

A QUALITATIVE EXPLORATION OF STUDENTS USE OF HUMATA.AI TO UNDERSTAND THESIS LITERATURE: A COGNITIVE LOAD PERSPECTIVE

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ABSTRACT

This qualitative study explores how Humata.ai, an AI summarization tool, helps final-year English Education students understand thesis literature from a Cognitive Load Theory (CLT) perspective. The study involved 10 final-year students from a university in Surabaya who used Humata.ai in their literature review process. Data were collected through semi-structured interviews and analyzed thematically using a theory-based approach. Findings indicate that Humata.ai helps alleviate extraneous cognitive load by simplifying complex academic texts, filtering out irrelevant information, and improving time efficiency. It also supports extraneous cognitive load by fostering critical thinking and encouraging strategic reading. However, students reported challenges such as technical issues, over-reliance, and occasional inaccuracies in summaries. These results suggest that while Humata.ai can serve as an aid in understanding thesis literature, its use must be supported by ethical and strategic use to maintain students' analytical skills. This study contributes to the growing discussion on AI-assisted learning and cognitive load management in higher education and recommends further research across disciplines and tools to explore the broader implications of AI pedagogy.

Keywords: *Humata.Ai, Higher Education, Cognitive Load Theory, Thesis Literature Understanding, AI-Assisted Reading.*

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INTRODUCTION

Reading academic literature in a second language (L2) is a challenging process for English as a Foreign Language (EFL) students, especially when writing a thesis. These texts often contain complex vocabulary, dense structures, and abstract concepts that can hinder comprehension. Students must not only comprehend the content but also critically analyze and synthesize ideas from multiple sources, requiring high-level reading skills and sustained cognitive effort. Especially for students that are working on their theses. Students must not only identify relevant sources but also understand and synthesize complex ideas from a variety of academic texts, such as journal articles, books, and reports. These materials tend to be long, dense, and filled with technical terminology and

theoretical frameworks, posing significant challenges, especially for English language students who are also using literature in English, which is not their native language. Research shows that many struggle to select relevant information due to limited cognitive capacity or underdeveloped critical reading skills, leading to confusion or shallow engagement with the literature (Simango, 2023; Tampani et al., 2023).

These difficulties can be understood through Cognitive Load Theory (CLT), which states that working memory has a limited capacity and is easily overwhelmed by excessive or poorly structured information (Sweller, 1988). CLT categorizes cognitive load into intrinsic (related to the complexity of the material), extraneous (caused by the way information is presented), and germane (related to the construction of understanding). This study focuses on extraneous and germane load, both of which can be influenced through learning support and how information is presented (Kalyuga, 2021). Exposure to irrelevant or disorganized material can contribute to extraneous load and interferes with comprehension (de Jong, 2010; Yohanes & Yusuf, 2021).

To help manage the cognitive demands of understanding literature, students need tools and strategies that can ease extraneous load and support meaningful engagement. Summarizing is one effective method, as it simplifies dense content and directs attention to the most relevant ideas (Tampani et al., 2023). Students can use artificial intelligence, which has been widely adopted in higher education, to support this strategy. Artificial intelligence or AI, defined as a system capable of learning and processing complex data (Popenici & Kerr, 2017), assists students in reading, writing, and research tasks (Salas-Pilco & Yang, 2022; Suryani & Fithriani, 2024). A global survey by HolonIQ (2024) also highlighted the increasing use of AI to address learning challenges. In this context, Humata.ai can help support comprehension of literature by generating focused summaries, allowing them to extract key information more efficiently.

Unlike ChatGPT, Humata.ai focuses on comprehension by simplifying the presentation of information without eliminating the need for critical analysis. Thus, it supports the easing of extraneous cognitive load and supports germane cognitive load. Recent findings confirm that AI tools like Humata.ai can assist students in reading academic texts by providing concise, focused summaries while maintaining access to the full content, making complex material more accessible (Habibah, 2024; Suryani & Fithriani, 2024).

Although AI in education is increasingly prevalent, studies examining how AI summarization tools support EFL students' academic reading skills through a CLT perspective are still limited. Previous research, such as that by Azwar and Jayanti (2025), has investigated students' acceptance of AI for grammar learning, suggesting potential benefits for other areas of academic skill development, including reading comprehension. However, the increasing use of AI has also raised concerns about over-reliance, reduced motivation for independent learning, and decreased critical thinking skills (Holmes et al., 2021; Cela et al., 2024; Oye et al., 2024). Similar concerns were highlighted by Azwar and Jayanti (2025), who found that while students generally viewed ChatGPT as beneficial for learning English grammar, some expressed appreciation for its over-reliance,

which could potentially undermine cognitive skills. While existing research has examined widely used tools like ChatGPT, there is a lack of research on how Humata.ai, in particular, can alleviate unfamiliar cognitive load and support relevant cognitive load in thesis literature reading.

Therefore, this study aims to investigate how Humata.ai assists students in easing irrelevant cognitive load and supporting relevant cognitive load when engaging with thesis literature. In addition, this study seeks to identify the specific challenges that students face in managing this type of cognitive load when using the tool. Based on Sweller's (1988) Cognitive Load Theory, this study explores students' experiences with Humata.ai to provide insights into how summary-based AI can be ethically and effectively integrated into higher education to support academic reading and critical engagement.

AI-assisted Learning in Education

Artificial Intelligence (AI) is transforming higher education by enhancing learning, research, and academic support through personalized learning, adaptive feedback, and intelligent summarization (Salas-Pilco & Yang, 2022; Holmes et al., 2023). According to Abdullah et al. (2024), the growth of AI-related educational research in Indonesia peaked in 2023, demonstrating institutional interest in using AI to enhance learning outcomes. AI tools, such as summary systems and adaptive learning platforms, assist students in navigating challenging academic content (Luckin et al., 2016; Zacharia et al., 2024). In particular, summary-based AI such as Humata.ai allows students to extract key ideas from dense literature, supporting thesis writing and academic comprehension (Habibah, 2024; Suryani & Fithriani, 2024).

Despite its advantages, concerns have been raised about the impact of AI on students' cognitive development. An excessive dependence on AI technologies may impair student's capacity for critical thought and problem-solving (Holmes et al., 2021; Cela et al., 2024). Oye et al. (2024) also pointed out dangers related to academic integrity, motivation, and a diminished role for educators. In an attempt to analyze the ways in which AI tools affect cognitive processes during learning, Sweller (1988) developed the Cognitive Load Theory. Artificial intelligence (AI) tools like Humata.ai can ease extraneous cognitive load by simplifying text structures (Chaudhry & Kazim, 2021), but the use must still encourage germane cognitive engagement.

Challenges in Academic Literature Comprehension

Comprehending academic literature remains a major challenge for students, especially during thesis writing. These difficulties include lengthy texts, complex vocabulary, limited prior knowledge, and low motivation (Anwar & Sailuddin, 2022; Hikmat, 2017). Students majoring in English are under greater pressure to analyze and critically evaluate texts because they are not familiar with literature in their native language (Simango, 2023). Therefore, their capacity to understand explicit and implicit meanings can be hampered by poor reading comprehension (Sahara, 2018). These challenges often lead to cognitive overload. To ease this, AI tools such as Humata.ai offer a summary feature that helps identify key ideas efficiently, reduces reading load, and supports comprehension (Habibah, 2024).

With the help of AI, students can focus on deeper analysis while navigating thesis literature more effectively.

Cognitive Load Theory and the Role of AI

Cognitive Load Theory (CLT), developed by Sweller (1988), is an important framework in understanding students' cognitive challenges when reading academic literature. CLT divides cognitive load into three types: 1) intrinsic load, which comes from the complexity of the material; 2) extraneous load, which comes from ineffective presentation of information; and 3) Germane load, which is a mental effort to build a meaningful understanding (de Jong, 2010; Retnowati, 2008; Kalyuga, 2021). Excessive cognitive load, especially extraneous load, often occurs in the process of reading thesis literature with dense, long, specific technical terms, and using a complicated academic style (Simango, 2023; Anwar & Sailuddin, 2022).

In this context, cognitive load management becomes important. Cognitive load management is a strategy to balance cognitive load so that it does not exceed working memory capacity (Twabu, 2025). This management includes efforts to simplify the presentation of information and direct attention to important information in learning (Olugbade et al., 2024). Educational technology, especially artificial intelligence (AI), can play a role in this strategy.

One example is Humata.ai, a summary-based artificial intelligence tool that offers automatic summary features and interactive Q&A. By simplifying the representation of long academic texts, Humata.ai helps ease extraneous load and supports germane load through active student engagement with literature (Habibah, 2024; Chaudhry & Kazim, 2021; Tampani et al., 2023). However, if used without control, AI risks reducing cognitive engagement and encouraging shallow processing (Holmes et al., 2021; Cela et al., 2024). Therefore, this article places CLT as the main lenses to evaluate the impact of using AI in understanding academic literature effectively.

Humata.ai Features and Educational Implications

Humata.ai is an AI-based tool to help read and understand academic literature through its superior features such as document upload, keyword extraction, automatic summary, and interactive Q&A system (Habibah, 2024; Suryani & Fithriani, 2024). By uploading a document or URL, users can immediately receive a summary along with the main keywords, allowing for quick understanding of long and complex texts (Suryani & Fithriani, 2024). This feature greatly supports the reduction of extraneous cognitive load, in accordance with the CLT principle, because it simplifies the presentation of the material so that it focuses on important information (Retnowati, 2008). In addition, the Q&A feature allows deeper exploration of the contents of the article, strengthening the cognitive process of analyzing literature more deeply (Habibah, 2024).

However, several challenges arise, such as the risk of dependency, decreased critical thinking skills, and the potential for plagiarism if the summary is used without reprocessing (Seo, 2021; Elaiess, 2024; Suryani & Fithriani, 2024). Therefore, it is important to understand how the use of Humata.ai affects students' learning engagement, whether it really supports understanding or

encourages passive learning. This study investigates students' cognitive experiences in using Humata.ai to understand complex thesis literature

RESEARCH METHOD

Research Design

This study used a qualitative descriptive research design that investigated how Humata.ai helps final year students of English Education Study Program ease cognitive load when they study thesis literature. This method was chosen because it allows a thorough examination of one's subjective experience that can only be achieved through direct interaction between the researcher and the participants (Creswell, 2007). This study is in line with the basic interpretive approach mentioned by Ary et al. (2018), which emphasizes the importance of understanding meaning from the perspective of the participants by using semi-structured interviews as the main technique of data collection. The main focus is how Humata.ai affects students' cognitive abilities to deal with complex academic texts, especially English as a second language.

The cognitive load theory (Sweller, 1988) underpins this study, emphasizing two types of cognitive pressure: extraneous and germane pressure. This theory was used as a reference for analyzing the data. The theory-driven theme analysis method was used to analyze the data, allowing for the identification of topics related to the use of Humata.ai, such as support for critical thinking, time efficiency, simplification of information, and potential technology dependency. The analysis followed six systematic stages (Nowell et al., 2017). This design is suitable for understanding how students view the use of AI in academic literature because it explores students' experiences through interviews, observations, and document reviews (Ary et al., 2018).

Research Participants

This study involved ten final-year English Education students from the 2021 cohort at a university in Surabaya who used Humata.ai to understand literary theses. Participants were selected through purposive sampling, appropriate for qualitative research that emphasizes in-depth exploration of experiences rather than numerical representations. The primary criterion for participants was active use of Humata.ai while reading academic literature. Students' experiences in managing extraneous and German cognitive load during this process were the focus of the study (Sweller, 1988; Kalyuga, 2021). The decision to include only ten participants was deliberate: in qualitative research, smaller samples allow for richer, more detailed accounts of individual experiences and allow researchers to conduct thorough, line-by-line thematic analysis (Creswell, 2014). In this context, ten participants provided sufficient diversity of perspectives while keeping the data set manageable for in-depth analysis.

Research Instruments

In this qualitative study, the researcher acted as the main instrument in data collection, as according to Yin and Robert K. (2016), which emphasizes direct interaction with participants. Data were collected using Humata.ai to understand academic literature through semi-structured interviews with open-ended questions (Sugiyono, 2013). Interviews were conducted via WhatsApp's Voice Note feature

and lasted for thirty to forty-five minutes with the consent of the participants. In relation to the formulation of the research problem, the interview protocol is divided into two parts. The first part discusses the function of Humata.ai in supporting extraneous cognitive load and supporting germane cognitive load. The second part identifies problems such as dependency, summary errors, and technical barriers (Sweller, 1988; Ary et al., 2018).

Data Analysis

This study collected data through interviews and documentation, including screenshots of participants' use of Humata.ai. According to participants' free time, interviews were conducted using telephone call technology and WhatsApp Voice Note (Ary et al., 2018). To maintain data accuracy, interviews were agreed to be recorded for 30 to 45 minutes. The purpose of this interview was to find out how students use Humata.ai to understand thesis literature and the difficulties they face.

The theme analysis method developed by Braun and Clarke (2006) was used to analyze the data. This method combines the cognitive load theory approach (Sweller, 1988). The focus consists of two types of cognitive load: extraneous and germane (Kalyuga, 2021). Participant transcripts on topics such as simplifying information, filtering out irrelevant data, and using strategies to support deep understanding were linked during coding (Nowell et al., 2017). This allows for a comprehensive analysis of students' cognitive experiences.

The analysis stages included six systematic steps: reading transcripts, coding based on CLT, grouping codes, reviewing and naming themes, and reporting results (Braun & Clarke, 2006). Emerging themes included literature simplification, time efficiency, summary accuracy, and technical challenges (extraneous load), as well as support for critical thinking, usage strategies, and awareness of dependence on AI (germane load). These results are used to answer research questions related to the impact of Humata.ai on cognitive processes in understanding thesis literature.

FINDING AND DISCUSSION

Finding

According to interviews with ten students, Humata.ai helps the understanding of thesis literature by easing the extraneous cognitive load through simplifying complex texts, filtering out irrelevant information, and time efficiency. In addition, Humata.ai helps the germane cognitive load by encouraging critical analysis and usage strategies. However, students also face problems such as technical issues, possible over-reliance, and inaccurate summaries.

The Role of Humata.ai in Assisting Students' Understanding of Thesis Literature by Easing Extraneous Cognitive Load

Simplification of complex texts

The figure below shows a screenshot of a student using Humata.ai, showing that Humata.ai presents a summary immediately after uploading a document.

Figure 1. Participant’s screenshot while using Humata.ai summary feature.

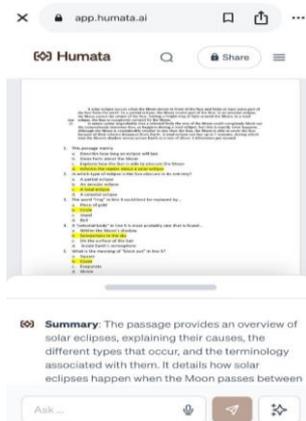
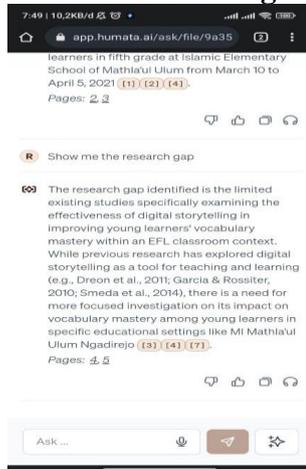


Figure 1 shows the results of the Humata.ai summary that can help students understand the main ideas and research results quickly. These summaries can be made into paragraphs or bullet points, allowing students to absorb information according to their learning style. In addition, students feel more comfortable focusing only on the important things, such as methodology or results without feeling overwhelmed. According to students, *"It was really easy when I used it... so it was easier to understand"* (Student 1) and *"In terms of efficiency, it's better to use Humata.ai because the information obtained is to the point"* (Student 2). By providing summaries immediately after a document is uploaded, Humata.ai allows students to focus their limited working memory on understanding key concepts, rather than parsing complex sentence structures. Similar benefits of AI-powered text simplification have been noted in previous educational technology studies (Habibah, 2024).

Filtering Unnecessary Information

The image below shows a screenshot of a student using Humata.ai, demonstrating that Humata.ai filters only the information the student needs.

Figure 2. Participant’s screenshot showing Humata.ai Q&A feature.



In figure 2, students utilize the Q&A feature to search for specific information such as definitions, methods, or findings. This shows how Humata.ai

helps students filter out irrelevant information, so they can focus more on the important things that are in line with their research needs. Most students stated that this tool presents information directly and in line with the objectives of their thesis. As in the interview, *“Humata.ai is very helpful because... it can filter out important information that I need...”* (Student 3). Another student added, *“So far, I can filter that much information. So, it's more about the important points.”* (Student 4). Filtering out irrelevant information is especially valuable, where a large amount of literature can lead to overload (Sweller, 1988).

Time Efficiency

In cognitive load theory (CLT), time efficiency is related to extra cognitive load. Students can get important information without reading the entire text thanks to the instant summary and question and answer features. This helps ease the mental load caused by searching and filtering unimportant information. According to seven out of ten students, Humata.ai speeds up the processing of academic literature because it provides summaries and specific answers instantly. As in the interview, *“This Q&A feature also gives me time efficiency so I don't have to scroll one by one from each page to find the answer.”* (Student 3). Another student added, *“It can shorten the time in reading articles or journals.”* (Student 2). In this way, Humata.ai allows students to concentrate on understanding and analyzing rather than decoding texts.

The Role of Humata.ai in Assisting Students' Understanding of Thesis Literature by Supporting Germane Cognitive Load

Supporting Critical Thinking

By providing follow-up questions and clarifying unclear concepts, Humata.ai Q&A feature encourages critical analysis. Interview transcripts such as *“Usually this feature is used for information that is not explicitly explained...”* (Student 2) and *“After Humata.ai provides answers or provides a summary of the article, we can definitely ask follow-up questions that can help our own studies...”* (Student 5) show that students are actively learning concepts. Because students allocate their mental resources to meaningful learning processes, it supports germane cognitive load. Through active engagement, they not only understand the material, but are also able to evaluate, compare, and expand their understanding.

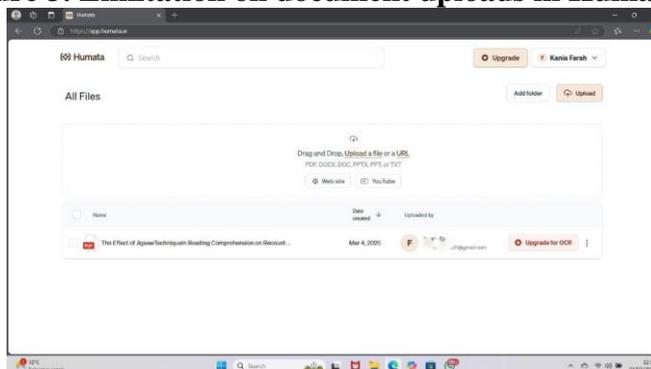
Strategies in Using Humata.ai

When using Humata.ai, students used several strategies, such as reading the literature first, skimming to select relevant documents, and verifying the AI summary with the original text. These strategies are shown in the transcripts, *“After that I have read it but it turns out I don't understand the meaning... I ask Humata.ai to help me find or provide information.”* (Student 6) and *“I will compare the summary with the original text to ensure that the summary contains the points that are really in the original text.”* (Student 8). These strategies support the germane load in the CLT framework because students use their cognitive efforts to build a deep understanding of the literature and do not just receive information passively. Students strengthen the meaningful and moral learning process by using AI selectively and reflectively.

Challenges in Using Humata.ai That Contribute to Extraneous Cognitive Load Technical Issues

The image below shows a screenshot of a student using Humata.ai, indicating that Humata.ai has a document upload limit per user account.

Figure 3. Limitation on document uploads in Humata.ai.



Technical issues such as unstable internet connections, processing delays, and document upload limits contribute to extraneous cognitive load when using Humata.ai. This load does not come from the learning material, but rather from technical glitches that interfere with focus and working memory. As students expressed, *“It just takes a little longer to process the journals I upload.”* (Student 9), and *“I had reached the limit of using Humata.ai for free... I could not continue using Humata.ai.”* (Student 8). This load does not support learning in CLT, and can even reduce student engagement with the literature. However, students overcome this problem with workarounds such as finding a place with good signal, sharing excessive documents, or using other AI alternatives.

Accuracy of Summarization

Several students complained about Humata.ai summary feature, which they deemed incomplete and inaccurate. They had to reread the original source because of this, which added an extra cognitive load that did not support hands-on learning. Student 7 stated, *“Double checking is still necessary... if there is something misunderstood... it still has to be necessary to double check or crosscheck and reread the original journal.”*. Another student noted that the summaries felt incomplete: *“...seems there are still important points that are not summarized.”* (Student 1). According to CLT, this contribute to extraneous load because students’ focus is divided on verifying information rather than understanding new material.

Challenges in Using Humata.ai That Contribute to Germane Cognitive Load Potential Over-reliance

Some students acknowledged that Humata.ai was fast and easy to use, but they also recognized the risk of dependency. Student 10 stated, *“Something that makes it easy for us will definitely cause dependency”*. Student 1 also expressed, *“...if you suddenly stop using it, it's probably difficult, maybe it's like being lazy...”*. This dependency can weaken the desire to actively read and understand

the content. As a result, the cognitive load of germane, which is the mental effort that helps create significant knowledge, is not utilized properly. Students become less engaged in active learning processes, such as reading and synthesizing. However, some students remain critical by rereading the original text and seeing AI as merely an aid rather than a substitute for the learning process.

Discussion

The Role of Humata.ai in Assisting Student's Understanding in Thesis Literature

This study aims to explore how Humata.ai helps students understand academic literature, especially in the context of writing a thesis, using the Cognitive Load Theory framework (Sweller, 1988). This study shows how artificial intelligence-based tools assist students' cognitive processes when they encounter complex academic texts. The main findings indicate that Humata.ai helps reduce extraneous cognitive load through simplifying reading content and filtering irrelevant information. In addition, through the implementation of planned learning strategies and active involvement in the learning process, Humata.ai also helps reduce extraneous cognitive load. The main themes that emerged included simplification, relevance filtering, time efficiency, and active reading strategies.

Filtering unnecessary information also plays a role in easing extraneous cognitive load, as it helps students focus their attention on the most important parts of the literature. As also found by Habibah (2024), students were able to quickly identify the main ideas in journal articles. Students can also immediately find the information they are looking for with the Q&A feature provided by Humata.ai, such as the research results section, research methods, and implicit information from the research. However, students realized the importance of continuing to develop their academic literacy in order to be able to assess whether the information provided was sufficient or needed to be explored further.

Time efficiency was another benefit that was often mentioned. Students felt that Humata.ai allowed them to understand the material faster, allowing them to spend more time on other academic activities. This finding supports the research findings of Suryani and Fithriani (2024), which showed that Humata.ai accelerated the literature review process. However, even though students quickly understand the literature, students still show an active learning approach, such as comparing the AI results with the original text. This indicates the use of metacognitive strategies to improve comprehension.

Another significant finding was ethical awareness about using Humata.ai. To avoid dependency, students used strategies such as continuing to read the original text, creating specific questions, and comparing AI results with their personal interpretations. This strategy maintains academic credibility (Elaisse, 2024). It also enhances their cognitive engagement. The metacognitive use of artificial intelligence helps balance technological efficiency with deep learning.

In conclusion, this study shows that Humata.ai can be used to enhance ESL students' comprehension of literature and extend the application of Cognitive Load Theory to the real world. The success of using AI does not lie in its ability to

replace human cognitive processes, but rather, it has the ability to actively encourage and strengthen learning engagement.

Challenges in Using Humata.ai for Understanding Thesis Literature

Although Humata.ai offers a number of benefits in helping students understand thesis literature, this study also found several challenges that need to be considered. These challenges include technical issues, summary accuracy, and potential dependency, closely related to extraneous cognitive load and germane cognitive load, which are important in determining the effectiveness of technology-based learning. This finding emphasizes the importance of the use of AI in academic contexts should not interfere with meaningful learning processes.

First, technical constraints appear to contribute to extraneous cognitive load. Many students reported limitations in the number of documents and pages that could be uploaded, as well as slow processing due to unstable internet connections. Instead of focusing on the content of the literature, students had to spend energy to overcome technical obstacles. The premium version does offer more complete features, but the subscription fee is an obstacle in itself. Therefore, students choose alternative routes, such as dividing large documents into small parts so that they can still be uploaded and using similar AI alternatives. This finding highlights the importance of equitable access to technology and adequate technical support so that AI integration can run optimally in the academic environment.

Second, the issue of summary accuracy is also a major concern. Some students stated that Humata.ai summary results were often too simple or did not contain important points, thus creating a risk of misunderstanding the content of the text. Mistakes in understanding the contents of the text are likely to affect students' understanding of the literature. This situation increases the cognitive burden because students have to verify information by rereading the original text. This shows the limitations of AI in capturing complex arguments found in academic literature. In accordance with Seo et al. (2021), summaries generated by AI are indeed prone to deviations in meaning, meaning misunderstandings of the true meaning intended by the literature. Even so, students in this study showed active strategies, such as comparing the summary results with the original source and only using AI as a support, not as the main source. These strategies help support the germane load in the learning process because students are still actively involved in building meaningful understanding of the literature.

Third, the potential dependence on Humata.ai is also a challenge for germane cognitive load. Some students admitted that the convenience offered by this tool made them tend to avoid reading directly from the source. This can reduce motivation to actively process information, thus inhibiting the formation of meaningful knowledge. Students feel no need to actively engage in literature, which is a challenge for germane cognitive load. Cela et al. (2024) also warn that excessive use of AI can reduce learning independence and critical thinking skills. However, some students in this study were aware of these risks and implemented strategies such as rereading the original text, preparing specific questions, and using AI as a complement rather than a substitute for understanding. These actions support deeper learning.

Overall, these findings confirm that the challenges in using Humata.ai are not only technical, but also related to how the tool affects students' cognitive processes. Technical constraints and summary accuracy do contribute to extraneous load, but students' strategies in verifying content and maintaining active engagement show efforts to maintain germane load. Thus, the integration of AI in learning is not enough to rely only on technology, but also requires metacognitive awareness, ethics of use, and guidance so that AI functions as a meaningful learning support, not as a substitute for cognitive processes.

CONCLUSION AND SUGGESTION

This study investigates the role of Humata.ai in helping students understand thesis literature, especially those related to cognitive load theory. By conducting interviews with ten English Language School students, it was found that Humata.ai has the ability to ease extraneous cognitive load by providing summaries and Q&A features that make it easier for students to obtain important information. In turn, these features encourage reflection, critical questioning, and strategies that support germane cognitive load.

However, several challenges arose. Technical problems such as unstable internet connections and limitations in uploading documents disrupted the learning process and contribute to extraneous cognitive load. In addition, inaccurate summaries required re-verification, which required more cognitive effort. Although some students were aware of the dependence on AI and used strategies such as rereading or comparing the original text, it is possible that dependence also emerged that contributed to germane cognitive load.

The implications of these findings suggest that the use of AI in education needs to be directed wisely. It is essential for students, teachers, and educational institutions to ensure that technology helps learning, not replaces it. Institutions can do important things such as creating policies, providing training, and supporting the use of AI.

This study has limitations, such as a limited number of participants, a focus on one study program, and a qualitative method that relies on self-reports. In addition, the focus on only one AI tool and one type of reading activity limits the generalizability of the results. In addition, intrinsic stress was not analyzed because it was considered beyond the capabilities of Humata.ai intervention.

Future research is recommended to involve more participants across disciplines, compare various AI tools, and combine quantitative approaches. In addition, the psychological and ethical aspects of AI use are also important to study, especially in relation to students' learning motivation and academic independence.

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