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Mobile Technology for Enhanced ESL Writing Education: A Systematic Review of Benefits and Pedagogical Innovations

Nur Yasmin Khairani Zakaria
Centre of Learning and Teaching Innovation, Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia
Corresponding Author: yasminzakaria@ukm.edu.my

Harwati Hashim
Centre of Learning and Teaching Innovation, Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia;
Email: harwati@ukm.edu.my

Khairul Azhar Jamaludin
Centre of Education Leadership & Policy, Faculty of Education, Universiti Kebangsaan Malaysia, Bangi, Malaysia;
Email: khairuljamaludin@ukm.edu.my

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Abstract
Mobile technology has emerged to facilitate effective learning in English as a second language education, especially in higher education. The integration of mobile technology stems from the advancement of the digital age, the fourth industrial revolution, which subsequently led to educational changes. Despite the growing interest in mobile technology, research exploration on mobile technology in English as a second language writing classrooms remains limited. This study aims to systematically review recent empirical research to answer the central question: What are the benefits and pedagogical innovations associated with mobile technology in ESL writing education? In this study, the researchers referred to the reliable framework named Preferred Reporting Items for Systematic Reviews and Meta-Analysis 2020 to conduct a rigorous review of peer-reviewed articles published between 2020 and 2024 from two of the largest academic databases: SCOPUS and ERIC. After a comprehensive and systematic inclusion and exclusion process, 11 studies were included in this review. Mobile technology demonstrated advantages in fostering a student-centered interactive environment that motivates English as a second language students through familiar technology and enables flexible learning inside and outside the classroom. Furthermore, mobile technology promotes student autonomy and peer collaboration, allowing students to control their learning and interact constructively with their peers. This study's findings contribute to the fourth goal of Sustainable Development Goal 4, which is to ensure access to equitable and quality education for all. The review concludes with recommendations for integrating mobile technology into teaching and learning to achieve sustainable learning experiences in global education.

Keywords: Academic writing, English as a second language, higher education, mobile technology, systematic literature review, technology-enhanced language learning, writing skills
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Introduction

Technology in education has transformed how knowledge is delivered and acquired to enhance teaching and learning experiences. Mobile technologies enable multiple access to unlimited resources, making education more accessible for a wider reach (Azar & Iskandar Tan, 2020). In 2020, the global coronavirus disease-19 (COVID-19) pandemic accelerated technology integration into education as schools and universities transitioned to online learning to address disruptions (Kamaluddin & Sundaresan, 2023). This shift highlights the importance of technology in maintaining educational continuity and showcases its potential to create more adaptable learning environments in a volatile, uncertain, complex, and ambiguous VUCA context (Aljaradin, Alzoubi & Alkaabi, 2024). The need to improve the quality of education is anchored by the United Nations' Sustainable Development Goals (SDGs), particularly SDG 4, which aims to ensure inclusive and equitable quality education for all. Education is perceived as a catalyst for social mobility, paving the way for overcoming poverty (Ghanem, 2020). Equipping society with the proper knowledge, skills, and qualifications provides access to higher-paying jobs, entrepreneurship opportunities, and financial independence (Aghajani & Adloo, 2018). Supporting the aim of Quality Education in SDG, English language education bridges the gap of language barriers as it allows people to engage in global communication and access broader educational and professional opportunities (Kamaluddin & Sundaresan, 2023; Ghanem, 2020). By integrating technology into English as a Second Language (ESL) education, educators can enhance learning quality and contribute to realizing SDG 4 (Aljaradin, Alzoubi & Alkaabi, 2024).

Learning using technology refers to incorporating technological tools to facilitate and enhance the educational process (Aghajani & Adloo, 2018). It involves leveraging advancements such as mobile devices (Fadzil, Hashim & Sulaiman, 2024), virtual classrooms (Azar & Iskandar Tan, 2020), and artificial intelligence (Ahmed, Sarfaraj & Warda, 2024; Hiuqh et al., 2020) to create an interactive learning environment. These technologies assist students by providing flexibility, enabling them to learn at their own pace and in their preferred environment (Mauricio & Genuino, 2020; Kamaluddin & Sundaresan, 2023). Mobile learning, as a subset of technology in education, specifically focuses on using mobile devices (smartphones, tablets, and laptops to support learning (Mauricio & Genuino, 2020) anytime and anywhere. Integrating mobile technology in classrooms provides several benefits, including increased engagement and motivation (Sun & Asmawi, 2023). It enables educators to employ innovative methods, such as gamification and augmented reality, to make lessons more interactive (Kohnke & Ting, 2024; Azar & Iskandar Tan, 2020).

In the ESL learning context, learners are constantly facing challenges regarding the accessibility (Kamaluddin & Sundaresan, 2023; Ghanem, 2020) of resources for learning, which includes limited access to authentic language resources, later hindering opportunities for ongoing practice and learning (Baghban & Rasri, 2020; Hiuqh et al., 2020). Moreover, large class sizes (Ahmed, Sarfaraj & Warda, 2024; Ghanem, 2020) and resource limitations (Azar & Iskandar Tan, 2020) make it difficult for educators to provide personalized feedback, leaving many learners without targeted support to address specific weaknesses. In addition, the limitation in terms of the duration of conventional classroom sessions often resulted in insufficient practice for enhancing language skills (Kamaluddin & Sundaresan, 2023; Ghanem, 2020).

Despite the potential for mobile technology to be integrated into language learning environments, the benefits of such tools in ESL writing instruction remain under-researched (Aghajani & Adloo, 2018). Previous research on mobile-assisted language learning (MALL) has

primarily focused on listening, speaking (Baghban & Rasri, 2020; Hiuqh et al., 2020), vocabulary acquisition, or general English proficiency (Mauricio & Genuino, 2020; Kamaluddin & Sundaresan, 2023). However, writing skills have received little attention in the context of mobile learning, especially in formal academic settings in higher education. Previous research on integrating mobile technology into writing instruction often lacks analysis of pedagogical implications and exploration of the benefits of these tools on student motivation, autonomy, collaboration, and writing performance (Aljaradin, Alzoubi & Alkaabi, 2024). While mobile technology has the potential to transform ESL education, there is a lack of systematic reviews that focus specifically on its use in ESL writing instruction in higher education. Therefore, this study aims to systematically review existing literature to answer the following research questions: (1) What are the benefits of mobile technology in ESL writing instruction? and (2) what are the pedagogical implications of mobile technology in enhance ESL writing education?

Literature Review

The integration of mobile-assisted language learning (MALL) has been recognized for its possibility to impact English as a second language (ESL) learning as it offers a flexible and interactive environment. Vygotsky's sociocultural theory emphasizes the importance of tools and social interactions in cognitive development, and mobile devices, as mediating tools, play an important role in language learning in learners' proximal zone of development. As Vygotsky (1978) put it, "Learning triggers a series of intrinsic developmental processes that can only be activated when children interact with people in their environment." Numerous studies have suggested the benefits of mobile technology in teaching English as a second language (ESL) writing. For example, Ebrahimi (2024) observed that "students who used mobile writing applications showed greater cohesion and lexical diversity in their compositions." In another study, Ahmed et al. (2024) reported that push notifications in mobile applications fostered more consistent writing habits and increased daily writing engagement by 25%. These findings suggest that mobile platforms encourage learners to learn autonomously and by providing instant feedback, thereby improving learning convenience (Mustafa et al., 2033, Ogunola et al., 2024). However, despite these encouraging results, current research often focuses on general language skills rather than specific writing skill development. In addition, few studies have been able to comprehensively integrate strategies or instructional frameworks to guide the integration of mobile technology into ESL writing classrooms.

The conventional classroom also lacks collaborative learning (Aghajani & Adloo, 2018), as it is limited to traditional classroom settings. Traditional learning environments frequently lack the flexibility to accommodate learners' individual needs and goals, limiting their autonomy in the learning process (Baghban & Rasri, 2020; Ghanem, 2020). Lastly, the digital divide and lack of exposure to technology create additional barriers for some learners, as it impedes their interest in learning by integrating a digital learning approach (Kamaluddin & Sundaresan, 2023; Hassan, Abdul Rahman & Azmi, 2021). In response to that, previous literature supported that mobile technology addresses these issues by supporting flexibility (Baghban & Rasri, 2020; Sun & Asmawi, 2023; Kohnke & Ting, 2024) and accessibility (Hiuqh et al., 2020; Azar & Iskandar Tan, 2020) solutions that empower learners to overcome these challenges and improve their language proficiency effectively.

The need for mobile technology in learning ESL arises from its ability to address language learners' unique challenges. Therefore, the integration of mobile technologies can be regarded as

an alternative to facilitate exposure to authentic language materials (Jalaluddin, Ismail & Darmi, 2020; Azar & Iskandar Tan, 2020), fosters peer collaboration through social and interactive tools (Mauricio & Genuino, 2020; Baghban & Rasri, 2020) and provides opportunities for practice and feedback (Ahmed, Sarfaraj & Warda, 2024) that traditional methods may not offer. By incorporating mobile technology into ESL education, learners can improve their proficiency (Ahmed, Sarfaraj & Warda, 2024; Abd Karim, Adnan & Zamzami, 2020) while developing critical digital literacy skills (Sun & Asmawi, 2023), aligning with the broader goals of modern education and the objectives of SDG 4. This integration ensures that language learning is effective, inclusive, equitable, and aligned with the demands of a digital world. Therefore, this systematic review aims to examine the benefits of mobile technology in the writing classroom for teachers and learners in the English as a Second Language ESL context and the pedagogical implications of integrating mobile technology in the writing classroom for teachers and learners in the English as a Second Language ESL context. The study focuses on understanding how mobile technology is integrated into writing classrooms and its pedagogical implications for teachers and learners. Specifically, the review addresses the following research questions:

Methodology

This study adopted a systematic review of past literature to gather, analyze, and synthesize findings from existing research on mobile-assisted language learning (MALL) for ESL writing. The objective of this literature review is to provide an overview of the integration of mobile technologies in the ESL writing classroom and the pedagogical implications it provides to teachers and learners.

Search Strategy and Data Sources

The researcher referred to two primary academic databases: ERIC Education Resources Information Center and SCOPUS, a scientific abstract and citation database. These databases were selected due to their credibility and reputation for providing reliable, peer-reviewed publications (Guz & Rushchitsky, 2009). The first database, ERIC, was chosen for its comprehensive coverage of educational research, making it an essential resource for studies related to ESL, language acquisition, and technology in education. On the other hand, SCOPUS is a multidisciplinary database recognized for its rigor in indexing high-impact journals and its extensive reach in social sciences and educational technology (Guz & Rushchitsky, 2009). Therefore, using ERIC and SCOPUS ensures high validity and reliability of the sources included.

Inclusion and Exclusion Criteria

This study includes research published within the last five years, 2020-2024, as it provides recent trends of publications and researchers that reflect current practices, tools, and theoretical advancements in MALL and ESL writing. Studies older than five years were excluded to maintain the relevance of the data provided in this study (Guz & Rushchitsky, 2009). Study, as it represents a mature population for academic settings. Studies were chosen based on the objectives of this review: exploring the benefits of mobile technology and its pedagogical implications in ESL writing classrooms. Therefore, papers focusing on mobile-assisted language learning in general ESL contexts without an emphasis on writing were excluded.

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Selection of Studies Based on Research Context

The inclusion criteria were further refined by specifically including studies related to mobile-assisted ESL writing for university students. This study chose university-level learners as the focus context.

Search Terms and Screening Process

To identify relevant studies, a systematic search was conducted using a combination of keywords related to the study objectives, such as "MALL," "ESL writing," "mobile-assisted language learning," and "university students." The initial search produced a broad set of results, which were screened by reviewing abstracts to determine their relevance to mobile-assisted ESL writing in university contexts. After initial screening, articles were evaluated based on their alignment with the review's objectives and further assessed for methodological rigor and contribution to the field.

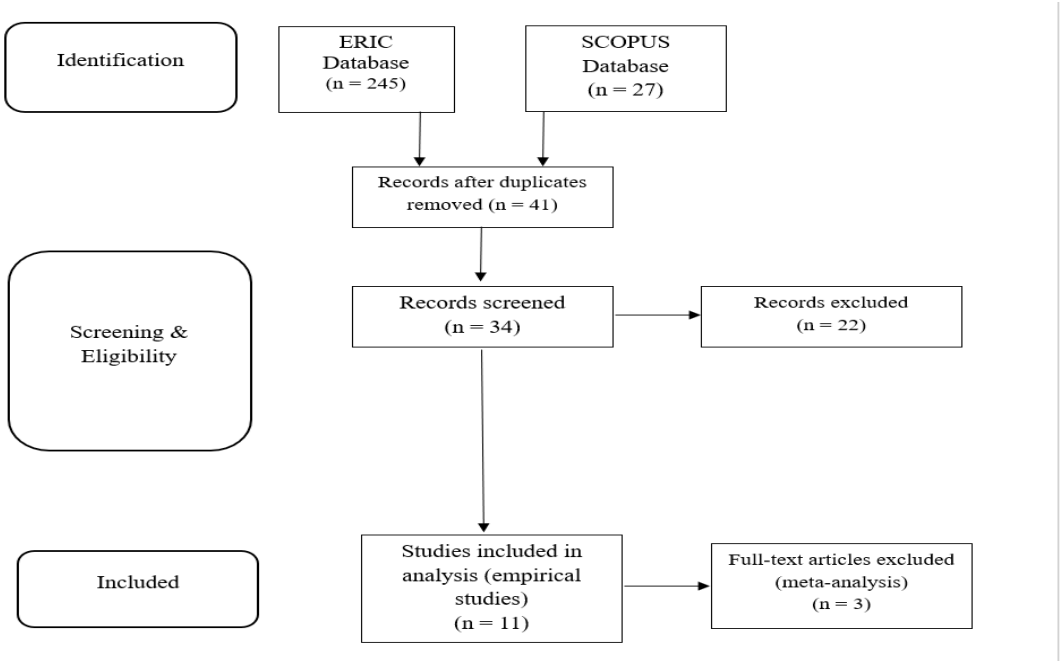


Figure. 1. PRISMA flow diagram of the study selection process

Results

The reviewed studies were selected based on the two largest databases: ERIC and SCOPUS. Table 1 presents a summary of the included studies to systematically identify, compare, and categorize patterns within the collected data.

Table 1. *Summary of included studies*

Authors	Main Findings	Pedagogical Implications

Jamshed, Ahmed, Sarfaraj, & Warda	Improved students' grammatical accuracy and positively affected students' attitudes.	Integrating AI tools like ChatGPT can support grammar accuracy and boost student motivation, providing personalized feedback that complements traditional instruction.
Rafidah Abd Karim et al.	Improved engagement, critical thinking, and writing performance, especially in the pre-writing stage.	Mind mapping apps aid in brainstorming and organizing ideas, encouraging critical thinking and engagement. These tools can be integrated into ESL curricula to support writing skill development.
Mojtaba Aghajani & Mahsa Adloo	Improved attitudes and writing aspects, like content and organization.	Tools like Telegram foster engagement and collaborative learning, enhancing writing content and organization. Teachers should guide students in balancing peer feedback with accurate language use.
Ali Sorayyaei Azar & Nur Haslinda Iskandar Tan	Create an engaging, student-centered learning environment.	A blend of MALL, Gamification, and VR can increase motivation and engagement in ESL. Educators should use MALL for accessibility, gamification for engagement, and VR for real-life simulation, adapting to virtual settings.
Nasibeh Mahi Gharehblagh & Najmeh Nasri	Improved writing skills, with students preferring its collaborative and flexible nature.	MALL can enhance writing skills through collaboration and engagement. Mobile tools like Telegram foster peer interaction and autonomy, complementing traditional instruction.
Lixuan Sun & Adelina Asmawi	Improved writing aspects like grammar, coherence, and vocabulary increased student motivation and enjoyment.	WeChat can enhance Business English Writing by promoting engagement and collaborative learning. Instructors can use it to facilitate peer feedback, asynchronous learning, and access to resources within a blended learning model.
Lucas Kohnke & Adrian Ting	Motivating vocabulary retention, with gamification elements aiding engagement and knowledge retention.	Gamified mobile apps targeting discipline-specific vocabulary can support ESL learners' academic success. Educators should integrate these tools in ESP/EAP to enhance vocabulary acquisition and engagement.
Lenicer Tamillarassi Stalin & Kim Hua Tan	Improved sentence construction, with high student engagement and motivation observed during feedback sessions.	Visual and interactive platforms like Snapchat can support sentence construction and early writing skills. Teachers should consider structured feedback to maximize benefits in primary-level ESL education.
Ilyana Jalaluddin, Lilliati Ismail, and Ramiza Darmi	Although spelling challenges remained, MAR enhanced vocabulary acquisition by linking words with real-world contexts.	MAR can be an effective tool for vocabulary learning among struggling learners. Integrating MAR with audio-visual aids could improve word recognition and retention, particularly with extended practice for spelling accuracy.
Michael C. Mauricio & Cecilia F. Genuino	Improved content, organization, and vocabulary were observed. Positive attitudes and motivation toward writing were also noted.	Smartphones can support collaborative writing by enhancing specific writing aspects and fostering engagement. Teachers may need to combine this with targeted grammar instruction to address gaps in grammatical and mechanical skills.
Mariam Al-Shehab	Improved content and grammar skills, enhanced motivation, autonomy, and peer collaboration.	MALL supports learner autonomy and engagement in ESL writing, yet may require combining traditional

		methods for comprehensive writing development, particularly in mechanics and word choice.

This study conducted a thematic analysis to explore the benefits of integrating mobile technology into ESL writing classrooms. The findings offered valuable perspectives on how mobile technology can enhance teaching and learning in ESL writing education. The accompanying tables present a detailed breakdown of the findings and corresponding references.

Table 2. *Thematic analyses of included studies*

Themes	Key Findings	Authors Year
Enhanced Grammar and Writing Skills	AI tools like ChatGPT improved grammatical accuracy; collaborative tools enhanced content and organization in writing.	Jamshed et al. (2024). Mauricio & Genuino 2020, Al-Shehab 2020, Aghajani & Adloo 2018
Engagement and Motivation	Gamification, interactive platforms, such as Snapchat and WeChat, and multimedia tools boosted student motivation and engagement in learning writing skills.	Kohnke & Ting 2021, Sun & Asmawi 2023, Stalin & Tan 2020, Sorayyaei Azar & Iskandar Tan 2020
Collaborative Learning	Tools like Telegram and WeChat fostered peer collaboration, enabling group discussions, peer reviews, and shared tasks for improved writing outcomes.	Aghajani & Adloo 2018, Sun & Asmawi 2023, Mauricio & Genuino 2020
Real-World Contextual Learning	Mobile Augmented Reality MAR and Virtual Reality VR linked learning to real-world contexts, improving vocabulary and writing relevance.	Jalaluddin et al. 2020, Sorayyaei Azar & Iskandar Tan 2020
Personalized Feedback and Autonomy	Mobile-assisted tools provided real-time, adaptive feedback, supporting student autonomy and learning at individual paces.	Jamshed et al. (2024). Al-Shehab 2020, Mauricio & Genuino 2020

The findings were divided into two primary categories: i benefits for students and ii benefits for teachers. For students, mobile technology was found to enhance writing skills (Aghajani & Adloo, 2018; Baghban & Rasri, 2020; Sun & Asmawi, 2023), boost motivation (Ahmed, Sarfaraj & Warda, 2024); (Abd Karim, Adnan & Zamzami, 2020), and improve engagement (Kohnke & Ting, 2024; Mauricio & Genuino, 2020; Fadzil, Hashim & Sulaiman, 2024; Al-Shehab, 2020). For educators, it supported personalized instruction and facilitated the adoption of innovative teaching methods (Ahmed, Sarfaraj & Warda, 2024; Baghban & Rasri, 2020; Sun & Asmawi, 2023; Azar & Iskandar Tan, 2020; Fadzil, Hashim & Sulaiman, 2024; Jalaluddin, Ismail & Darmi, 2020; Kohnke & Ting, 2024).

Discussion

RQ1: *What are the benefits of mobile technology in ESL writing instruction?*

The findings from the reviewed studies from 2020 to 2024 analyzed the role of Mobile-Assisted Language Learning MALL in ESL writing education. Analyses revealed that MALL is effective in enhancing students' engagement (Mauricio & Genuino, 2020; Azar & Iskandar Tan, 2020), vocabulary acquisition (Mauricio & Genuino, 2020; Jalaluddin, Ismail & Darmi, 2020), and

overall motivation in writing activities (Ahmed, Sarfaraj & Warda, 2024; Abd Karim, Adnan & Zamzami, 2020; Aghajani & Adloo, 2018; Kohnke & Ting, 2024; Mauricio & Genuino, 2020). Previous studies also indicated that mobile platforms enable a collaborative and flexible learning environment allowing learners to develop content knowledge (Mauricio & Genuino, 2020; Sun & Asmawi, 2023; Aghajani & Adloo, 2018), improve organizational skills (Ahmed, Sarfaraj & Warda, 2024; Mauricio & Genuino, 2020), and enhance grammar usage, all while promoting autonomy and self-directed (Al-Shehab, 2020). Analyses revealed that mobile technology is effective in enhancing students' engagement (Mauricio & Genuino, 2020), vocabulary acquisition (Jalaluddin, Ismail & Darmi, 2020; and overall motivation in writing activities (Abd Karim, Adnan & Zamzami, 2020; Sun & Asmawi, 2023; Kohnke & Ting, 2024). Previous studies also indicated that mobile platforms enable a collaborative and flexible learning environment (Mauricio & Genuino, 2020), allowing learners to develop content knowledge (Aghajani & Adloo, 2018), improve organizational skills (Ahmed, Sarfaraj & Warda, 2024; Sun & Asmawi, 2023), and enhance grammar usage, all while promoting autonomy and self-directed learning (Baghban & Rasri, 2020).

Benefits for Students

Mobile technologies transform traditional language learning by offering accessible, interactive, and multimedia-rich tools (Fadzil, Hashim & Sulaiman, 2024; Aghajani & Adloo, 2018; Jalaluddin, Ismail & Darmi, 2020; Kohnke & Ting, 2024) that align with the needs of digital-native students (Azar & Iskandar Tan, 2020; Fadzil, Hashim & Sulaiman, 2024; Sun & Asmawi, 2023). Its flexibility allows students to practice at their convenience (Baghban & Rasri, 2020; Mauricio & Genuino, 2020), reducing anxiety (Ahmed, Sarfaraj & Warda, 2024; Aghajani & Adloo, 2018) and making learning more enjoyable (Fadzil, Hashim & Sulaiman, 2024). Features like gamification, such as progress tracking and rewards, encourage consistent practice without pressure (Azar & Iskandar Tan, 2020). Research highlights that familiar technology boosts student motivation (Aghajani & Adloo, 2018), with 85% of learners feeling more engaged when educational practices incorporate tools they use daily.

Moreover, mobile technologies provide opportunities for collaborative activities (Mauricio & Genuino, 2020), such as peer reviews and shared writing tasks, through platforms like Google Docs or Telegram (Baghban & Rasri, 2020). These activities foster social interaction (Sun & Asmawi, 2023), build a positive classroom culture, and increase students' motivation. Personalized and adaptive learning experiences cater to individual learning paces, with tools adjusting content based on progress (Ahmed, Sarfaraj & Warda, 2024). Additionally, features like voice-to-text functions enable students to experiment with spoken and written language, making writing practice more creative and engaging (Fadzil, Hashim & Sulaiman, 2024). This approach keeps students engaged and nurtures a sense of accomplishment. By integrating interactivity, personalization, and collaboration, mobile technologies create an engaging and student-centered learning environment that significantly enhances motivation, helping students develop writing skills effectively.

Benefits for Teachers

For teachers, mobile technologies offer tools that simplify instruction and allow for innovative teaching approaches. Mobile technology facilitates real-time feedback, enabling educators to address individual learner needs promptly (Ahmed, Sarfaraj & Warda, 2024; Sun & Asmawi, 2023). Applications with built-in analytics, such as tracking student progress or identifying weak areas, provide teachers with data-driven insights to tailor instruction [12,

(Kohnke & Ting, 2024). This adaptability helps teachers implement personalized strategies that accommodate diverse learner profiles within the classroom. Mobile technologies also support collaborative teaching practices (Mauricio & Genuino, 2020), allowing educators to design activities that foster peer interaction and active participation (Fadzil, Hashim & Sulaiman, 2024). For instance, teachers can organize virtual writing workshops or group tasks on platforms like Padlet (Kohnke & Ting, 2024), where students collectively brainstorm and refine ideas. Such tools encourage creativity and ease the burden of one-on-one instruction by promoting peer learning (Aghajani & Adloo, 2018; Baghban & Rasri, 2020; Mauricio & Genuino, 2020; Sun & Asmawi, 2023).

Previous studies also highlighted that mobile technology tools save teachers time in lesson preparation by offering pre-designed resources, templates, and interactive content (Azar & Iskandar Tan, 2020; Sun & Asmawi, 2023; Kohnke & Ting, 2024; Jalaluddin, Ismail & Darmi, 2020; Fadzil, Hashim & Sulaiman, 2024). Teachers can focus more on facilitating discussions and guiding students than creating materials from scratch. By incorporating innovative features like gamification, mobile technologies make lessons more dynamic, sustaining student engagement and reducing classroom management challenges (Kohnke & Ting, 2024; Aghajani & Adloo, 2018; Baghban & Rasri, 2020). Overall, mobile technologies empower teachers by streamlining instruction, promoting innovation, and fostering a collaborative and interactive classroom environment, ultimately enhancing the overall effectiveness of ESL writing education (Ahmed, Sarfaraj & Warda, 2024; Aghajani & Adloo, 2018).

RQ2: *What are the pedagogical implications of integrating mobile technology in the writing classroom for teachers and learners in the context of English as a Second Language (ESL)?*

The thematic analysis presented in Table 3 reveals several pedagogical implications. These implications highlight the pedagogical roles that mobile technologies can play in enhancing teaching and learning processes.

Table 3. *Summary of pedagogical implications of included studies*

Themes	Pedagogical Implications	Supporting Studies
Personalized Learning	Mobile technology enables adaptive learning experiences, offering real-time feedback and tailored content to meet individual learner needs.	Jamshed et al. (2024). Al-Shehab 2020, Mauricio & Genuino 2020
Enhanced Engagement and Motivation	Interactive and gamified tools encourage consistent practice and foster higher motivation among learners by making writing tasks enjoyable.	Kohnke & Ting 2021, Sun & Asmawi 2023, Stalin & Tan 2020
Collaborative Learning	Platforms like Telegram and Google Docs facilitate peer feedback and group tasks, promoting active participation and idea-sharing.	Aghajani & Adloo 2018, Sun & Asmawi 2023, Mauricio & Genuino 2020
Support for Differentiated Instruction	Mobile technology provides scalable solutions for diverse classroom needs, allowing teachers to address individual strengths and weaknesses.	Al-Shehab 2020, Mauricio & Genuino 2020

Several themes emerged from thematic analysis. These themes highlight the pedagogical roles that mobile technologies play in enhancing teaching and learning processes. Incorporating mobile technology allows teachers to develop and refine their technological abilities, making them more adaptable to digital learning environments (Al-Shehab, 2020; Mauricio & Genuino, 2020). Previous studies emphasized that equipping teachers with these skills enables them to design interactive and personalized learning experiences (Al-Shehab, 2020; Abd Karim, Adnan &

Zamzami, 2020). This competence enhances instruction and ensures that educators can effectively leverage technology to address diverse learner needs.

Analyses from previous studies also revealed that mobile technologies can incorporate aesthetic elements, such as vibrant visuals, typography, and multimedia features, which foster creativity and imagination in learners (Fadzil, Hashim & Sulaiman, 2024; Jalaluddin, Ismail & Darmi, 2020; Fadzil, Hashim & Sulaiman, 2024). Researchers argued that such features encourage independent thinking and emotional engagement (Ahmed, Sarfaraj & Warda, 2024; Sun & Asmawi, 2023), which are critical for fostering deep learning and self-expression (Aghajani & Adloo, 2018; Kohnke & Ting, 2024). For example, gamification elements like badges, color-coded progress indicators, and multimedia prompts can make the writing process more engaging for ESL students (Kohnke & Ting, 2024; Azar & Iskandar Tan, 2020; Sun & Asmawi, 2023; Fadzil, Hashim & Sulaiman, 2024).

Applications with guided writing frameworks (Ahmed, Sarfaraj & Warda, 2024), mind mapping tools (Azar & Iskandar Tan, 2020), and real-time feedback assist learners in maintaining logical flow and structure in their writing (Sun & Asmawi, 2023). These features improve writing quality and provide students with strategies to apply coherence across various writing contexts. Mobile technologies also enable the incorporation of contextual signals (Jalaluddin, Ismail & Darmi, 2020; Azar & Iskandar Tan, 2020; Baghban & Rasri, 2020) into the learning process. Studies suggest that such contextualization helps students connect language learning to real-world applications (Sun & Asmawi, 2023), fostering more profound understanding and retention (Kohnke & Ting, 2024). Moreover, adaptive algorithms within mobile tools offer personalized feedback and learning paths (Mauricio & Genuino, 2020), accommodating diverse learning styles and paces (Baghban & Rasri, 2020).

In addition to promoting contextual and personalized learning, mobile technologies also support AI-powered tools such as ChatGPT and Grammarly, provide real-time, adaptive feedback on grammar, vocabulary, and sentence structure (Ahmed, Sarfaraj & Warda, 2024); (Sun & Asmawi, 2023). This integration bridges gaps left by traditional instruction (Baghban & Rasri, 2020), enabling students to focus on refining their writing skills (Abd Karim, Adnan & Zamzami, 2020). Previous researchers also asserted that AI tools not only improve grammatical accuracy (Ahmed, Sarfaraj & Warda, 2024; Sun & Asmawi, 2023) but also boost student confidence (Aghajani & Adloo, 2018) and autonomy (Mauricio & Genuino, 2020) in the writing process. Mobile technologies also offer the strategic use of typography such as font size, style, and layout (Fadzil, Hashim & Sulaiman, 2024; Kohnke & Ting, 2024) which serve a crucial role in supporting ESL learners' comprehension and engagement (Azar & Iskandar Tan, 2020; Pheng, Hashim & Sulaiman, 2021). Researchers highlighted that typography impacts pedagogical process because well-designed textual elements can aid in decoding information (Fadzil, Hashim & Sulaiman, 2024; Kohnke & Ting, 2024) making learning materials more accessible (Sun & Asmawi, 2023). The flexibility to select caption sizes, symbols, and formatted text in mobile applications enhances readability (Jalaluddin, Ismail, & Darmi, 2020) and creates a more user-friendly learning environment (Azar & Iskandar Tan, 2020).

The integration of mobile technology in ESL writing classrooms provides substantial pedagogical implications, including enhanced engagement (Kohnke & Ting, 2024); (Fadzil, Hashim & Sulaiman, 2024), personalized learning (Ahmed, Sarfaraj & Warda, 2024; Baghban & Rasri, 2020) and improved writing proficiency (Mauricio & Genuino, 2020; Ahmed, Sarfaraj & Warda, 2024). Mobile-assisted learning can address key challenges in ESL writing education by

equipping teachers with digital tools and aligning technological features with educational goals. These innovations enrich the learning experience and align with global objectives like Sustainable Development Goal 4 SDG 4 by fostering inclusive and equitable quality education.

Conclusion

The main findings from this analysis highlight the significant roles of mobile technologies in enhancing student engagement, motivation, and specific aspects of writing skills while also identifying critical limitations that suggest a need for blended learning approaches. Analysis of this study also revealed that even though mobile technologies are useful for enhancing ESL writing skills, their full potential could only be explored deeper through a meaningful and practical intervention and exploration. Several directions for future research are suggested. First, future research should explore the long-term effects of mobile-assisted tools on students' learning particularly in the context of writing instruction. Second, future research should focus more on underprivileged and marginalized groups of learners, including students in rural, multilingual, or low-resource settings, and is needed to better understand how equity and accessibility affect research results. Third, further research could explore the integration of emerging technologies (e.g., artificial intelligence, augmented reality, or adaptive learning systems) into mobile ESL writing tools. Finally, more longitudinal and mixed methods of research are suggested to provide a deeper understanding of the motivational and affective dimensions of mobile-assisted writing, an area that has not been fully explored. These directions will help to apply mobile technologies in ESL writing education in a more inclusive context. This analysis, therefore, reinforces the need for mobile technology integration in education to create a flexible and convenient learning environment.

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About the Authors:

Nur Yasmin Khairani Zakaria is a doctoral researcher at the Faculty of Education, Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia. Her research interests focus on educational technology and mobile learning applications, particularly for enhancing ESL (English as a Second Language) writing skills among tertiary learners. With a keen interest in the intersection of pedagogy and technology, she aims to contribute to the development of innovative educational tools for transformative learning experiences. https://orcid.org/0009-0005-8786-8623

Associate Professor Dr. Harwati Hashim is a faculty member at the Faculty of Education, Universiti Kebangsaan Malaysia (UKM). She is also a member of the University Research Group

on EduXcellence: Development of Innovative Curriculum & Pedagogy. Her research interests include mobile-assisted language learning, instructional design, and innovative pedagogical approaches in ESL education. Dr. Harwati has extensive experience in curriculum development and is committed to enhancing educational practices through technology integration. https://orcid.org/0000-0002- 8817-427X

Dr. Khairul Azhar Jamaludin serves at the Faculty of Education, Universiti Kebangsaan Malaysia(UKM) and an active member of the University Research Group on ELITEE: Enhanced Learning for Inclusive Transformation of Education Experience. His research focuses on educational inclusion, technology-enhanced learning, and the development of equitable and transformative educational experiences. Dr. Khairul is dedicated to exploring innovative strategies for fostering inclusive education through technological advancements. https://orcid.org/0000-0001-6212-7494

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