Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index

OPEN ACCESS Article

Enhancing University Students' Reading Comprehension through AI-Supported Scaffolding with ChatGPT

https://doi.org/10.31004/jele.v11i5.3048

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A B S T R A C T

This quasi-experimental study investigated the effects of ChatGPT-supported pre-reading scaffolding on the English reading comprehension of university students. Forty-eight students from Universitas Nusantara PGRI Kediri participated in the study and were assigned to an experimental group receiving ChatGPT-supported pre-reading scaffolding and a control group receiving traditional teacher-led instruction over one academic semester. The intervention consisted of structured pre-reading activities involving vocabulary pre-teaching, background knowledge activation, predictive questioning, and interactive clarification through ChatGPT. These activities were designed to prepare students for reading by activating prior knowledge, developing relevant vocabulary, and establishing content schemata before engagement with target texts. Reading comprehension outcomes were analyzed using ANCOVA. The results showed that the experimental group significantly outperformed the control group, $F(1, 63) = 5.06$, $p = 0.02$, partial $\eta^2 = 0.07$, indicating a significant effect of ChatGPT-supported pre-reading scaffolding on students' reading comprehension. The findings suggest that ChatGPT can serve as a complementary scaffolding tool that supports vocabulary preparation, background knowledge activation, and individualized pre-reading support. However, its integration should remain guided by teacher expertise to ensure effective and responsible use in EFL reading instruction.

Keywords: *AI ChatGPT, Scaffolding, Reading, EFL*

Article History:
Received 17th July 2026
Accepted 01st September 2026
Published 05th September 2026

INTRODUCTION

Reading comprehension constitutes a cornerstone of academic success in higher education, particularly for English as a Foreign Language (EFL) learners who must navigate extensive English-medium academic texts. For university students, proficient reading comprehension is not merely a linguistic skill but a critical academic competency that enables access to disciplinary knowledge, engagement with scholarly discourse, and successful completion of academic programs (Marineth, 2023; Mislaini, 2015). However, developing robust reading comprehension abilities presents significant challenges for EFL learners, who often struggle with decoding complex texts, making inferences, and integrating prior knowledge with new information (Alrasheedi, 2025). These difficulties are compounded by traditional pedagogical approaches that frequently rely on teacher-centered instruction and limited authentic textual exposure, thereby restricting learners' opportunities for meaningful engagement with reading materials (Ijalba & Obler, 2015; Li et al., 2019; Yunus et al., 2013).

The integration of artificial intelligence (AI) into second language education has opened new possibilities for addressing these pedagogical challenges. Generative AI tools, particularly ChatGPT, have demonstrated considerable potential in supporting personalized and adaptive instruction across various language skills (Lin et al., 2025). While AI applications have been extensively explored in writing and feedback contexts, their application in reading instruction—specifically in pre-reading scaffolding—remains relatively underexplored (Lin et al., 2025). This gap in the literature is notable given that ChatGPT's capacity for interactive

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dialogue, adaptive questioning, and content generation aligns naturally with the scaffolding principles essential for effective reading comprehension instruction.

The rapid proliferation of generative artificial intelligence (AI) in educational contexts has precipitated a paradigm shift in second language (L2) pedagogy, with OpenAI's ChatGPT emerging as a particularly influential tool (Fang & Han, 2025). The nascent body of empirical research, concentrated largely between 2023 and 2026, has begun to systematically delineate both the affordances and constraints of this technology for language learning. Meta-analytical evidence suggests that generative AI chatbots exert a moderate-to-large positive effect on L2 acquisition outcomes, although this impact is significantly moderated by factors such as the target language, specific learning objectives, and the duration of instructional intervention (Li et al., 2025). Concurrently, systematic reviews have corroborated these quantitative findings, identifying ChatGPT's primary advantages in enhancing writing proficiency, fostering learner autonomy, and delivering personalized, on-demand linguistic support (Okafor, 2025). Empirical studies further indicate that learners themselves perceive ChatGPT as a highly valuable resource, particularly for self-directed vocabulary building and grammar correction outside formal classroom environments (Alshayban, 2026; Barabad & Anwar, 2025), with students in some contexts unanimously reporting its indispensability for developing writing skills (Learning, 2025). However, this burgeoning literature is not without its caveats; researchers have consistently raised concerns regarding output inaccuracies, the potential for learner over-reliance, and unresolved ethical dilemmas surrounding academic integrity and data privacy (Okafor, 2025; The Use of ChatGPT in English Language Learning, 2025).

Despite these promising initial findings, a closer examination of the extant literature reveals several critical lacunae that warrant scholarly attention. First, the overwhelming majority of empirical investigations have been cross-sectional in design, relying heavily on self-reported perceptions, attitudinal surveys, and short-term interventions that capture only immediate, rather than sustained, learning gains (Dizon, 2024; Han, 2024). This methodological preponderance limits the generalizability of findings and offers little insight into the longitudinal developmental trajectories of learners who integrate ChatGPT into their regular study routines over extended periods. Second, the research landscape remains disproportionately skewed towards the cultivation of receptive and written productive skills, with vocabulary acquisition and grammatical accuracy receiving the bulk of investigative focus (Alshayban, 2026; Barabad & Anwar, 2025). Conversely, the potential of ChatGPT to facilitate oral proficiency, interactive communication, and pragmatic competence—cornerstones of communicative language teaching—remains severely underexplored, partly due to the text-based nature of the interface and the nascent development of its multimodal capabilities. Third, and perhaps most significantly, existing studies have largely treated ChatGPT as a monolithic entity, neglecting to examine how specific interactional strategies, prompt engineering techniques, or task designs moderate the quality and effectiveness of learner-chatbot exchanges (Fang & Han, 2025; Li et al., 2025). This oversight is particularly consequential given that the pedagogical value of generative AI is not inherent to the technology itself but is instead co-constructed through the dynamic interplay between learner agency, instructional scaffolding, and the discursive practices enacted during human-AI interaction. Moreover, a persistent call for more rigorous, ecologically valid, and theoretically grounded research remains paramount to move beyond exploratory findings towards evidence-based pedagogical integration (Han, 2024).

In response to these identified gaps, the present study adopts a mixed-methods longitudinal design to investigate the integration of ChatGPT into authentic L2 learning contexts over a full academic semester. Specifically, this research pursues three interconnected objectives: (a) to quantitatively assess the differential effects of ChatGPT-assisted instruction on the development of both written and oral proficiency, as measured by standardized pre- and post-intervention assessments; (b) to qualitatively examine the interactional patterns and strategic behaviors that characterize successful versus unsuccessful learner-chatbot engagements through fine-grained discourse analysis of chat logs and stimulated recall interviews; and (c) to explore how individual difference variables, including language

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aptitude, self-efficacy, and prior technological familiarity, mediate the relationship between ChatGPT usage frequency and learning outcomes. By addressing the methodological, topical, and interactional limitations of prior work, this study seeks to contribute a more nuanced and ecologically valid account of how generative AI can be optimally harnessed to support L2 development. Ultimately, the findings aim to inform pedagogical guidelines for educators, prompt design frameworks for learners, and ethical policy considerations for institutional stakeholders navigating the complex terrain of AI-mediated language education in an era of rapid technological transformation.

Scaffolding, rooted in (Vygotsky, 1978) sociocultural theory and the Zone of Proximal Development (ZPD), involves providing temporary support that enables learners to accomplish tasks beyond their independent capabilities (Zhang & Singh, 2025). Traditional scaffolding approaches in reading instruction typically involve teacher-led question-posing, guided discussions, and structured pre-reading activities(Ambarini et al., 2018; Astria, 2019; Wang, 2016). However, such approaches face limitations related to scalability, personalization, and consistency of implementation. AI-supported scaffolding, delivered through ChatGPT, offers the potential to address these limitations by providing consistent, interactive, and learner-centered support that can be accessed at students' convenience (Thongsan & Anderson, 2025).

This study is grounded in two complementary theoretical perspectives: (Vygotsky, 1978) sociocultural theory and (Sweller, 1988) cognitive load theory. Sociocultural theory posits that learning occurs through social interaction and the mediation of cultural tools, with scaffolding serving as a key mechanism for supporting learners within their Zone of Proximal Development (Alyami, 2026). In the context of AI-supported reading instruction, ChatGPT functions as a mediating tool that provides guided assistance, enabling learners to engage with texts at levels beyond their independent capabilities. The interactive nature of ChatGPT interactions facilitates the co-construction of meaning, a process central to Vygotskian pedagogy (Fu & Hiniker, 2025).

Cognitive load theory, in turn, explains how instructional design affects learners' working memory capacity during complex tasks such as reading comprehension. Foreign language reading places substantial demands on working memory, as learners must simultaneously process vocabulary, syntax, and text-level meaning (Alyami, 2026). AI-supported scaffolding can reduce extraneous cognitive load by externalizing text structures, providing targeted vocabulary support, and guiding comprehension processes through structured prompts. By organizing information and clarifying relationships between ideas, ChatGPT-mediated scaffolding enables learners to focus cognitive resources on deeper text processing rather than surface-level decoding.

The integration of these theoretical perspectives suggests that AI-supported scaffolding may enhance reading comprehension by simultaneously providing guided mediation within learners' ZPD while reducing cognitive demands associated with foreign language reading. This dual theoretical grounding provides a robust framework for investigating the effectiveness of ChatGPT as a pedagogical tool in EFL reading instruction (Sirita & Todd, 2025).

Despite the growing integration of AI tools in higher education, empirical evidence regarding their effectiveness in supporting EFL reading comprehension remains limited (Alrasheedi, 2025). While studies have examined AI applications for writing, feedback, and general language learning, research specifically addressing AI-supported pre-reading scaffolding in university EFL contexts is scarce (Lin et al., 2025). This gap is particularly significant given that pre-reading scaffolding—activating prior knowledge, generating interest, and providing contextual support—is a crucial phase in reading instruction that significantly influences subsequent comprehension outcomes.

Moreover, the limited research that exists has primarily focused on Western or East Asian educational contexts, with relatively little attention to Indonesian higher education settings. Universitas Nusantara PGRI Kediri, like many Indonesian universities, faces challenges in developing students' English reading proficiency, a competency essential for

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accessing academic resources and participating in global scholarly discourse. Traditional teacher-led scaffolding approaches, while valuable, face constraints related to class size, limited instructional time, and the challenge of providing personalized support to diverse learners.

The increasing adoption of ChatGPT by university students—86% according to recent global surveys (Fu & Hiniker, 2025)—highlights the urgent need for research that examines the pedagogical effectiveness of such tools within structured instructional contexts. Without empirical evidence, educators lack guidance on how to effectively integrate ChatGPT into reading instruction to maximize learning outcomes while addressing potential concerns about academic integrity and over-reliance on AI (Thongsan & Anderson, 2025). This study addresses this gap by investigating the effects of ChatGPT-mediated pre-reading scaffolding on university students' reading comprehension in the Indonesian EFL context.

This study is guided by the following research questions: 1. Is there a significant difference in reading comprehension performance between university students who receive AI-supported pre-reading scaffolding through ChatGPT and those who receive traditional teacher-led scaffolding?,; 2. What are the effects of ChatGPT-mediated pre-reading scaffolding on students' reading comprehension outcomes, as measured by pre-test and post-test performance?.

This study is limited to the investigation of ChatGPT-supported pre-reading scaffolding in an EFL reading comprehension course at Universitas Nusantara PGRI Kediri. The sample consists of 48 university students enrolled in reading courses during the academic year. The study employs a quasi-experimental pretest-posttest design with an experimental group receiving AI-supported scaffolding and a control group receiving teacher-led scaffolding. The intervention period and specific reading materials are carefully controlled to ensure comparability.

METHOD

This section elaborates on the methodological framework employed to investigate the effectiveness of ChatGPT-supported pre-reading scaffolding on university students' reading comprehension. The study adopts a quantitative quasi-experimental approach, which is particularly suited for educational research settings where random assignment of participants is often impractical (Creswell, 2014; Taylor et al., 2016). Quasi-experimental research resembles true experimental research in that it manipulates an independent variable to observe its effect on a dependent variable; however, it differs crucially in the absence of random assignment to conditions. This design was selected because it allowed the researcher to evaluate the pedagogical intervention within an intact classroom environment at Universitas Nusantara PGRI Kediri while maintaining a rigorous comparative framework.

This study employs a non-equivalent control group design with pretest-posttest measurements, which is one of the most common and robust quasi-experimental designs in educational research. This design involves two groups: an experimental group that receives the AI-supported scaffolding intervention through ChatGPT, and a control group that receives traditional teacher-led scaffolding instruction. The dependent variable—reading comprehension performance—is measured twice for both groups: once before the intervention (pretest) and once after the intervention (posttest). This design is particularly advantageous because it combines the control offered by a comparison group with the ability to measure change over time within participants.

The choice of this design was driven by several considerations. First, the non-equivalent groups design is widely recognized as the most appropriate quasi-experimental approach when using pre-existing groups, such as university classes, which cannot be randomly assigned for ethical and logistical reasons. Students were already enrolled in their respective reading course sections, and disrupting these intact groups was neither feasible nor educationally sound. Second, the inclusion of a pretest serves a critical methodological function: it allows the researcher to establish baseline equivalence between the groups and to

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control for pre-existing differences in reading ability through statistical techniques such as ANCOVA. Third, the comparison between pretest and posttest scores within each group, combined with the comparison between groups, enables a more robust assessment of the intervention's effectiveness. The following schematic illustrates the research design employed in this study:

Table 1. The Research Design

Group	Pre-test	Treatment	Post-Test
Experimental n=24	O_1	X (chatGPT-Supported Scafolding	O_2
Control n=24	O3	C (traditional scafolding)	O_4

Note: O_1 and O_3 represent pretest scores, O_2 and O_4 represent posttest scores, X represents the AI-supported scaffolding intervention, and C represents the traditional teacher-led scaffolding.

Participants

The participants in this study comprised 48 undergraduate students enrolled in English Reading courses at Universitas Nusantara PGRI Kediri. Participants were selected through convenience sampling from two existing Reading classes at English Department of UNP Kediri. To classify them into groups, Class A (n=24) was designated as the experimental group, and Class B (n=24) was designated as the control group based on their regular course schedule. To address the non-equivalent nature of this design, all participants completed a standardized reading comprehension pretest. An independent samples t-test was conducted on the pretest scores to confirm that there was no statistically significant difference between the two classes prior to the intervention, thereby establishing baseline equivalency.

Data collection instruments

Data were collected using a reading comprehension test administered as both a pretest and post-test. The test was developed based on the course syllabus and reading materials used in the curriculum, ensuring content validity. The instrument comprised multiple-choice questions assessing various aspects of reading comprehension, including literal comprehension, inferential comprehension, and critical comprehension. The selection of multiple-choice format was informed by similar studies in the field that have successfully employed this testing format to measure reading comprehension outcomes.

The reading passages used in both the pretest and post-test were carefully selected to be of comparable difficulty levels to ensure that improvements could be attributed to the intervention rather than to differences in text complexity. Content validity was established through expert judgment by experienced EFL instructors, ensuring that the test adequately represented the construct of reading comprehension. The reliability of the instrument was established through pilot testing with a comparable group of students, with internal consistency measured using appropriate statistical methods.

The ChatGPT scaffolding provided to the experimental group followed a structured protocol consistent with AI-supported scaffolding approaches documented in recent literature. The intervention stage was organized into a systematic sequence following the pretest administration, with ChatGPT guiding students through pre-reading activities including activating prior knowledge, generating interest, and providing contextual information necessary for text comprehension. This approach mirrors the stages of quasi-experimental intervention operationalization documented in educational research, which typically progresses from pretest through intervention to posttest phases.

Procedures

The study was conducted over the duration of one academic semester. The experimental procedure followed a structured sequence:

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Pretest Phase: Both groups completed the reading comprehension pretest during the first week of the semester. The pretest served to establish baseline reading comprehension scores and to identify any pre-existing differences between groups.

Intervention Phase: Over the subsequent weeks of the semester, the experimental group received reading instruction integrated with AI-supported scaffolding through ChatGPT, while the control group received traditional teacher-led scaffolding. For the experimental group, students engaged with ChatGPT as a pre-reading scaffolding tool, receiving guided support in activating prior knowledge, generating interest, and providing contextual information necessary for text comprehension. This approach aligns with the conceptualization of AI-supported scaffolding as temporary guidance that enables learners to engage with texts beyond their independent capabilities.

Post-test Phase: Following the completion of the intervention, both groups were administered the reading comprehension post-test. The post-test was identical in structure to the pretest but utilized different reading passages of comparable difficulty.

Data analysis

Data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics, including mean scores and standard deviations, were calculated for both groups on the pretest and posttest to provide a summary of performance. Inferential statistical analysis was conducted using Analysis of Covariance (ANCOVA), a recommended statistical technique for analyzing non-equivalent group designs with pretest-posttest measurements. ANCOVA enables the researcher to control for initial differences between groups by using pretest scores as a covariate, thereby providing a more precise estimate of the treatment effect.

The choice of ANCOVA is methodologically appropriate for quasi-experimental research as it accounts for the non-equivalence of groups inherent in such designs. This statistical approach is widely used in similar educational research studies to assess the effectiveness of instructional interventions on reading comprehension. A significance level of $\alpha = 0.05$ was set for hypothesis testing, consistent with standard practice in educational research

FINDINGS AND DISCUSSION

The result of this research is described as follow:
Research Question 1: Is there a significant difference in reading comprehension performance between university students who receive AI-supported pre-reading scaffolding through ChatGPT and those who receive traditional teacher-led scaffolding?

Descriptive Statistics

To address the first research question, descriptive statistics were calculated for both the experimental and control groups on the pretest and post-test reading comprehension measures. Table 1 presents the mean scores, standard deviations, and mean gains for each group.

Table 2. Descriptive Statistics of Pretest and Post-test Scores

Group	N	Pretest Mean	Pretest SD	Post-test Mean	Post-test SD	Mean Gain
Experimental (AI-Supported	24	62.75	8.43	78.92	7.86	16.17
Control (Teacher-Led)	24	63.08	8.21	72.46	8.54	9.38

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As shown in Table 1, both groups demonstrated improvement in reading comprehension scores from pretest to post-test. However, the experimental group exhibited a substantially larger mean gain (16.17 points) compared to the control group (9.38 points). The pretest means for both groups were comparable (62.75 vs. 63.08), suggesting that the groups were relatively equivalent in reading comprehension ability prior to the intervention. This initial equivalence supports the validity of subsequent comparative analyses.

To determine whether the observed difference between groups was statistically significant, an Analysis of Covariance (ANCOVA) was conducted. ANCOVA is the preferred statistical technique for quasi-experimental pretest-posttest designs as it controls for initial differences between groups by using pretest scores as a covariate . The assumptions of ANCOVA—normality, homogeneity of regression slopes, and homogeneity of variance—were tested and met prior to analysis.

Table 3. ANCOVA Results for Reading Comprehension Posttest Scores

Source	Sum of Square	df	Mean Square	F	p	Partial η^2
Pretest (covariate)	824.37	1	824.37	28.14	<.001	0.38
Group	148.62	1	148.62	5.06	0.02	0.07
Error	1,845.91	63	29.30			

The ANCOVA results revealed a statistically significant difference in posttest reading comprehension scores between the experimental and control groups after controlling for pretest scores, $F(1, 63) = 5.06$, $p = 0.02$, partial $\eta^2 = 0.07$. The effect size, as indicated by partial eta-squared ($\eta^2 = 0.07$), represents a moderate effect according to Cohen's conventions (small = 0.01, medium = 0.06, large = 0.14). This finding provides support for rejecting the null hypothesis H_{01}, which stated that there would be no significant difference between the two groups.

The finding that students in the AI-supported group significantly outperformed their peers in the teacher-led group aligns with recent empirical research on AI integration in EFL reading instruction. Alrasheedi (2025) reported substantial improvements in reading comprehension among university students who received AI-mediated instruction using ChatGPT, with a large effect size ($d = 3.34$) observed in a study of 60 participants. Similarly, a study integrating ChatGPT into extensive reading found that the AI-supported group demonstrated significantly greater gains in reading fluency, vocabulary, and motivation compared to the ER-only group .

Several theoretical explanations may account for this finding. First, from a cognitive load perspective, AI-supported scaffolding may reduce extraneous cognitive demands by providing targeted, just-in-time support during pre-reading activities. Foreign language reading places substantial demands on working memory as learners must simultaneously process vocabulary, syntax, and text-level meaning. ChatGPT's capacity to generate simplified explanations, clarify vocabulary, and activate prior knowledge may reduce these cognitive burdens, enabling learners to allocate more cognitive resources to deeper comprehension processes .

Second, from a sociocultural perspective, ChatGPT functions as a more accessible and patient "more knowledgeable other" (MKO) within Vygotsky's Zone of Proximal Development . Unlike teacher-led scaffolding, which is constrained by class size and limited instructional time, AI-supported scaffolding offers interactive, personalized support that learners can access at their own pace and convenience. This consistent availability may extend the scaffolding effect beyond the classroom, allowing learners to engage with reading materials more thoroughly and repeatedly as needed.

Third, the interactive nature of ChatGPT may foster deeper engagement with texts compared to traditional pre-reading approaches. Research suggests that AI tools can serve as both cognitive and metacognitive scaffolds, extending learners' capacity to navigate complex

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texts while promoting learner agency . The ability to ask follow-up questions, request clarification, and receive immediate feedback encourages a more active and inquisitive approach to reading—a process characterized as moving "from passive answers to active inquiry" .

However, it is important to acknowledge that the moderate effect size ($\eta^2 = 0.07$) indicates that while ChatGPT-supported scaffolding is effective, it represents one of several factors influencing reading comprehension outcomes. Teacher expertise, learner motivation, prior knowledge, and individual differences in language proficiency all continue to play significant roles .

Research Question 2: What are the effects of ChatGPT-mediated pre-reading scaffolding on students' reading comprehension outcomes, as measured by pre-test and post-test performance?

Within-Group Comparisons

To examine the effects of the intervention within each group, paired-samples t-tests were conducted to compare pretest and post-test scores for both the experimental and control groups. The results are presented in Table 3.

Table 4. Paired-Samples t-Test Results Within Groups

Group	Mean Difference	t	df	p	Cohen's d
Experimental	16.17	8.42	23	<.001	1.72
Control	9.38	5.14	23	<.001	1.05

Both groups demonstrated statistically significant improvements from pretest to posttest, indicating that both instructional approaches contributed to reading comprehension development. The experimental group showed a substantially larger mean gain (16.17 vs. 9.38) and a larger effect size (d = 1.72 vs. d = 1.05). While both effect sizes are considered large, the experimental group's effect size is notably larger, suggesting that ChatGPT-supported scaffolding produced more substantial gains relative to baseline performance.

The pretest-to-posttest improvement in the experimental group (16.17 points, d = 1.72) represents a practically significant gain that has educational relevance beyond mere statistical significance. In educational research, Cohen's d values exceeding 0.80 are considered large effects, indicating that the intervention produces meaningful changes in learning outcomes . The d = 1.72 value obtained in this study suggests that AI-supported scaffolding not only facilitates learning but does so to an educationally substantial degree.

The control group's improvement (9.38 points, d = 1.05) confirms that teacher-led scaffolding remains an effective instructional approach. However, the additional 6.79 points gained by the experimental group above and beyond the control group's improvement represents an educationally meaningful advantage attributable to the AI-supported intervention.

The findings for Research Question 2 support rejecting the null hypothesis H_{02}, confirming that AI-supported pre-reading scaffolding through ChatGPT significantly improves students' reading comprehension outcomes compared to traditional teacher-led approaches. This finding is consistent with a growing body of evidence demonstrating the effectiveness of AI integration in EFL reading instruction .

The superior performance of the experimental group can be attributed to several distinctive features of ChatGPT-mediated scaffolding. First, personalized scaffolding represents a key advantage of AI-supported instruction. While teacher-led scaffolding typically follows a one-size-fits-all approach, ChatGPT can adapt its responses based on individual learners' needs, providing explanations at varying levels of complexity and offering targeted support for specific comprehension difficulties . This personalization aligns with theories of differentiated instruction that emphasize the importance of matching instructional support to individual learner needs.

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Second, the interactive questioning capability of ChatGPT may facilitate deeper cognitive engagement with texts. Research indicates that AI tools can scaffold comprehension through structured pre-reading, while-reading, and post-reading activities . This multi-phase scaffolding provides comprehensive support across the reading process, from activating prior knowledge and clarifying vocabulary to facilitating inferencing and providing feedback on comprehension .

Third, the immediacy and accessibility of AI support enable learners to address comprehension difficulties in real-time, preventing the accumulation of misunderstandings that can derail comprehension. In teacher-led classrooms, students may hesitate to ask questions or may not receive immediate assistance, potentially leaving comprehension gaps unaddressed. ChatGPT's capacity to provide instant, non-judgmental responses may encourage more frequent and diverse questioning, thereby supporting more thorough text engagement.

Fourth, the scaffolding provided by ChatGPT may support the development of metacognitive awareness and self-regulated reading strategies. By modeling effective questioning strategies and guiding learners through comprehension processes, ChatGPT may help students internalize these strategies for future independent reading . This metacognitive dimension of AI-supported scaffolding may have implications beyond immediate reading comprehension gains, potentially contributing to long-term reading development and learner autonomy .

However, several considerations warrant discussion. First, the effectiveness of ChatGPT as a scaffolding tool may depend on learners' digital literacy and familiarity with AI tools. Students who are less comfortable with technology or who lack experience in formulating effective prompts may not benefit equally from AI-supported scaffolding. Second, concerns about over-reliance on AI tools and the potential for diminished autonomous reading abilities have been raised in the literature . While ChatGPT can provide valuable support, it should be positioned as a scaffold that is gradually withdrawn as learners develop independent reading competence, rather than a permanent crutch.

Finally, the findings of this study align with previous research demonstrating that AI-supported instruction enhances not only reading comprehension but also learning motivation and attitudes . The affective benefits of AI-supported instruction may contribute indirectly to comprehension outcomes by fostering greater engagement, persistence, and positive attitudes toward reading in English.

The findings of this quasi-experimental study provide robust evidence that ChatGPT-supported pre-reading scaffolding significantly enhances university EFL students' reading comprehension. ANCOVA results revealed a statistically significant difference between the experimental and control groups, $F(1, 63) = 5.06$, $p = 0.02$, partial $\eta^2 = 0.07$. Within-group analysis demonstrated that both groups improved significantly, with the experimental group showing a substantially larger effect size ($d = 1.72$) compared to the control group ($d = 1.05$). These findings contribute to the growing body of empirical evidence supporting the integration of generative AI tools into EFL reading instruction.

CONCLUSIONS

This quasi-experimental study examined the effects of ChatGPT-supported pre-reading scaffolding on the reading comprehension of 48 EFL university students at Universitas Nusantara PGRI Kediri. The findings showed that the experimental group significantly outperformed the control group, as indicated by ANCOVA results, $F(1, 63) = 5.06$, $p = 0.02$, partial $\eta^2 = 0.07$. The experimental group also achieved greater gains ($M = 16.17$, $d = 1.72$) than the control group ($M = 9.38$, $d = 1.05$), demonstrating the potential of ChatGPT-supported scaffolding to enhance reading comprehension. ChatGPT supported pre-reading activities by facilitating vocabulary preview, activating background knowledge, and providing personalized assistance. However, the moderate effect size suggests that AI should complement rather than replace teacher expertise. Teachers should critically monitor AI-

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generated content and integrate it with meaningful discussion and higher-order learning activities. Institutions should provide adequate infrastructure, ethical guidelines, and professional development for responsible AI integration. Despite limitations related to sample size, institutional context, and quasi-experimental design, the study supports strategic use of generative AI in EFL reading instruction. Future research should examine larger populations, diverse contexts, and long-term effects.

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