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Using AI-Powered Tools in Enhancing Reading Skills in the ESL Classroom: A Systematic Review (2020-2024)

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Abstract

With the rise of Industrial Revolution 4.0, Artificial Intelligence (AI) has been incorporated into various fields, including education. In Malaysia, digital education is currently being emphasised, with new tools such as Virtual Reality, Augmented Reality and online learning platforms being utilised. However, the review on the use of AI-powered tools in the Malaysian ESL classroom is scarce, despite the current trends. Using two databases, namely Web of Science (WoS) and SCOPUS, 9 articles were extracted out of 67, from 2020 to 2024, with exclusion and inclusion criteria taken into consideration. First, the significant findings showed that AI-powered tools can be used to enhance a variety of reading skills spanning across 6 major themes. Secondly, AI-powered tools also are easily utilised and adapted to enhance reading skills across diverse age groups, which have been organised into 4 groups for this review. In conclusion, several recommendations were provided at the end of this research, highlighting key areas that should be the focus of future studies.

Keywords: Artificial Intelligence, English as a Second Language, Reading skills, Technology, AI in Education

Introduction

The education landscape today has been evolving rapidly with the rise of various technological advancements, including Artifical Intelligence (AI). It is undeniable that 21st-century learning marks a shift from traditional classrooms to a more student-centered approach that involves these new enhancements (Santhanasamy & Yunus, 2021). Recent

advances in AI have had a big impact on language learning. AI mimics human intelligence in computer programs and can handle tasks like solving problems, analysing data, and interpreting information (Hassani et al., 2020). Moreover, the rise of AI-powered tools such as ChatGPT and Grammarly show the potential of AI, highlighting the importance of incorporating this technology into current language learning programs and classroom strategies. AI also helps automate routine tasks in education, such as grading and assessments, freeing up time for teachers to focus more on individual student progress (Singh et al., 2020).

The Malaysian education system is currently undergoing a paradigm shift from conventional education to digital education. This is important as teachers that are relevant should go beyond traditional teaching methods by embracing innovation and adapting to changes in the learning process (Yunus & Suliman, 2014). To spearhead this transformation, the Ministry of Education Malaysia launched the Digital Education Policy with the aspiration to revamp and boost the digital education landscape, thus producing a digitally literate generation that is competitive (Ministry of Education Malaysia, 2023). This is aligned to Shift 7 of the Malaysian Education Blueprint 2013-2025, which aims to leverage ICT to elevate quality learning in Malaysia (Ministry of Education Malaysia, 2013). With so much focus and attention put on digital education, it is pertinent to explore on related aspects, including AI and AI-powered tools in the classroom.

Despite English being an official language in Malaysia, it is evident that many Malaysians struggle to master the language after 12 years of education. This was illuminated when over 52,000 candidates failed English in their Sijil Pelajaran Malaysia, or Malaysian Certificate of Education in 2023 (Daim, 2023). This was supported by experts who disagree with the results of the International 2023 Education First (EF) English Proficiency Index (EPI) which placed Malaysia in third for English proficiency among Asian countries (Jeevita, 2023). As for the reading competency, an OECD report highlighted that Malaysia faced drops in all three primary metrics of the Programme for International Student Assessment (PISA), particularly in reading literacy (Ikram, 2023). The country experienced a notable 27-point decline in reading literacy, an unexpected decrease as it had never encountered a drop of more than five points in this category. This data underscores an ongoing issue in the overall quality of English teaching and learning, including the teaching and learning of reading skills.

The rise of digital education may provide a solution to these issues, yet there is a lack of systemic reviews focusing on AI-powered tools, leaving a gap. Nevertheless, it is evidently vital to look into the research trends surrounding the use of AI-powered tools, specifically in enhancing reading skills in the ESL classroom. The motivation behind this study is to explore available literature on the use of AI-powered tools in enhancing reading skills as the findings will be able to shed some light on existing problems as mentioned above. It is also hoped that this review will help encourage more studies involving AI or AI-powered tools in the primary ESL classroom in the future. This is vital as AI is growing in significance day by day as shown. Therefore, this systemic review aims to review the current trends and research on the use of AI-powered tools in enhancing reading skills in the ESL classroom, with two research questions as follows;

RQ1: What reading skills can be promoted with artificial intelligence?

RQ2: What is the target age group for using AI-powered tools to enhance reading skills?

Trends in Using Technology in the ESL Classroom

According to Al-Maashani and Mudsh (2023), technology started to rise in significance and play a role in modern education over the past three decades. These tools are highly developed for use across various skills and are freely available everywhere. Additionally, both teachers and students today frequently carry laptops, tablets, and smartphones, all equipped with a wide range of applications and features, including internet access, to support the teaching and learning process (Alamri, 2021). In fact, technology is considered to play a vital role in a teacher's responsibilities today, as it helps support students' learning (Qizi, 2023). There are also studies that refer to the term 'TELL' or Technology-Enhanced Language Learning when discussing about the role and impact of technology on teaching and learning a second language, including English (Annet, 2024; Iberahim et al., 2023; Zainuddin, 2023; Zhou & Wei, 2018).

As technology continues to shape education, ESL teachers must adapt their teaching approaches to meet the needs of a new generation of tech-savvy learners (Hashim, 2018). By understanding students' digital habits and preferences, educators can select the most suitable tools and platforms that align with students' existing skills, ultimately enhancing language learning (Hassan & Plcorpora, 2021). In addition, teachers can leverage a variety of digital resources to enrich curriculum activities or use personalized communication tools to better support student learning (Pazilah et al., 2024).

Research suggests that when technology aligns with students' interests, it not only boosts engagement but also fosters peer collaboration, leading to improved language proficiency (Martin et al., 2019). To successfully incorporate digital tools in the classroom, ESL teachers must develop strong technological skills alongside 21st-century competencies. As Raman et al. (2023) highlight, technology offers innovative approaches, new strategies, and dynamic resources that can significantly enhance the teaching and learning experience.

Numerous studies have demonstrated that integrating technology into ESL instruction increases motivation and engagement, making lessons more interactive and stimulating (Rafiq et al., 2020; Pazilah et al., 2019; Pinter, 2019). Since learning a second language can often be intimidating, causing anxiety among learners (Toh & Rahmat, 2021), technology has the potential to create a more supportive and engaging environment. Given that today's students are naturally inclined toward digital tools, incorporating technology into ESL learning can help them feel more at ease and confident in their language development (Wah & Hashim, 2021). Ultimately, embracing digital tools in language instruction is crucial to ensuring effective and meaningful ESL learning experiences.

In terms of teaching the language itself, technology has demonstrated numerous success in showing results. Studies by Balula et al. (2020), and, Kohnke and Ting (2021) showed how mobile learning helped ESL students improve their vocabulary acquisition. In addition, studies by researchers in Hashim et al. (2023) and Yunus et al. (2012) showed how technological gadgets such as iPads and digital comics could be used to enhance writing skills. Another study also demonstrated the role of digital storytelling in improving speaking skills (Nair & Yunus, 2021). Social media was also discovered to be a great tool in helping ESL learners improve their speaking skills (John & Yunus, 2021). Furthermore, blogging was another tool that integrated technology into the ESL classroom, which showed success in

improving ESL learners' writing skills (Said et al,, 2013). From the literature gathered, it can be derived that technology is not foreign to the education and ESL classroom context, but instead is being widely used in today's classroom. It is evident that technology is perceived as a beneficial tool that can enhance and enrich the learning experience in the classroom and help students learn better.

Trends in Using Artificial Intelligence in the ESL Classroom

The COVID-19 pandemic has accelerated the adoption of Artificial Intelligence (AI) in the ESL classroom, with studies showing a significant rise in the use of AI-powered tools and systems (Sharifuddin & Hashim, 2024). Findings show that these technologies have become increasingly popular among educators, students, and other stakeholders in the learning process (Pantelimon et al., 2021). As digital transformation continues to reshape the education sector, the influence of machine learning and AI-driven solutions is becoming inevitable (Suta et al., 2020). This rapid shift has also fueled advancements in educational technology, including AI-driven learning platforms (Haristiani, 2019).

Another factor leading to the rise of AI in the ESL classroom is that traditional methods of teaching English are increasingly inadequate for fulfilling the contemporary society's demands for comprehensive talent development (Huang, 2021). The rapid progress of artificial intelligence technology has introduced new possibilities for modernizing English education, offering the potential to create an intelligent teaching environment (Yuan, 2021). The relevance of incorporating AI technology into educational systems is widely recognised, highlighting the importance of investigating the use of AI-powered tools in enhancing reading skills in the ESL classroom.

With the rapid advancement of information technologies, artificial intelligence has been widely utilized in the educational sector. AI-powered technologies such as adaptive learning systems, socially assistive robots, intelligent tutoring systems, and administrative support systems target to assist language learners in enhancing their skills in areas such as reading, writing, vocabulary, oral communication, and grammar (De La Vall & Araya, 2023). Moreover, AI has been shown to assist in predicting students' course GPA based on their reading engagement (Junco & Clem, 2015); help grade short-answer assignments and provide feedback (Suzen et al, 2020); and even in academia (Yang et al., 2021).

Another major advantage of integrating AI in the ESL classroom is the ability to personalise learning. This is important because different learners have unique learning styles and strategy preferences that help them acquire and develop their language skills effectively (Hashim et al., 2018). Providing personalized instruction in a traditional classroom can be challenging, as teachers must address the diverse needs of multiple students simultaneously (Khalil & Alharbi, 2022). AI-powered language learning programs offer a solution by delivering customized learning experiences tailored to each student's strengths and areas for improvement (Gallacher, 2018). Moreover, AI-driven vocabulary learning tools, available round the clock, provide students with the flexibility to study at their own pace, which is an important advantage for many learners (Alemi & Bahramipour, 2019). Additionally, AI can support students in test preparation and assessments by offering immediate, personalized feedback, allowing them to track progress and refine their skills more effectively (Lee et al., 2022).

Therefore, the literature gathered show that there is potential for articifial intelligence to contribute towards the enhancement of reading skills in the ESL classroom, which makes this systemic literature review paper relevant and significant.

There are many other reviews and literature on the use of artificial intelligence in different fields such as medicine and manufacturing. Unfortunately, systemic literature reviews as well as articles on artificial intelligence with regards to education in general, and specifically reading skills is still scarce. To this end, the use of AI-powered tools in enhancing reading needs more assessment and discussion, and this paper aims to fill that gap.

Methodology

This section outlines the methodology used to collect articles on AI-powered tools for improving reading skills in ESL classrooms. The study adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which encompass the stages of identification, screening, eligibility, and exclusion. The systematic review utilized the SCOPUS and Web of Science (WoS) databases. The PRISMA for this review can be referred to in Figure 1, and is highly regarded for its comprehensive and flexible nature, making it a suitable framework for this review (Rafiq et al., 2021)

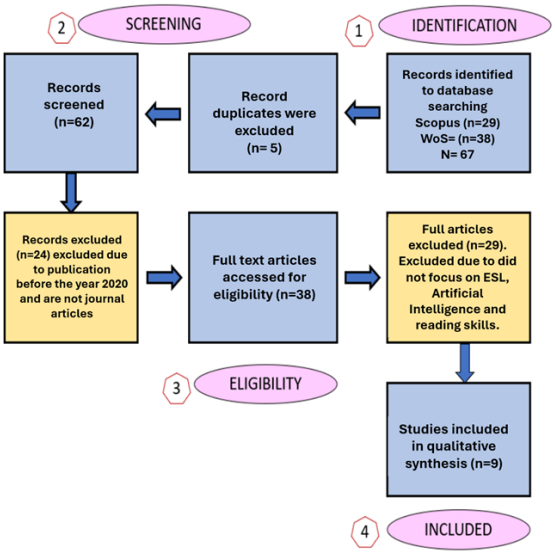

Figure 1. PRISMA systematic review adapted from Ramalingam et al., 2022

Identification

The first step in the systematic review process, known as identification, follows the PRISMA guidelines. This stage involves selecting databases and constructing relevant search terms. For this study, two databases were chosen: Web of Science (WoS), and SCOPUS. Key terms were carefully selected to encompass concepts related to artificial intelligence and reading skills in the ESL classroom. The identification process involved finding related terms, synonyms, and variations for the main keywords, such as AI-powered tools, AI in education, primary ESL classroom and reading skills. Keywords were developed based on the research question, with input from previous studies, online thesauruses, and suggestions from SCOPUS. This approach resulted in the retrieval of 67 articles relevant to the study's objectives. Table 1 below shows the search string utilised in this study in each database.

Table 1
The Search String Used for the Systematic Review Process

Database	Search string used
SCOPUS	TITLE-ABS-KEY (("AI-Powered Tools*" OR "Artificial Intelligence" OR "AI in Education*") AND ("Reading Skills in the Lower Primary ESL Classroom*" OR "Primary ESL Classroom" OR "Primary ESL Reading" OR "Reading Skills*"))
Web of Science	TS= (("AI-Powered Tools*" OR "Artificial Intelligence" OR "AI in Education*") AND ("Reading Skills in the Lower Primary ESL Classroom*" OR "Primary ESL Classroom" OR "Primary ESL Reading" OR "Reading Skills*"))

Screening and Eligibility

After identifying relevant articles, the next step involved screening for duplicates and determining relevance. Duplicate papers were carefully identified and removed from SCOPUS and Web of Science (WoS), resulting in the elimination of 5 duplicates and leaving 62 articles for further consideration. The titles, abstracts, and keywords of these articles were then reviewed to ensure they were relevant to the study's focus on artificial intelligence and reading skills. Consequently, 24 articles were excluded for not fitting the study's criteria, narrowing the selection to 38 articles.

The selection of articles was guided by the study's research question and specific inclusion criteria as can be seen in Table 2. The timeframe from 2020 to 2024 was chosen to ensure the latest findings were gathered and to capture the most recent developments in the field. Only empirical studies published in journals were included to ensure high-quality data. Additionally, articles had to be in English to avoid translation issues, and only those related to English as a Second Language (ESL), artificial intelligence and reading skills were considered. This meticulous process resulted in the exclusion of 29 articles that did not meet the criteria, refining the set of studies included in the systematic review.

Table 2
Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Timeline	2020-2024	Before 2024
Literature type	Empirical (journal articles)	Systematic reviews, books, chapters in a book, conference proceedings
Language	English	Non-English
Scope	Related to ESL, Artificial Intelligence and reading skills	Not related to ESL, Artificial Intelligence and reading skills

Included

The systematic review focused on articles related to ESL, artificial intelligence and reading skills. The studies included are listed in Table 3. From the identified databases, five articles were selected from Web of Science (WoS) and four articles from SCOPUS. These databases were chosen due to the high quality of articles they offer, especially in the field of education (Rafiq et al., 2021). The studies primarily aimed to explore how tools and applications powered by artificial intelligence could help enhance reading skills, among language learners from diverse backgrounds.

Table 3
Summary of the Selected Studies

Study	Database	Aim	Samples	Findings
Hollander, Sabatini & Graesser (2022)	WoS	To assess how evaluating learners' component reading skills can provide insights into different aspects of their needs in AutoTutor lessons.	252 adult literacy learners	The results indicate that this framework can benefit adaptive systems by improving the accuracy of assessments and the validity of instructional content in adult literacy education.
Yang, Chen, Flanagan & Ogata (2021)	WoS	To investigate whether practicing with cloze items generated by modern AI techniques creates a testing effect and positively influences reading comprehension.	74 university students	The results demonstrate that machine-generated cloze testing enhances learning in higher education.
Rizvi, Gauthier & Mavrikis (2022)	WoS	To analyze the data logs from Navigo, a set of language games aimed at helping primary school children improve their reading skills, using Bayesian Knowledge Tracing (BKT) as a tool.	127 students from 10 primary schools in the UK	The results indicate that the games contributed to an increase in students' learning rates for reading accuracy. Additionally, the implicit learning opportunities provided by various game mechanics may benefit male students more than female students.
Martinez-Murcia, Ortiz & Gimenez (2020)	WoS	To investigate the capability of a trained encoder to identify the risk of Developmental Dyslexia in five-year-old children.	572 children in school, aged 5 to 8 years old.	The results indicate that the model could predict the risk of Developmental Dyslexia two years before the children's reading abilities were first assessed.
Peña, Vásquez-Venegas & Guevara (2024)	WoS	To evaluate the effectiveness of a short, tablet-based intervention designed to teach toddlers and preschoolers new word-object and letter-sound associations.	101 toddlers and 152 preschoolers	The results indicate that the intervention is effective for teaching new vocabulary and pre-reading skills, which are crucial for future development.
Yuan & Zhang (2024)	Scopus	To assess the effectiveness of an	52 university students	The results indicate that the model supports

		adaptive Huber growth curve model in representing cognitive abilities in English reading.		integrated intelligent teaching of reading and writing skills, as well as the development of students' critical thinking abilities. abilities during English reading.
Draffan, Ding, Wald & Newman (2020)	Scopus	To present the concept of improving the readability of web content through the use of artificial intelligence (AI) techniques.	Active web page readers	The findings indicate a 70% likelihood of a good match between symbols and labels. The proposed combination of machine learning algorithms, including word embedding and image recognition with deep neural networks, has the potential to enhance readability skills.
Vinodh & Rose (2020)	Scopus	To analyze the existing research on dyslexia detection using various procedures, materials, and forms of machine learning approaches.	Children at risk of having dyslexia	The findings suggest that machine learning and artificial intelligence play a significant role in detecting early symptoms of dyslexia.
Tabassum (2020)	Scopus	To discuss the development of an integrated and intelligent mobile (Android) application designed for the learning needs of children with autism.	Children with autism	E-learning contributes to the development of reading skills in children and can improve overall fluency, writing, and comprehension abilities.

Findings and Discussions

In this section, the findings of the review will be discussed with regards to the research questions set for this study.

RQ1: What reading skills can be promoted with artificial intelligence?

From the systemic literature review, it is evident that AI-powered tools can be utilised in a variety of ways to help enhance reading skills in the ESL classroom. Table 4 below organises the reading skills that can be enhanced through AI, into 6 themes namely reading comprehension, reading accuracy, reading assessment, critical thinking skills, pre-reading skills and enhancement of reading among special needs students. From the literature reviewed, one aspect that can be really appreciated is the balance or inclusivity of how AI can be used to enhance not only the mainstream ESL classrooms but also reading in special education classrooms. The ability to cater in to everyone’s needs and to examine how AI can

be utilised to enhance students from diverse backgrounds in aligned to the aspirations of the Malaysian Education Blueprint 2013-2025, which aims to offer the same educational opportunities to all students, including minority groups and students with physical and learning disabilities (Ministry of Education Malaysia, 2013). In short, it is evident that AI-powered tools can promote many different reading skills, which have been organised into 6 major themes.

Table 4
Reading Skills that can be Promoted with Artificial Intelligence

Reading skills	Study
Reading comprehension,	Draffan, Ding, Wald & Newman (2020) Tabassum (2020)
Reading accuracy	Rizvi, Gauthier & Mavrikis (2022)
Reading assessment	Hollander, Sabatini & Graesser (2022) Yang, Chen, Flanagan & Ogata (2021)
Critical thinking skills	Yuan & Zhang (2024)
Pre-reading skills	Peña, Vásquez-Venegas & Guevara (2024)
Enhancement of reading among special needs students	Martinez-Murcia, Ortiz & Gimenez (2020) Vinodh & Rose (2020)

RQ2: What is the target age group for using AI-powered tools to enhance reading skills?
From the systemic literature review, it can be derived that artificial intelligence is a technology that is user-friendly for all age groups. This is great as it shows the effectiveness of AI-powered tools and the endless possibilities it can be utilised with in adapting to different educational contexts. In fact, Peña et al. (2024) cite several studies that suggest that both parents and children can actively engage with interactive technologies, often participating together. For example, when families encourage the use of technology to improve literacy in 3- to 4-year-old children, the children can benefit from this method. Furthermore, parents can utilize these technologies to guide their children's learning and answer their questions.

This systemic literature review has identified that AI-powered tools can enhance reading skills among 4 age groups namely early childhood, primary education, tertiary education and adult learners. Unfortunately, this review was unable to obtain literature on teenagers pursuing secondary education although they are present in publications before 2020, and databases outside Web of Science and SCOPUS. Table 5 below summarises the target age groups for using AI-powered tools to enhance reading skills.

Table 5
Target age groups for using AI-powered tools to enhance reading skills

Target Age Group	Study
Early childhood	Peña, Vásquez-Venegas & Guevara (2024) Tabassum (2020)
Primary education	Rizvi, Gauthier & Mavrikis (2022) Martinez-Murcia, Ortiz & Gimenez (2020) Vinodh & Rose (2020)
Tertiary education	Yang, Chen, Flanagan & Ogata (2021) Yuan & Zhang (2024)
Adult learners	Hollander, Sabatini & Graesser (2022) Draffan, Ding, Wald & Newman (2020)

Conclusion

This systemic literature review has successfully analysed and synthesised studies associated with AI-powered tools in enhancing reading skills in the ESL classroom. This paper aspired to close the gap present in existing literature by providing insights into how artificial intelligence can be utilised in the ESL classroom, specifically for the teaching and learning of reading skills. From the analysis, it can be observed that artificial intelligence is truly unique and beneficial as it can be utilised to promote a variety of reading skills from reading comprehension, reading accuracy, critical thinking skills, pre-reading skills, reading assessment and even help enhance reading for ESL classes in special education. Moreover, there are so many AI-powered tools available today, and many more tools will continue to make use of artificial intelligence, as evident in its ability to help enhance reading skills across a variety of age groups from early childhood to adult learners.

Despite the many positive outcomes of this systemic literature review, several shortcomings still can be addressed for future reviews. First and foremost, after the process of identification, screening and eligibility, only 9 out of 67 studies were included in this systemic literature review. This can be used as evidence to show that there is a lack of research and literature available on this research topic, and many more studies need to be conducted for research to fully measure the effectiveness and potential of artificial intelligence in the future. Moreover, out of all the studies included, none were from Malaysia, which shows how new artificial intelligence still is in the Malaysian ESL landscape. More effort is highly encouraged to implement studies and research the potential of AI in the Malaysian ESL classroom, be it for reading, writing, listening, speaking or grammar skills. Thirdly, the researcher would like to encourage for future systemic literature reviews conducted on the same topic, be expanded to more databases, in order to increase the quantity of studies gathered.

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