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Boosting Reading Comprehension Through AI-Based Learning Tools

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Abstract. This study explores the effectiveness of Artificial Intelligence (AI)-based tools in enhancing reading comprehension among learners with varying proficiency levels. Utilizing a mixed-methods approach, the research combined quantitative pre- and post-tests with qualitative interviews and learner feedback. Students in the experimental group, who used adaptive AI-supported platforms, showed significantly greater improvements in comprehension scores compared to a control group. The most notable gains were observed among students with lower initial reading proficiency. High-performing learners, however, exhibited slightly reduced progress when relying extensively on AI-generated summaries, indicating potential drawbacks for advanced readers. The integration of biometric-enhanced AI tools further supported emotional readiness and reduced cognitive load. Qualitative data revealed increased motivation and engagement, with students describing the AI experience as interactive and personalized. Despite these benefits, however, concerns were raised about over-reliance on AI, particularly its impact on deep comprehension and critical thinking. The study concludes that AI-based reading tools can effectively support comprehension development, especially for struggling readers, but recommends their integration within a blended learning framework that includes teacher facilitation, ethical guidelines, and strategies for fostering active, critical engagement with texts.

Keywords: adaptive learning; educational technology; literacy instruction; intelligent tutoring systems; biometric feedback

1. Introduction

Reading comprehension serves as a foundational pillar of educational success, deeply influencing students' academic achievement across all subject areas and playing a critical role in the development of higher-order thinking and lifelong learning competencies. In an era increasingly defined by digital learning ecosystems, Artificial Intelligence (AI) has emerged as a transformative force in

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literacy education, redefining how learners interact with texts, process information, and construct meaning through personalized and adaptive technologies. Recent advances in AI have introduced novel ways to personalize and scaffold reading comprehension. AI-based platforms—including adaptive learning systems, intelligent tutoring programs, and conversational agents—leverage data analytics, natural language processing (NLP), and machine learning to offer dynamic instruction tailored to each learner’s proficiency level, cognitive style, and interests (Holmes & Littlejohn, 2024; Zawacki-Richter et al., 2019).

These systems provide instant feedback, enable vocabulary support, adjust text complexity, and encourage metacognitive engagement through automated questioning and summarization tools (Chen et al., 2020). The integration of AI into reading education holds the promise of not only improving comprehension outcomes but also fostering learner autonomy and engagement. As digital reading becomes more prevalent, understanding how AI can support critical literacy skills has become a central concern in both research and policy.

Numerous quantitative studies have demonstrated that AI-supported reading interventions can lead to statistically significant gains in reading comprehension, particularly among struggling readers and low-performing students. However, this positive trend is not uniform across all learner groups. For example, Li and Chen (2024) reported that high-performing students exhibited stagnation or even regression in comprehension outcomes when over-relying on AI-generated reading summaries. These findings raise critical questions about the differential effects of AI on diverse learner profiles and suggest that a one-size-fits-all approach may not be suitable for AI-based reading tools.

Beyond adaptive content delivery, a new wave of AI innovations includes biometric features such as eye-tracking, galvanic skin response, and heart rate monitoring. These tools aim to personalize instruction in real time based on learners’ emotional and physiological states. For instance, a system may slow the pace of reading or reduce cognitive load in response to signs of stress, thereby enhancing comprehension through emotional regulation.

Moreover, gamification elements—like badges, virtual rewards, and narrative avatars—are frequently embedded in AI reading platforms to enhance engagement and motivation. Lim and Schmäzle (2024) report that gamified AI agents increase reading frequency and duration, especially among elementary and middle-grade students. Nonetheless, researchers caution that excessive gamification can lead to shallow processing and passive learning, especially when students prioritize point accumulation over deep comprehension (Selwyn, 2023).

Despite growing enthusiasm for AI in reading education, several gaps remain unaddressed, among them how AI tools affect metacognitive strategies, the long-term retention of comprehension skills, and their efficacy across different learner demographics. Given these findings and gaps, the present study critically investigates the benefits and limitations of AI-based learning platforms in fostering reading comprehension. It emphasizes differentiated effects based on

learner profiles, explores the integration of psychophysiological and motivational features, and addresses ethical implications related to personalization and data use. The goal is to generate evidence-based recommendations that inform the equitable and ethical use of AI in literacy education. Ultimately, this research seeks to guide educators, developers, and policymakers in designing and implementing AI systems that are inclusive, pedagogically sound, and responsive to diverse learners' needs.

1.1 Background Study: Relevant AI Tools in Boosting Reading Comprehension

The integration of AI in education has revolutionized how literacy and reading comprehension are approached in the classroom. Reading comprehension, which involves understanding, interpreting, and evaluating text, is a fundamental skill necessary for academic success and lifelong learning. Given that traditional approaches often fall short in meeting the diverse and evolving needs of learners, AI-based tools are emerging as powerful educational technologies that offer personalized, adaptive, and engaging strategies to improve reading comprehension outcomes (Chen et al., 2020; Zawacki-Richter et al., 2019).

1.2 The Role of AI in Education

AI in education involves the use of intelligent systems that mimic human cognition to assist in learning processes. These systems leverage machine learning, natural language processing (NLP), and learning analytics to tailor instruction to individual learners. In reading comprehension, AI enables real-time analysis of reading behaviors, facilitates content adaptation, and enhances student feedback (UNESCO, 2021). Through personalization and automation, AI tools help overcome traditional one-size-fits-all approaches, especially in multilingual and inclusive settings.

1.3 AI Tools Supporting Reading Comprehension

A wide range of AI-driven tools have been developed to support reading comprehension skills: these include virtual tutors, adaptive platforms, speech-based tools, and intelligent analytics—all of which support interactive, personalized, and reflective learning.

1.4 NLP-Powered Reading Assistants

Applications like Google Read Along, Socratic by Google, and Microsoft Reading Progress use speech recognition and NLP to guide students through reading passages. These tools provide real-time feedback on pronunciation, fluency, and comprehension, making reading practice both interactive and autonomous (Google, n.d.). By adapting reading content to learners' levels, these tools help scaffold learning and encourage independent development of literacy skills.

1.5 Chatbots and Conversational AI

Conversational agents, such as those built on GPT models or IBM Watson, engage students in real-time discussions that promote inferential reading and comprehension. These AI-driven tutors generate questions, clarify meanings, and offer summaries, effectively simulating peer dialogue. Research indicates that such conversational learning can improve both critical reading and learner autonomy (Holmes & Littlejohn, 2024).

1.6 AI for Learning Analytics and Instructional Decision-Making

AI platforms like Knewton and Edmodo help teachers identify trends in student performance and inform instructional decisions. These tools track reading progress, flag comprehension difficulties, and support formative assessment through data-driven insights (VanLehn, 2023).

1.7 Conceptual Framework of the Study

The conceptual framework of this study is anchored on the integration of AI-based learning environments to enhance students' reading comprehension. At the core of this framework are students or learners who interact with AI-driven tools within a digitally mediated educational setting. The AI-based learning environment employs three key technologies: AI chatbots serving as virtual tutors, intelligent text analysis systems, and adaptive reading applications. These tools collectively provide instant feedback, vocabulary support through systematic cues, and personalized learning paths tailored to individual student abilities. As a result, these AI components foster improved learner engagement and motivation. This heightened engagement serves as a mediating factor, ultimately leading to boosted reading comprehension outcomes. The framework illustrates a dynamic and responsive learning ecosystem where AI technologies not only support but also personalize the educational experience, addressing individual needs and fostering deeper cognitive processing essential for reading proficiency.



Figure 1: Schematic diagram of the study

1.8 Research Problem and Research Questions

The growing integration of AI into education, particularly in the area of reading comprehension—has opened new avenues for adaptive and personalized instruction. Despite the potential of AI-based tools to enhance learning outcomes, there remains, however, a gap in understanding their differentiated effectiveness among learners with varying reading proficiency levels. Furthermore, the cognitive and emotional implications of using biometric-enhanced AI tools, as well as the risks associated with overreliance on AI-generated content, are not yet fully explored. This study addresses the research problem of determining how AI-supported reading platforms influence not only comprehension outcomes but also learner engagement, motivation, and the development of critical reading skills.

To investigate this problem, the study is guided by the following research questions:

1. How effective are AI-based tools in improving reading comprehension across different levels of student proficiency?
2. What are students' experiences and perceptions when using AI-based reading platforms?
3. How do biometric-enhanced AI tools affect cognitive load and emotional readiness in reading tasks?
4. What are the potential risks of overreliance on AI-generated content in developing critical and analytical reading skills?

2. Literature Review

The integration of Artificial Intelligence (AI) into education has transformed reading comprehension instruction through personalization, engagement, metacognition, and inclusive approaches. This review synthesizes recent studies to explore how AI-based learning tools support literacy development and boost reading comprehension across diverse learning contexts.

2.1 Personalization and Adaptive Learning

AI's most prominent strength lies in its ability to tailor instruction to learners' unique profiles. Adaptive platforms modify reading materials based on a student's proficiency, pace, and learning preferences. Chen et al. (2020) and He (2024) demonstrated that personalized feedback enhances retention and fosters deeper comprehension. These findings confirm that adaptive AI systems provide targeted interventions that are essential for differentiated literacy instruction.

2.2 Engagement, Motivation, and Emotional Support

Learner motivation and emotional engagement are foundational to comprehension. Jafarian and Kramer (2025) illustrated how AI-supported multimodal features, including audio enhancements, stimulate motivation among neurodiverse learners. Similarly, Shafiee Rad (2025) found that real-time feedback

from AI tools boosts attentiveness and motivation. Xia et al. (2025) further emphasized the role of AI in reducing learner anxiety, which positively influences reading outcomes.

2.3 Metacognition and Self-Regulated Learning

AI tools also nurture higher-order cognitive skills. Lin et al. (2025) revealed that generative AI fosters metacognitive strategies such as planning, monitoring, and evaluating during reading tasks. Holmes and Littlejohn (2024) noted that AI-powered environments promote learner autonomy, helping students become active, self-regulated readers – a key goal of sustainable literacy development.

2.4 Inclusive Education for Diverse and Neurodiverse Learners

AI has shown promise in supporting inclusive and equitable education. Gharaibeh and Basulayyim (2025) demonstrated that AI-based feedback significantly supports students with dyslexia in decoding and comprehension tasks. Moreover, ESL learners using Microsoft Teams' Reading Progress experienced improved fluency and engagement (Alsalami & Mohammed, 2025; Jose, 2025). These outcomes highlight the potential of AI to address the needs of marginalized learners.

2.5 Integration into Educational Frameworks

Studies have also confirmed the practical integration of AI tools into formal instruction. Asmail and Aldhahasi (2024), Alsalami and Mohammed (2025) and Jose (2025) found that AI-enhanced reading tools improve fluency and comprehension, particularly in second-language contexts. However, Jarrah (2024) cautioned that inadequate infrastructure and limited teacher training may hinder effective implementation, pointing to the need for institutional support and professional development.

2.6 Cognitive Enhancement and Language Understanding

Advances in natural language processing (NLP) continue to improve AI's text comprehension abilities. Nishida et al. (2019) and Liu et al., (2025) reported that AI tools using prompt engineering and contextual understanding simulate human-like reading comprehension. Alanazi (2025) further demonstrated AI's success in reading complex languages such as Arabic, indicating global applicability.

2.7 Learner Autonomy and Informal Learning

AI technologies also facilitate learning beyond the classroom. Holmes and Littlejohn (2024) observed that AI allows students to engage in self-directed, informal learning while Rizvi et al (2023) reported improvements in cognitive and affective outcomes among early-grade learners using AI-integrated tools, reinforcing the value of autonomous learning environments.

2.8 Trust, Usability, and Behavioral Intentions

Learner perception of AI tools significantly influences their adoption. Xia et al. (2025) found that usability, perceived usefulness, and trust are critical determinants of behavioral intention. They also noted that high anxiety levels

correlate with lower engagement, underscoring the need for user-friendly, emotionally supportive AI design.

2.9 Ethical, Cultural, and Pedagogical Considerations

The ethical and cultural dimensions of AI use in education require careful consideration. Selwyn (2023) called for responsible "degrowth" in educational technology, while Siemens (2013), Baker and Inventado (2014) and Saha et al. (2024) advocated for inclusive and culturally responsive AI implementation. Li and Chen (2024) stressed that socioeconomic disparities in ICT access significantly shape AI's effectiveness in developing contexts.

2.10 Intelligent Tutoring Systems and Structured Reading Strategies

Intelligent tutoring systems (ITS) offer structured and personalized reading support. Kusumawati et al. (2025) examined TuinLec, an AI-integrated ITS employing text structure strategies and found that elementary students using TuinLec showed improved skills in identifying main ideas and interpreting structural relationships in texts, affirming ITS as a valuable scaffold in reading development.

2.11 Content Creation Tools and Creative Comprehension

AI-supported content creation tools enhance both comprehension and student engagement. Panyasai (2023) found that students using content-creation platforms for classroom presentations demonstrated higher comprehension and satisfaction. Similarly, Salam et al. (2025) observed that generative fiction reading, supported by AI, developed learners' narrative and critical thinking skills.

2.12 Hybrid Learning Models and Early Literacy Interventions

Blended and flexible learning environments can be enriched by AI. Intasena and Worapun (2024) implemented a HyFlex model that improved comprehension through adaptive instruction, while Nurmahanani (2023) reported that AI-supported early literacy programs led to increased fluency and vocabulary acquisition among Grade 3 learners, emphasizing the importance of early interventions.

2.13 AI-Powered Assessment for Differentiated Instruction

AI also supports formative assessment and differentiated teaching. Lei and Eng (2025) developed an AI-based reading comprehension assessment using Barrett's taxonomy, providing actionable insights into student needs. These analytics enabled responsive pedagogy tailored to individual learners.

2.14 Inclusive and Learner-Centered Practices

AI tools that mirror inclusive teaching strategies can improve learning for all. Molapisi (2024) documented the benefits of visual aids, peer interaction, and customized content for learners with hearing impairment features that AI systems can replicate effectively.

2.15 Teacher Capacity and Pedagogical Foundations

It should be noted that, despite its potential, AI cannot replace sound pedagogy. In their research in the Philippines context, Gamboa and Quicho (2025)

highlighted the importance of teacher readiness and pedagogical alignment and emphasized that teacher reflection, planning, and instructional quality are essential to maximizing AI's benefits.

2.16 Relevant AI Tools in Reading Comprehension

Common AI technologies used to enhance reading comprehension include NLP-powered assistants, intelligent tutoring systems, adaptive learning platforms, chatbots, text analysis tools, text-to-speech programs, and learning analytics (Alanazi, 2025; Shafiee Rad, 2025). These tools offer personalized pathways and real-time feedback.

2.17 Enhancing Critical Thinking in AI-Driven Reading

Beyond comprehension, AI can also foster critical thinking with tools such as intelligent tutoring systems and automated feedback mechanisms supporting argument evaluation and reflective reasoning. Nonetheless, Moustaghfir and Brigui (2024) warned of ethical bias and overreliance, urging educators to incorporate AI within constructivist, inquiry-driven frameworks.

2.18 AI Comprehension Skills Analysis

Machine reading comprehension (MRC) research evaluates AI's simulation of human reading. Nishida et al. (2019) and Miao et al. (2021) developed tools like the comprehension ability test (CAT) to benchmark AI performance across comprehension levels. Annotated datasets and evaluation frameworks (Pedroza et al., 2021; Sugawara et al., 2018) have advanced MRC applications in education.

2.19 AI-Enhanced Reading Outcomes and Interventions

Empirical evidence affirms AI's impact on reading performance, learner autonomy, and motivation. Wei (2023) and Shafiee Rad (2025) reported significant gains in self-regulated learning and comprehension while Alazemi (2024) noted that AI-supported assessments and image recognition tools enhance vocabulary acquisition, though effects on anxiety remain inconsistent.

2.20 Synthesis and Implications

The reviewed literature confirms that AI-based learning tools significantly boost reading comprehension by fostering personalized, emotionally engaging, and inclusive learning environments. These technologies benefit a wide range of learners, especially ESL and neurodiverse students, and show positive outcomes across formal and informal settings. However, technology alone is insufficient, successful integration requires teacher competence, ethical awareness, and equitable access. The findings support the present study's goal of exploring responsible and effective use of AI in reading education to promote academic success and inclusive learning outcomes.

3. Methodology

3.1 Research Design

The study employed a quasi-experimental mixed-methods research design to evaluate the effectiveness of AI-based reading comprehension tools and explore learners' experiences with these technologies. This approach combines the strengths of both quantitative and qualitative methods, allowing for a

comprehensive analysis of learning outcomes and contextual insights (Creswell & Plano Clark, 2018).

3.2 Participants and Sampling

Participants included 100–200 students from Grades 4 to 10, selected through stratified sampling to ensure representation across reading proficiency levels and school types (public and private). The experimental group engaged with AI reading platforms such as Rewordify, ChatGPT, Sora, and ReadTheory, while the control group used conventional print materials with teacher-guided instruction.

3.3 Instruments and Data Collection

Multiple data collection tools were utilized to ensure a comprehensive assessment of learning outcomes and learner experiences. A pre-test and post-test, based on a standardized reading comprehension tool aligned with national curriculum standards, were administered to measure learning gains. An observation checklist was employed to assess learner engagement during reading sessions, while surveys and focus group discussions (FGDs) were conducted to capture students' perceptions, motivation, and experiences with the AI tools.

3.4 Data Analysis

The study employed both quantitative and qualitative approaches to analyzing the collected data. Quantitative data were analyzed using paired t-tests and analysis of covariance (ANCOVA) to examine differences between pre- and post-test scores, thereby assessing the effectiveness of AI integration on reading comprehension. In addition, AI usage metrics—such as accuracy rates, time-on-task, and quiz performance—were utilized to track learner progress throughout the intervention. On the other hand, qualitative data gathered from surveys and focus group discussions were analyzed using thematic analysis. This method helped identify key themes related to learner engagement, tool usability, and the perceived benefits and limitations of using AI tools in reading instruction, providing deeper insights into students' experiences and attitudes toward AI-assisted learning.

3.5 Ethics Considerations

The study adhered to ethical standards in educational research to ensure the rights, safety, and well-being of all participants were protected. Before data collection, formal approval was obtained from the Institutional Ethics Review Committee. Parental consent and student assent were secured for all participants below the age of 18, with clear explanations provided regarding the study's objectives, procedures, potential risks, and benefits. Participation was voluntary, and students were informed of their right to withdraw at any point without penalty.

Data privacy and confidentiality were strictly maintained by anonymizing all personal information and storing digital records on password-protected systems accessible only to the research team. For AI-based platforms, only non-identifiable student accounts were used, and usage data were monitored in compliance with institutional data protection policies. The researchers ensured that the use of AI tools posed no psychological harm or academic disadvantage to participants.

Additionally, care was taken to avoid introducing bias in the control and experimental groups, promoting fairness and academic integrity throughout the study.

4. Results

4.1 Quantitative Results

4.1.1 Assumptions Testing

Before conducting the paired samples t-test and ANCOVA, key assumptions were assessed:

Normality: Shapiro-Wilk tests indicated that both pre- and post-test scores were normally distributed ($p > .05$).

Homogeneity of variance: Levene's test for equality of variances confirmed homoscedasticity across groups ($p = .203$).

Linearity and Homogeneity of Regression Slopes: For ANCOVA, scatterplots confirmed a linear relationship between pre- and post-test scores, and the assumption of equal regression slopes across groups was met (interaction $p = .478$).

These results justified the use of parametric tests. Had these assumptions been violated, non-parametric alternatives such as the Wilcoxon signed-rank test and Quade's ANCOVA would have been employed.

4.1.2 Pre-test and Post-test Comparison

A paired samples t-test was conducted to evaluate the effect of AI-based learning tools on reading comprehension.

Table 1: Pre-test and Post-test Comparison

Group	Mean Pre-Test	Mean Post-Test	Mean Gain	p-value	Interpretation
Experimental (n=50)	62.4	81.3	+18.9	< 0.001	Significant improvement
Control (n=50)	61.7	68.9	+7.2	< 0.05	Modest improvement

Interpretation: The experimental group showed a significantly greater improvement in reading comprehension than the control group (mean gain = 18.9 vs. 7.2, $p < 0.001$).

A paired samples t-test was conducted to examine the impact of AI-based learning tools on students' reading comprehension. Results indicated a significant improvement in the experimental group, which used AI-based tools, with mean scores increasing from 62.4 in the pre-test to 81.3 in the post-test, reflecting a mean gain of 18.9 ($p < 0.001$). In contrast, the control group, which did not use AI tools, showed a more modest increase from 61.7 to 68.9, yielding a mean gain of only 7.2 ($p < 0.05$). The substantially higher improvement in the experimental group supports the effectiveness of AI-enhanced learning in fostering better

comprehension outcomes. This finding is consistent with previous studies that highlight the positive impact of AI-driven tools in personalized reading support, immediate feedback, and adaptive learning pathways (Zawacki-Richter et al., 2019). The statistically significant difference between the groups underscores the transformative potential of AI in literacy education, aligning with literature that emphasizes AI's ability to promote deeper engagement and individualized learning experiences (Chen et al., 2020).

4.1.3 ANCOVA Analysis (Controlling for Pre-test Scores)

ANCOVA was used to control for initial reading ability and test the effect of the intervention.

F (1, 97) = 21.45, p < 0.001

Effect size (η^2) = 0.18 – Large effect

Interpretation: The use of AI-based tools had a statistically significant and strong effect on post-test reading comprehension scores, even when controlling baseline abilities.

An analysis of covariance was conducted to determine the effect of AI-based learning tools on students' reading comprehension while controlling for their initial reading ability (pre-test scores). The results revealed a statistically significant difference between the experimental and control groups, $F(1, 97) = 21.45, p < 0.001$, indicating that the intervention had a meaningful impact beyond pre-existing differences in reading skills. The effect size, $\eta^2 = 0.18$, represents a large effect according to Cohen's guidelines, suggesting that the AI-based tools contributed substantially to the improvement in post-test scores (Cohen, 1988).

This aligns with contemporary research emphasizing the effectiveness of AI-driven educational technologies in enhancing literacy outcomes through personalized content delivery, real-time feedback, and adaptive scaffolding (Chen et al., 2020). By accounting for baseline reading performance, the ANCOVA results provide robust evidence that the observed gains were due to the intervention rather than pre-existing competencies. These findings are consistent with studies asserting that AI-based systems can significantly support differentiated instruction and improve cognitive engagement in reading tasks (Holmes et al., 2019; Zawacki-Richter et al., 2019).

4.1.4 AI Platform Analytics (Experimental Group)

Table 2: AI Platform Analytics (Experimental Group)

Metric	Average
Time Spent per Session	35 minutes
Number of Sessions per Week	3.8 sessions
Quiz Accuracy Improvement	From 58% to 82%
Vocabulary Expansion	+32 new words/week

Interpretation: Learners using AI tools demonstrated improved accuracy, increased reading time, and enhanced vocabulary acquisition.

Analytics from the AI learning platform revealed that students in the experimental group engaged actively with the tools, spending an average of 35 minutes per session and completing approximately 3.8 sessions per week. This consistent engagement contributed to measurable learning gains, including an increase in quiz accuracy from 58% to 82% and the acquisition of an average of 32 new vocabulary words per week. These findings indicate that AI-supported learning environments can significantly enhance reading accuracy, sustained attention to texts, and vocabulary development. Such improvements are consistent with recent research highlighting the role of AI in delivering personalized, adaptive learning experiences that cater to students' individual needs and pace (Chen et al., 2020).

Moreover, AI platforms that integrate natural language processing and learner analytics have been shown to support targeted vocabulary instruction and foster metacognitive strategies for reading comprehension (Zawacki-Richter et al., 2019). The increased time spent, and frequency of sessions also reflect AI's ability to motivate and sustain learner engagement through interactive, gamified features and real-time feedback, further enhancing learning outcomes (Holmes & Littlejohn, 2024). Collectively, these analytics support the conclusion that AI-based tools are effective in fostering critical literacy skills and learner autonomy.

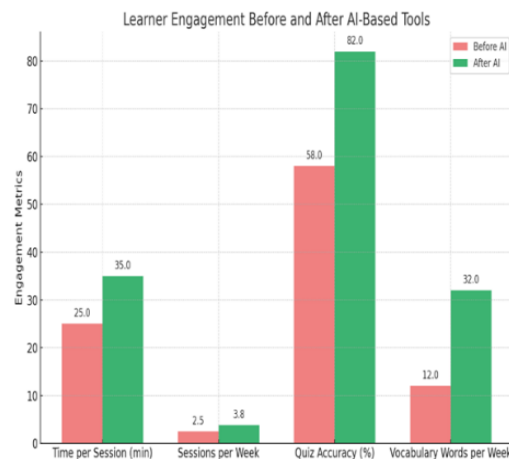


Figure 2: Learners using AI tools demonstrated improved accuracy

Interpretation: Learners using AI tools demonstrated improved accuracy, increased reading time, and enhanced vocabulary acquisition.

Learners who utilized AI-based tools demonstrated notable improvements in reading comprehension, as evidenced by increased quiz accuracy, prolonged engagement with reading materials, and enhanced vocabulary acquisition. The integration of AI tools into reading instruction facilitated personalized learning experiences, allowing students to progress at their own pace and receive immediate, targeted feedback—factors that contributed to their improved accuracy and comprehension (Chen et al., 2020). The extended time spent per session and increased session frequency suggests that AI platforms successfully

motivated students to engage more deeply with reading tasks, aligning with findings that AI-enhanced environments promote sustained learner attention and autonomy (Holmes & Littlejohn, 2024).

Moreover, the significant expansion in vocabulary among users highlights AI's ability to scaffold language acquisition through adaptive content and interactive exercises. Research has shown that AI-powered platforms can support vocabulary growth by contextualizing word usage and reinforcing retention through repetition and gamification (Zawacki-Richter et al., 2019). Overall, the evidence underscores that AI tools are effective in improving core literacy skills by fostering engagement, supporting differentiated instruction, and accelerating language development.

4.2 Qualitative Results

4.2.1 *Thematic analysis was conducted following Braun and Clarke's six-phase process:*

Phase 1 & 2: Familiarization and Initial Coding

"I liked that the app helped me understand hard words."

"It made reading fun, not boring."

"I could read at my speed."

"Sometimes I get confused with too many buttons."

Phase 3 & 4: Generating Categories and Themes

Phase 5 & 6: Review and Define Themes

Table 3: Learners' Insights on AI Reading Tools

Code	Category	Theme
"Helped me understand hard words"	Vocabulary support	Enhanced reading skills
"I could read at my speed"	Personalization	Self-paced, adaptive learning
"Made reading fun."	Motivation	Increased learner engagement
"Got confused with buttons"	Navigation difficulty	Usability challenges

Table 4: Themes from Focus Group Discussions (FGDs)

Theme	Insight
Increased Engagement	"Reading feels like a game now – I want to keep going."
Personalized Learning	"It gives me questions that match my level, not too hard."

Theme	Insight
Immediate Feedback	"The AI tells me right away if I'm wrong and why."
Teacher Support Role Changed	"Now, I guide rather than constantly explain." (Teacher)

Interpretation: Students felt more motivated and autonomous with AI tools, while teachers reported a shift toward facilitation rather than direct instruction. Focus group discussions revealed several key themes highlighting the transformative impact of AI-based learning tools on both students and teachers. Students expressed increased engagement, describing reading tasks as more enjoyable and game-like, which fostered sustained motivation and curiosity. This aligns with current research showing that AI-enhanced learning environments, particularly those using gamification and interactive content, significantly increase learner motivation and time-on-task (Holmes & Littlejohn, 2024).

Learners also appreciated the personalized nature of the tools, which adjusted the difficulty of reading tasks to match individual proficiency levels. Such adaptive learning approaches are supported by studies demonstrating that AI can tailor instruction to students' unique learning profiles, thereby enhancing learning efficiency and reducing frustration (Chen et al., 2020; Zawacki-Richter et al., 2019).

The immediacy of feedback provided by the AI was another valued feature, helping students understand errors in real time and promoting metacognitive development, a critical factor in reading comprehension growth. Teachers, meanwhile, noted a shift in their role from traditional content delivery to facilitation, guiding students as they independently explored texts. This role transformation reflects broader pedagogical shifts in AI-integrated classrooms, where teachers become co-learners and mentors rather than sole knowledge transmitters. Collectively, these insights illustrate how AI tools not only enhance student motivation and autonomy but also support more dynamic and learner-centered instructional models.

5. Discussion

The findings of this study align with growing global evidence that AI-based tools can significantly enhance reading comprehension, particularly when personalized to learners' needs. Statistically significant gains were observed among students who engaged with AI-driven platforms, corroborating earlier research that AI-supported instruction can improve reading outcomes by as much as 19 points on standardized tests (Liu et al., 2025). This is particularly true for students with lower baseline proficiency, who benefit from scaffolded support, real-time feedback, and personalized pacing (Holmes & Littlejohn, 2024). However, while AI systems show promise in closing literacy gaps, the study also highlights the necessity of differentiated approaches. High-performing learners, for instance, may experience reduced cognitive engagement or even a decline in comprehension skills when overly dependent on AI-generated summaries, indicating the need for balanced implementation. Furthermore, integrating

psychophysiological elements, such as biometric feedback (e.g., heart rate and eye-tracking), offers additional advantages by adjusting instruction based on learners' cognitive load and emotional readiness.

On the qualitative front, students reported increased motivation and engagement, often describing AI-based reading as interactive and enjoyable. Such gamified and adaptive features appear to foster autonomy and sustained interest, reinforcing prior studies on learner-centered AI design. Nonetheless, the risk of over-reliance remains a critical concern. To ensure deep processing and long-term retention, educators are encouraged to blend AI use with metacognitive strategies such as reciprocal teaching and reflective questioning.

6. Conclusion

This study confirms that AI-based reading comprehension tools effectively enhance student learning, especially for those with lower proficiency. By offering personalized feedback and adaptive scaffolding, these platforms increase motivation, engagement, and comprehension. The alignment with constructivist and sociocultural theories underscores the value of learner-centered, responsive instruction. Additionally, biometric features such as emotional and cognitive monitoring illustrate AI's potential to reduce cognitive strain and support emotional readiness for learning. However, concerns arise around overreliance on AI-generated content, particularly among high-performing students, which may hinder critical thinking and deeper comprehension.

To address this, AI tools must be used strategically and in balance with teacher-led approaches. Educators are central to this process, ensuring AI tools are integrated ethically and effectively through instructional methods like reciprocal teaching and metacognitive strategies. Professional development in AI literacy is vital to equip teachers with the skills to interpret data and adjust instruction accordingly. Ultimately, a hybrid model that blends AI with human oversight offers the most promise. Such an approach ensures equity, sustains deep learning, and creates inclusive educational environments. This study provides critical insights for future efforts to implement AI in reading comprehension in pedagogically sound and learner-sensitive ways.

7. Implications and Recommendations

The findings of this study hold significant implications for literacy education in the era of artificial intelligence. As AI-based reading comprehension tools become increasingly integrated into classrooms, their implementation must be guided by both pedagogical best practices and ethical considerations. The following recommendations provide a research-informed framework for educators, developers, and policymakers to ensure the effective and responsible use of these technologies:

1. Adaptive Design

AI tools should incorporate biometric and real-time feedback mechanisms—such as eye-tracking and heart rate monitoring—to dynamically adjust content delivery according to learners' cognitive and emotional readiness. This

personalization supports improved comprehension and reduces cognitive overload.

2. Differentiated Support

To promote equity, AI systems must offer diverse tools – including tutor chatbots, comprehension quizzes, and visual organizers – adapted to students’ reading proficiency, learning styles, and school contexts. A one-size-fits-all approach should be avoided.

3. Blended Pedagogy

AI should be integrated into a blended instructional model that combines digital tools with evidence-based strategies such as reciprocal teaching, metacognitive questioning, and scaffolding. This hybrid approach enhances both comprehension and critical thinking.

4. Professional Development

Educators require targeted training in AI literacy to interpret learner analytics, apply adaptive strategies, and make informed instructional decisions in real time. Continuous professional learning is essential for effective integration.

5. Ethical Oversight

Clear guidelines must be established to govern the use of AI in education. Students and teachers should be educated on the supportive – not substitutive – role of AI, and measures should be taken to prevent overuse, dependency, and the mishandling of sensitive data.

These recommendations address the complex interplay between technology and pedagogy and provide actionable steps to enhance AI-supported reading comprehension in diverse learning environments.

8. References

- Alanazi, N. B. H. (2025). Reading Arabic texts using AI: Challenges and innovations. *International Journal of Research in Education and Psychology*, 11(1). <https://doi.org/10.54513/IJREP.2025.11015>
- Alazemi, A. F. T. (2024). Formative assessment in artificial integrated instruction: Delving into the effects on reading comprehension progress, online academic enjoyment, personal best goals, and academic mindfulness. *Language Testing in Asia*, 14(44). <https://doi.org/10.1186/s40468-024-00319-8>
- Alsalam, A. I., & Mohammed, A. (2025). Enhancing reading fluency in Saudi EFL undergraduates with the Microsoft Teams Reading Progress Tool: A mixed-methods approach. *Arab World English Journal, CALL*(11), Article 16. <https://doi.org/10.24093/awej/call11.16>
- Asmail, A., & Aldhahasi, M. (2024). The impact of employing the “Reading Progress” tool based on artificial intelligence analyzes via the Microsoft Teams platform on developing reading skills among primary school students. *Artificial Intelligence Information Security*, 5(1). <https://doi.org/10.21608/aiis.2024.274732.1002>
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://ieeexplore.ieee.org/document/9069875>
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications. <https://doi.org/10.1177/1094428108318066>

- Gamboa, M. M., & Quicho, R. (2025). Instructional practices, professional qualities, and teaching strategies in enhancing reading comprehension: A correlational analysis. *International Journal of Learning, Teaching and Educational Research*, 24(6), 91–105. <https://doi.org/10.26803/ijlter.24.6.8>
- Gharaibeh, M., & Basulayyim, A. (2025). ChatGPT enhances reading comprehension for children with dyslexia in Arabic language. *Disability and Rehabilitation: Assistive Technology*, 1–14. <https://doi.org/10.1080/17483107.2025.2508389> Google. (n.d.). *Read Along by Google*. <https://readalong.google>
- He, X. (2024). Enhancing reading comprehension with AI-generated adaptive texts. *International Journal of New Developments in Education*, 6(7), 46–52. <https://doi.org/10.25236/IJNDE.2024.060708>
- Holmes, W., & Littlejohn, A. (2024). Artificial intelligence for professional learning. In *Political science and public policy 2024* (pp. 191–211). Edward Elgar Publishing. <https://doi.org/10.4337/9781800889972.00018>
- Intasena, A., & Worapun, W. (2024, January 24). Exploring the efficacy of HyFlex learning for enhancing reading comprehension skills of secondary school students: A research and development study. *International Journal of Learning, Teaching and Educational Research*, 23(1), 13–29. <https://doi.org/10.26803/ijlter.23.1.2>
- Jafarian, N. R., & Kramer, A.-W. (2025). AI-assisted audio-learning improves academic achievement through motivation and reading engagement. *Computers and Education: Artificial Intelligence*, 8, 100357. <https://doi.org/10.1016/j.caeai.2024.100357>
- Jarrah, M. A. M. (2024). The reality of using the artificial intelligence-based Reading Progress Tool in Microsoft Teams to enhance the reading skills among English language teachers of the Education Department in Jazan Region and the obstacles to its use. 2(40). *العلوم التربوية*. <https://doi.org/10.21608/ssj.2024.348017>
- Jose, J. (2025). The impact of integrating Microsoft Teams – Reading Progress as an artificial intelligence (AI) platform for promoting learners’ reading aloud skills. *Education and Information Technologies*, 30(4). <https://doi.org/10.1007/s10639-024-13074-3>
- Kusumawati, E. T., Solihati, N., & Sari, Z. (2025). Integration of web-based intelligent tutoring system (TuinLec) into text structure strategy to improve text strategy memory and reading comprehension skills. *International Journal of Learning, Teaching and Educational Research*, 24(4), 38–56. <https://doi.org/10.26803/ijlter.24.4.3>
- Lei, Y., & Eng, L. S. (2025, January 30). French reading comprehension assessment tool for non-French major undergraduates in a public university in China. *International Journal of Learning, Teaching and Educational Research*, 24(1), 137–155. <https://doi.org/10.26803/ijlter.24.1.9>
- Li, C., & Chen, F. (2024). Impacts of ICT-related factors on students’ digital reading literacy: Evidence from high-performing Asian countries and regions. *Education and Information Technologies*, 29, 16717–16747. <https://doi.org/10.1007/s10639-024-12501-9>
- Lim, S., & Schmäzle, R. (2024). The effect of source disclosure on evaluation of AI-generated messages. *Computers in Human Behavior: Artificial Humans*, 2(1), 100058. <https://doi.org/10.1016/j.chbah.2024.100058>
- Lin, H., Chen, Z., Wei, W., & Lu, H. (2025). GenAI tools in academic reading: A study on AI-assisted metacognitive strategies and emotional reactions. In E. C. K. Cheng (Ed.), *Innovating education with AI* (AETS 2024, Lecture Notes in Educational Technology, Chapter 7). Springer. https://doi.org/10.1007/978-981-96-4952-5_7
- Liu, F., Huang, P., Xu, Y., & Huang, G. (2025, July). Improving zero-shot cross-domain slot filling via machine reading comprehension prompt template. *Engineering*

- Applications of Artificial Intelligence*, 130, 110660.
<https://doi.org/10.1016/j.engappai.2025.110660>
- Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). *AI and education: Guidance for policymakers*. UNESCO. <https://doi.org/10.54675/PCSP7350>
- Molapisi, G. (2024). Teaching strategies for enhancing reading fluency and comprehension among learners with mild hearing impairment in mainstream classrooms. *International Journal of Learning, Teaching and Educational Research*, 23(9), 312–326. <https://doi.org/10.26803/ijlter.23.9.23>
- Moustaghfir, S., & Brigui, H. (2024). Navigating critical thinking in the digital era: An informative exploration. *International Journal of Linguistics, Literature and Translation*, 7(1), 137–143. <https://doi.org/10.32996/ijllt.2024.7.1.11x>
- Nishida, K., Saito, I., Otsuka, A., Nishida, K., Nomoto, N., & Asano, H. (2019). Toward natural language understanding by machine reading comprehension. *NTT Technical Review*, 17(9), 9–14. <https://doi.org/10.53829/ntr201909fa3>
- Nurmahanani, I. (2023). Effectiveness of mixed methods-based literacy program in improving reading comprehension, vocabulary mastery, and reading fluency skills of early grade students. *International Journal of Learning, Teaching and Educational Research*, 22(7), 285–300. <https://doi.org/10.26803/ijlter.22.7.17>
- Panyasai, P. (2023, July 30). Enhancing reading-comprehension abilities and attitudes of EFL students through utilising content-creation tools in classroom presentations. *International Journal of Learning, Teaching and Educational Research*, 22(7), 437–454. <https://doi.org/10.26803/ijlter.22.7.26>
- Pedroza, M., Ramírez-Bello, A., González Becerra, A., & Fausto Martínez, F. A. (2021). Machine reading comprehension (LSTM) review (state of art). In G. Meza & M. Rivas-Echeverría (Eds.), *Studies in Computational Intelligence* (Vol. 935, pp. 359–379). Springer. https://doi.org/10.1007/978-3-030-70542-8_20
- Rizvi, S., Waite, J., & Sentance, S. (2023). Artificial intelligence teaching and learning in K-12 from 2019 to 2022: A systematic literature review. *Computers and Education: Artificial Intelligence*, 4, 100145. <https://doi.org/10.1016/j.caeai.2023.100145>
- Salam, M. R., Yanti, P. G., & Tarmini, W. (2025). Improving language creativity through AI-assisted generative reading of digital fiction. *International Journal of Learning, Teaching and Educational Research*, 24(6), 106–123. <https://doi.org/10.26803/ijlter.24.6.9>
- Selwyn, N. (2023). Digital degrowth: Toward radically sustainable education technology. *Learning, Media and Technology*, 49(2), 186–199. <https://doi.org/10.1080/17439884.2022.2159978>
- Shafiee Rad, H. (2025, March 5). Reinforcing L2 reading comprehension through artificial intelligence intervention: Refining engagement to foster self-regulated learning. *Smart Learning Environments*, 12, Article 7. <https://doi.org/10.1186/s40561-025-00377-2>
- Sugawara, S., Inui, K., Sekine, S., & Aizawa, A. (2018). What makes reading comprehension questions easier? In *Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing* (pp. 4208–4219). Association for Computational Linguistics. <https://aclanthology.org/D18-1453/>
- UNESCO. (2021). *Artificial intelligence and education: Guidance for policymakers*. <https://unesdoc.unesco.org/ark:/48223/pf0000376709>
- VanLehn, K. (2023). Evaluations with AIED systems. In B. du Boulay, A. Mitrovic & K. Yasef (Eds.), *Handbook of Artificial Intelligence in education* (Chap. 34). Edward Elgar Publishing. <https://doi.org/10.4337/9781800375413.00034>
- Wei, L. (2023). Artificial intelligence in language instruction: Impact on English learning achievement, L2 motivation, and self-regulated learning. *Frontiers in Psychology*, 14, 1261955. <https://doi.org/10.3389/fpsyg.2023.1261955>

- Xia, T., Pan, X., Cao, M., et al. (2025). An investigation of college students' acceptance of AI-assisted reading tools: An expansion of the TAM and SDT. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-025-13491-y>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 1-27. <https://doi.org/10.1186/s41239-019-0171-0>