, they facilitate seamless asynchronous learning outside the physical classroom. AI tools essentially function as personalized digital tutors that support continuous, self-directed practice (Yunusovna, 2025; Zheng & Zhang, 2025). This cultivation of learner autonomy is highly valuable, as it enables students to practice writing at their own individual pace, transforming a rigid classroom requirement into an independent, flexible skill-acquisition routine.

Despite these widespread advantages, a critical conceptual gap remains within the existing literature. A large portion of contemporary research heavily focuses on general high school or higher education settings, evaluating how AI tools enhance academic essays, argumentative compositions, or research prose (e.g., Aini & Basthomi, 2025; Sari et al., 2025; O'Neill & Russell, 2019). However, this academic focus creates a pedagogical paradox when applied directly to vocational secondary education.

As argued by Andi Asrifan (2025), the core mandate of vocational high schools is not academic scholarship, but immediate workplace readiness. Consequently, vocational English instruction must be grounded within the framework of English for Specific Purposes (ESP). Vocational students require highly practical, transactional, and occupation-specific writing competencies—such as drafting technical incident reports, composing formal professional correspondence, writing standard operating procedures (SOPs), or generating business emails.

Therefore, the findings from higher education research cannot be adopted blindly; instead, they must be strategically extrapolated and re-aligned. Rather than using generative AI to produce generic essays, vocational students should be taught to leverage AI as a structural template partner for specialized text genres. For example, an engineering student can prompt an AI tool to provide the standard layout of a diagnostic report, independently populate the content with technical data, and then employ analytical AI tools to refine the technical vocabulary and formal pragmatic tone. This targeted integration ensures that AI technology directly supports professional literacy and tangible career readiness (Smith, 2016).

Finally, the systematic review clearly shows that AI integration is not a pedagogical panacea and carries several risks. The most severe challenge is the threat of cognitive over-reliance. If students utilize generative AI tools to instantly output complete texts, they completely bypass the necessary cognitive friction involved in drafting, organizing thoughts, and retrieving lexical items. Over time, this passive dependency can degrade critical thinking, stunt genuine language acquisition, and increase risks of academic dishonesty.

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urthermore, as noted by Jiang et al. (2024), Caleb et al. (2025), and Saputra et al. (2025), educators must navigate institutional challenges related to algorithmic bias, data privacy vulnerabilities, and a pronounced socio-cultural digital divide. In many developing regions, students in rural or low-income vocational schools lack stable internet infrastructure or personal computing devices, which can worsen existing educational inequalities.

Consequently, the synthesized data strongly indicate that AI applications cannot serve as a substitute for human instructional guidance. To maximize the benefits of AI while safeguarding educational integrity, teachers must act as essential pedagogical mediators. Instructors must implement strict hybrid learning frameworks that position AI explicitly as an auxiliary cognitive scaffolding tool, ensuring that the human student remains the active intellectual driver of the writing process.

5. Conclusion

This systematic literature review concludes that the integration of Artificial Intelligence (AI)-based applications possesses immense potential to revolutionize English writing instruction within the vocational high school sector. By providing real-time automated feedback, adaptive lexical scaffolding, and syntactic corrections, AI utilities effectively mitigate long-standing instructional bottlenecks, such as constrained classroom hours and low learner confidence. These technological interventions systematically improve grammatical accuracy, enhance vocabulary variety, and cultivate robust learner autonomy by shifting practice into a flexible, self-paced digital environment.

Crucially, this study underscores that to fully unlock the value of AI within vocational education, a definitive pedagogical shift is mandatory. Educators must intentionally steer the deployment of AI tools away from generic academic essay writing and actively realign them toward the development of workplace-specific text genres within an English for Specific Purposes (ESP) framework. This reorientation ensures that AI directly accelerates professional literacy, transactional communication competence, and tangible career readiness for the global workforce. Furthermore, while AI serves as an empowering pedagogical ally, it cannot operate as a surrogate for human instruction. Educators must remain vigilant against the systemic risks of cognitive over-reliance, technology dependency, and digital divide disparities. Ultimately, AI should be implemented not as a replacement for the student's internal cognitive processing, but as an auxiliary scaffolding tool mediated by strategic teacher guidance to safeguard educational integrity.

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