

Exploring English Education Students' Experiences in AI-Supported Reading Tasks for HOTS Development

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Abstract

This study addresses the limited engagement of EFL students in Higher-Order Thinking Skills (HOTS) during reading activities, particularly their difficulty in moving beyond literal comprehension toward analysis, evaluation, and creation. At the same time, the growing use of Artificial Intelligence (AI) in language learning offers potential as a cognitive scaffold; however, its pedagogical role in fostering HOTS in EFL reading remains underexplored, especially in contexts where AI is often used merely as an answer provider. Therefore, this study aims to explore English Education students' experiences in developing HOTS through AI-supported reading activities at Universitas Kuningan. Using a qualitative case study design, the study involved 31 students enrolled in an intensive reading course. Data were collected through reading tasks conducted with and without AI assistance, classroom observations, and semi-structured interviews, and were analyzed using reflexive thematic analysis. The findings show that without AI support, students predominantly demonstrated literal comprehension and relied on copying textual information. In contrast, when AI was used as a reflective tool, students actively compared responses, evaluated arguments, and reconstructed their understanding, indicating the development of analyzing (C4), evaluating (C5), and creating (C6) processes. AI functioned as a cognitive scaffold that promoted deeper cognitive engagement; however, challenges such as overreliance on AI and concerns about response validity were also identified. The study concludes that AI can support HOTS development in EFL reading only when it is integrated reflectively and pedagogically, rather than used as an instant answer generator, and highlights implications for designing more effective AI-supported reading instruction in higher education contexts.

Keywords: Artificial intelligence; EFL reading; Higher order thinking; Cognitive scaffolding

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INTRODUCTION

The development of sophisticated cognitive skills has become the primary emphasis of learning due to the 21st century's swift changes in education. Students are expected to analyze, assess, and create meaning in addition to comprehending texts in language instruction, especially in English as a Foreign Language (EFL). According to Bloom's updated taxonomy, these skills are usually referred to as Higher-Order Thinking Skills (HOTS), which include analysis (C4), assessment (C5), and creativity (C6) (Akbar et al., 2025; Setiawan et al., 2023). Consequently, one of the main objectives of EFL reading instruction is now to create HOTS.

Reading plays a crucial role in developing HOTS because it requires learners to engage actively with texts. In EFL contexts, reading is no longer viewed as a passive or receptive skill, but as a cognitive process that involves interpreting ideas, evaluating arguments, and generating responses. Therefore, reading comprehension extends beyond identifying main ideas and supporting details to include critical reading and creative interpretation (Akbar et al., 2025; Nurviyani, 2024). This positions reading as a key medium for fostering higher-level thinking and cognitive engagement.

In actuality, though, a lot of EFL students still have trouble developing HOTS during reading assignments. According to earlier research, students frequently struggle to recognize important concepts, rephrase material in their own terms, and come to logical conclusions (Fitria & Nafiah, 2025; Nurhayati, 2023). Limited vocabulary, unusual sentence structures, and inadequate exposure to academic texts all exacerbate these difficulties. As a result, rather than participating in analysis and evaluation, students frequently rely on surface-level techniques such copying sentences straight from the book (Mahardhika et al., 2025; Akbar et al., 2025). This suggests that the development of higher-order thinking is not adequately supported by traditional reading activities.

Several teaching strategies have been put forth to deal with this problem. It has been demonstrated that metacognitive techniques help students monitor and control their comprehension, which supports inferential and evaluative thinking (Juliana & Anggraini, 2024). Strategies for guided reading and visualization can improve deeper comprehension and analytical engagement (Thamrin et al., 2025; Setyawati et al., 2025). Additionally, learner autonomy and independent text evaluation are encouraged by strategy-based training (Rahmasari et al., 2025). However, these methods may not adequately address individual cognitive differences in varied classroom situations and may call for extensive instructional support. Recent advancements in educational technology have introduced new possibilities for supporting reading instruction. Artificial Intelligence (AI), in particular, has emerged as a promising tool due to its ability to provide immediate feedback, generate guiding questions, and adapt learning activities to students' needs (Yuan, 2025; Sayin & Gierl, 2024). Studies indicate that AI-supported learning environments can reduce cognitive load, improve comprehension, and enhance learner engagement (Daweli & Mahyoub, 2024; Silor & Silor, 2025).

More significantly, AI can support the development of HOTS by acting as a type of cognitive scaffolding. AI can help students compare solutions, assess differences, and reflect on their thought processes rather than just being a mechanism for producing answers. According to Thongsan and Anderson's (2025) research, students are encouraged to transition from passive response to active inquiry using AI-supported reading activities. Similarly, Zhang et al. (2025) showed that students' critical engagement is improved when ChatGPT is combined with structured reading techniques. According to Dewi et al. (2025), students in Indonesia can assess their reasoning and develop a deeper knowledge by using generative AI reflectively. These results imply that through interactive and reflective processes, AI-supported reading activities may aid in the development of HOTS.

However, the use of AI in EFL reading also presents challenges. In many cases, students use AI primarily for translation, vocabulary lookup, or directly obtaining answers. Such practices may limit cognitive engagement and lead to dependency, where students rely on AI rather than actively constructing meaning. Without appropriate task design, AI use may shift students from active analysis to passive acceptance of information (Thongsan & Anderson, 2025; Wen & Chu, 2025). This highlights the need for structured AI-supported reading activities that explicitly require students to analyze, evaluate, and reconstruct their understanding.

Despite increasing attention to AI and HOTS in language education, previous studies have largely examined these aspects separately. Research on HOTS has focused

on instructional strategies, while studies on AI have emphasized technological affordances. There is still limited research investigating how AI-supported reading activities can be designed to support the development of HOTS through students' actual learning experiences, particularly in EFL contexts (Dewi et al., 2025; Daweli & Mahyoub, 2024). This gap is especially evident in Indonesian higher education settings.

This work addresses this gap by conceptualizing AI-supported reading activities as a type of cognitive scaffolding that promotes HOTS growth. Students participate in activities including contrasting their original answers with those produced by AI, assessing discrepancies, and updating their interpretations. As essential elements of higher-order thinking, these procedures should make analysis, assessment, and creativity easier. Thus, the purpose of this study is to investigate how AI-supported reading activities at Universitas Kuningan help English education students build higher-order thinking skills. In particular, the following research issues are addressed in this study: (1) When completing AI-supported reading tasks, how do EFL students use higher-order cognitive processes (analysis, assessment, and creation)? (2) How do students view AI's contribution to the growth of reading-related higher-order thinking skills? (3) What difficulties do students encounter while utilizing AI for reading assignments?

METHOD

Research Design

This study employs a qualitative approach with a case study design to explore students' cognitive processes, learning experiences, and perceptions in completing English as a Foreign Language (EFL) reading tasks supported by Artificial Intelligence (AI). The qualitative approach is appropriate because the study focuses on understanding the meaning of students' higher-order thinking processes rather than measuring learning outcomes quantitatively. This aligns with the interpretivist paradigm, which views learning as a subjective and context-dependent process of meaning construction (Asmawi & Alam, 2024).

The case in this study is bounded within a specific instructional context, namely the Intensive Reading class in the English Education Department at Universitas Kuningan. This class is selected as the bounded case because it provides a structured environment where students engage in reading activities that explicitly require Higher-Order Thinking Skills (HOTS), including analyzing, evaluating, and creating (C4–C6). In addition, the integration of AI-supported reading tasks within this course makes it a relevant and authentic context for examining how students interact with AI as a cognitive scaffold.

Participants

The participants of this study were 31 undergraduate students enrolled in the Intensive Reading course in the English Education Department at Universitas Kuningan. The students were in their third semester, with an age range of approximately 19–21 years old, and were categorized as having intermediate English proficiency based on their course placement and prior academic performance. The participants were divided into two classes: Class A (17 students) and Class B (14 students), both of which followed the same curriculum and learning objectives.

The participants were selected using purposive sampling, as they were directly involved in reading activities that required the application of Higher-Order Thinking Skills (HOTS), including analyzing, evaluating, and creating. The Intensive Reading course was considered appropriate for this study because it provides structured reading tasks that encourage deeper cognitive engagement and critical thinking processes. From the total participants, ten students (five from each class) were selected for semi-structured interviews. The selection was based on variation in students' participation levels, response quality, and engagement during classroom activities to ensure diverse perspectives. This

approach allowed the researcher to capture a range of experiences, from highly active to less active participants. Ethical considerations were strictly followed in this study. All participants provided informed consent prior to data collection and were informed about the purpose of the study. Their identities were kept confidential, and the data were used solely for research purposes.

Research Instruments

The research instruments in this study were developed by adapting relevant previous studies and were aligned with the objective of examining students' Higher-Order Thinking Skills (HOTS) in EFL reading. The first instrument was a reading task without AI, which aimed to identify students' initial HOTS performance. In this task, students were required to determine the main idea, identify supporting details, summarize the text, and draw conclusions. These activities were designed to reflect HOTS indicators, particularly analyzing (C4), evaluating (C5), and creating (C6), based on the framework proposed by Akbar et al. (2025). For instance, students were asked to explain relationships between ideas in the text, justify the relevance of information, and construct their own conclusions using their own words.

The second instrument was an AI-assisted reading task adapted from the AI-supported reading model proposed by Zhang et al. (2025). In this task, students were allowed to use AI (ChatGPT) as a reading aid. They were instructed to generate AI responses related to the text, compare these responses with their initial answers, evaluate the relevance and accuracy of the AI-generated output, and revise their answers based on critical reflection. The third instrument was classroom observation, which was conducted using an observation sheet designed to capture students' cognitive engagement during AI-supported reading activities. The observed indicators were aligned with HOTS processes (C4–C6), including students' ability to analyze textual information, evaluate differences between responses, and construct new understanding through discussion and revision. Observable behaviors included providing text-based reasoning, comparing multiple sources of information, questioning AI-generated responses, and actively engaging in reflective discussions. The fourth instrument was semi-structured interviews, which were conducted to explore students' experiences, perceptions, and challenges in using AI for HOTS-based reading tasks.

Data Collection and Analysis Techniques

Data collection in this study was conducted in a systematic and chronological manner. In the first stage, students completed reading tasks without AI assistance to examine their initial Higher-Order Thinking Skills (HOTS), particularly in analyzing, evaluating, and creating. In the second stage, students engaged in AI-supported reading activities using ChatGPT. At this stage, students were introduced to ChatGPT as a learning tool and were given explicit instructions to use it reflectively. They were required to generate AI responses, compare them with their initial answers, evaluate the relevance and accuracy of the AI-generated output, and revise their responses based on critical reflection. To prevent overreliance, students were instructed not to copy AI responses directly but to justify and reconstruct their answers.

Classroom observation was conducted throughout these activities to document students' cognitive engagement, including how they compared responses, evaluated information, and constructed new understanding. After completing the tasks, semi-structured interviews were conducted with selected participants to explore their experiences, perceptions, and challenges in using AI during reading activities. Data were collected from reading tasks, observation notes, and interview results to enable triangulation and to strengthen the credibility of the findings.

The data were analyzed using reflexive thematic analysis following Braun and Clarke (2022), which is suitable for interpreting students' experiences and cognitive processes. The analysis followed six phases: familiarization with the data, generating initial codes, constructing themes, reviewing themes, defining and naming themes, and producing the report. During the familiarization phase, the researcher repeatedly read students' written responses, observation notes, and interview data to gain a comprehensive understanding. Initial codes were generated inductively from meaningful segments of the data related to students' cognitive engagement. Data from reading tasks, observation notes, and interview results were integrated during this coding process to identify recurring patterns. These codes were then organized into potential themes that reflected students' experiences in developing HOTS through AI-supported reading. The themes were reviewed and refined to ensure consistency with the data and alignment with the research questions. HOTS indicators (C4–C6) were used as an analytical lens to interpret how students demonstrated analyzing, evaluating, and creating processes. Representative excerpts from the data were selected to illustrate each theme.

RESULTS AND DISCUSSION

Results

The results of this study show that students' experiences with AI-supported reading activities follow a predictable pattern. At first, the majority of students used literal comprehension techniques, like copying textual content. Students did, however, show a shift towards higher-order cognitive activity after engaging with AI, especially when it came to comparing, assessing, and editing their answers.

AI functioned as a cognitive scaffold by prompting reflection and encouraging students to justify their answers. At the same time, several challenges emerged, including difficulties with overly long responses, concerns about answer validity, and the potential risk of dependency. These findings reflect patterns observed within this specific case study context rather than generalizable outcomes.

Initial Reading Behavior of Students

The results demonstrate that pupils mostly depended on literal comprehension techniques prior to the use of AI. Numerous students stated that they had trouble understanding the text, particularly because of the formal language and new vocabulary. As a result, rather than interpreting meaning, students preferred to concentrate on finding solutions straight from the text. One student stated: *"It was difficult because there were many unfamiliar words, so I struggled to understand the text"* (Participant B2, Class B). Another student mentioned: *"Without AI, I had to read the whole text carefully, and it was confusing"* (Participant A2, Class A). Additionally, students' responses were occasionally unfocused and frequently lacked order. According to one comment: *"My answers were not focused and sometimes went off-topic without AI"* (Participant A3, Class A). This suggests that the majority of students were thinking at lower levels, especially in terms of understanding and recall.

HOTS Development and Cognitive Engagement (RQ1)

Students showed a change in their level of cognitive involvement following the introduction of AI-supported reading exercises. Rather of simply responding to enquiries, they started contrasting their answers with those produced by AI and making changes in response to their assessment. One participant explained: *"I analyzed which answer made more sense, evaluated it, and then created a better answer"* (Participant A3, Class A). This process shows that students were engaging in analysis, evaluation, and reconstruction of their responses. The comparison between their own answers and AI outputs created opportunities for deeper thinking. Students were required to identify differences, assess the

relevance of information, and justify their choices. This indicates the development of higher-order thinking skills, particularly analysis (C4), evaluation (C5), and creation (C6). Consequently, the results imply that AI-assisted reading assignments motivated students to shift beyond literal understanding to more analytical and reflective involvement.

AI as a Cognitive Scaffold and Students' Perceptions (RQ2)

In general, students saw AI as a useful tool that enhanced their comprehension and raised the calibre of their responses. Numerous participants reported that AI gave them more organised answers and helped them explain assignments. One student reported: *"ChatGPT helped me understand what I should do"* (Participant A1, Class A). Another reported: *"The answers from AI are more structured and detailed"* (Participant A5, Class A). However, students did not simply accept AI-generated answers. Instead, they used AI as a reference to compare and refine their own responses. As one participant explained: *"It is better to answer first, then use AI to improve it"* (Participant B3, Class B).

Another student emphasized: *"AI is only a supporting tool, we still need to think by ourselves"* (Participant B5, Class B). These results show that rather than taking the place of students' thought processes, AI served as a cognitive scaffold by promoting introspection, comparison, and justification.

Challenge of Using AI

Despite the advantages, using AI-supported reading activities has been found to provide a number of difficulties. The challenge of deciphering AI-generated responses, which were frequently excessively lengthy or not directly related to the objective, was one of the main problems. As one student commented: *"The answer is detailed but not always relevant"* (Participant A2, Class A). Another said: *"Sometimes the answers are too long and confusing"* (Participant B2, Class B). Concerns over the reliability of AI responses were also voiced by students. Some stated that they regularly used AI tools or other sources to double-check their responses. One participant said: *"I usually compare ChatGPT answers with other AI tools"* (Participant A1, Class A). In addition, there was a potential risk of dependency. Some students admitted that they were used to relying on AI for answers, as reflected in the statement: *"I am used to asking AI for answers"* (Participant B4, Class B). However, other students showed awareness of this issue and emphasized that AI should be used only as a supporting tool. All things considered, these difficulties show how crucial it is to help students use AI in reading assignments in a responsible and critical manner.

Table 1. Summary of Themes and Findings in AI-Assisted Reading

Focus of Research	Key Patterns Identified	Data-Based Proof
Students' initial HOTS without AI	Students mostly at LOTS level; limited analytical engagement; relied on copying text.	"It's quite difficult when we analyze it ourselves without the help of AI and have to rely on my own thinking, so I copied it from the original text." (Participant A3, Class A).
AI as a cognitive scaffold	Students compared and revised answers; engaged in evaluative thinking; AI prompts reflection.	"We need to analyze and evaluate AI answers first; we cannot carelessly use them directly because they usually do not match our requests." (Participant A4, Class A).
Development of HOTS through AI	AI facilitated higher-order thinking: Analyze (C4), Evaluate (C5), Create (C6);	"When my answer differs from AI's answer, I have to analyze which makes more sense, then evaluate it and

Focus of Research	Key Patterns Identified	Data-Based Proof
	students reconstructed summaries and conclusions.	make a new answer based on both perspectives.” (Participant B6, Class B).
Students’ perceptions & challenges	AI helpful but sometimes confusing; students verified AI responses; potential risk of dependency without guidance.	“Sometimes AI gives very long answers and makes us confused, so I often ensure the validity of the answer by checking from other sources.” (Participant B7, Class B).

Discussion

The findings of this study reveal a meaningful shift in students’ cognitive engagement when AI is integrated into EFL reading activities. Prior to AI use, students predominantly relied on literal comprehension strategies, such as copying textual information, which reflects lower-order thinking processes. This pattern suggests that without adequate cognitive scaffolding, students tend to remain at the levels of understanding and recall. In contrast, the introduction of AI-supported reading tasks encouraged students to move beyond surface-level comprehension toward deeper cognitive engagement. This tendency is consistent with previous studies indicating that EFL learners often experience difficulty transitioning from literal comprehension to higher-order thinking without structured instructional support (Nurhayati, 2023; Setiawan et al., 2023; Mahardhika et al., 2025).

This shift can be understood through the role of AI as a cognitive scaffold. By requiring students to compare their initial responses with AI-generated answers, evaluate their relevance, and revise their ideas, the learning process became more reflective and analytical. This finding supports Thongsan and Anderson (2025), who argue that AI-supported environments can transform students from passive recipients into active evaluators. It also extends Zhang et al. (2025), which emphasizes that AI can promote analytical thinking by encouraging learners to distinguish between multiple interpretations. Similar findings have been reported by Li et al. (2025) and Silor and Silor (2025), who note that AI tools can enhance learner engagement and promote deeper interaction with texts when supported by reflective instructional design.

The development of Higher-Order Thinking Skills was evident in students’ engagement in analysis, evaluation, and creation. Students demonstrated analytical thinking when identifying differences between their responses and AI outputs, evaluative thinking when assessing the accuracy and relevance of information, and creative thinking when reconstructing their conclusions. These findings are consistent with Mahardhika et al. (2025) and Fitria and Nafiah (2025), who highlight that HOTS development occurs when students are actively involved in critiquing and reconstructing knowledge. This is also supported by Himawan et al. (2024) and Widiyana et al. (2023), who argue that activities involving reconstruction and synthesis of ideas can simultaneously foster critical and creative thinking. In this study, AI functioned as a tool that stimulated these processes rather than replacing students’ cognitive efforts.

Another important finding is the emergence of metacognitive awareness during AI-supported reading. Students were observed to re-evaluate their understanding, verify AI responses, and cross-check information. This indicates that AI-supported tasks can promote self-regulated learning and metacognitive engagement, as suggested by Samadi et al. (2024) and Shafiee Rad (2025). In addition, studies by Rahmasari et al. (2025) and Juliana and Anggraini (2024) emphasize that reflective learning environments play a significant role in fostering learner autonomy and strategic reading behavior. However, this benefit is conditional. The findings also reveal potential challenges, including

overreliance on AI, difficulty interpreting lengthy responses, and concerns about the validity of AI-generated answers. These challenges align with Wen and Chu (2025) and Sayin and Gierl (2024), who highlight that AI-generated content may not always be accurate or pedagogically appropriate without critical evaluation.

These findings highlight an important pedagogical implication: AI can support HOTS development only when it is integrated through structured tasks, reflective prompts, and clear instructional guidance. Without such design, AI risks being used merely as an instant answer provider, which may limit students' cognitive development. Therefore, teachers play a crucial role in designing AI-supported reading activities that encourage comparison, evaluation, and reconstruction rather than passive acceptance. This aligns with Dewi et al. (2025) and Iskandar et al. (2025), who emphasize that AI integration in education must be accompanied by pedagogical strategies that promote critical engagement and digital literacy. In terms of contribution, this study extends previous research by integrating HOTS-based reading instruction with AI-supported learning within a qualitative case study framework. While earlier studies have examined HOTS development or AI use separately, this study demonstrates how AI can function as a cognitive scaffold that supports higher-order thinking when used reflectively in an EFL reading context, particularly in Indonesian higher education settings.

Future research should explore longer intervention periods to examine sustained cognitive development, involve students from different proficiency levels and institutions, and incorporate various text genres to broaden the applicability of findings. Comparative studies between AI-supported and non-AI-supported reading instruction are also recommended to further understand the effectiveness of AI integration in language learning (Yuan, 2025). In conclusion, this study demonstrates that AI-supported reading activities can facilitate the development of Higher-Order Thinking Skills in EFL contexts when implemented through reflective and pedagogically guided practices. AI is most effective not as a source of answers, but as a tool that encourages students to think more critically, evaluate information, and construct their own understanding.

CONCLUSION

This study indicates that the use of AI in EFL reading instruction can support the development of Higher-Order Thinking Skills (HOTS), particularly in analyzing (C4), evaluating (C5), and creating (C6), when it is implemented in a structured and reflective manner. Regarding the research questions, the results indicate that: When completing AI-supported reading tasks, students (1) engaged in higher-order cognitive processes by comparing, evaluating, and revising their responses; (2) saw AI as a useful tool that supports clarity, structure, and reflection rather than as a final answer provider; and (3) encountered a number of difficulties, such as dependency risks, trouble deciphering lengthy responses, and doubts about the validity of AI-generated answers. The results also show that the majority of pupils used literal comprehension techniques before AI was incorporated. However, students showed a change towards more analytical, evaluative, and reflective involvement in reading tasks when AI was presented as a cognitive scaffold.

In terms of pedagogy, this study emphasises that AI should be utilised as a reflective learning tool backed by carefully crafted activities that promote comparison, justification, and reconstruction rather than as an instant response generator. In order to foster critical thinking and learner autonomy in EFL reading courses, educators and curriculum designers are urged to use AI. However, this study is limited to a specific case within one Intensive Reading class at a single university, which may not represent broader EFL contexts. Future research is recommended to involve different proficiency levels, diverse educational settings, and longer implementation periods to examine the sustained impact of AI-supported reading on HOTS development.

RECOMMENDATION

This study was conducted within a specific context and relatively short implementation period, which may limit the generalizability of the findings. Future research is recommended to involve broader educational settings and longer intervention durations to examine the long-term impact of AI-assisted reading instruction on students' higher-order thinking development. Further studies may also explore different instructional designs to minimize students' dependency on AI-generated responses.

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DECLARE OF AI USE

The authors used ChatGPT to assist in language editing, paraphrasing, and improving the clarity of the manuscript. The AI tool was not used to generate research data or findings. All interpretations, analyses, and conclusions are the authors' own. The authors take full responsibility for the accuracy and integrity of the final manuscript.

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