SALEE: Study of Applied Linguistics and English Education
Vol. 7, No. 2, July 2026

SALEE
Study of Applied Linguistics and English Education
P-ISSN: 2715-9795 E-ISSN: 2716-1617

The Ability of ChatGPT as an AI-Powered Chatbot in Writing an English Scientific Paper

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Received: 15 March 2025 *Accepted: 1 June 2026* *Published: 30 July 2026*

Abstract

ChatGPT is an AI-powered chatbot capable of generating human-like text based on the input provided through conversations like humans in natural language. This study aims to evaluate the capability of ChatGPT, an AI-powered chatbot, in assisting with the writing of English scientific papers, particularly undergraduate theses. This research applies a content analysis approach to examine the textual outputs generated by ChatGPT in response to academic thesis-related prompts. The researcher conducted 13 trials by inputting various thesis-related prompts into ChatGPT. The queries covered multiple components of a thesis, including the title, background (research gap, research question, and significance), literature review, methodology (design, data collection, and analysis), findings, discussion, conclusion, and references. The results indicate that ChatGPT was able to generate coherent responses for most thesis components. However, its output for the findings, discussion, and conclusion was inadequate due to the absence of actual research data and context, which are essential for producing valid results. Additionally, when given a differently formulated research objective, ChatGPT occasionally provided inconsistent or inappropriate responses. While the tool demonstrates a strong contextual understanding of text and generates relevant content, its limitations highlight potential issues related to academic integrity, including plagiarism and ethical concerns. This study underscores the need for critical human oversight when using AI tools in academic writing.

Keywords: ChatGPT, OpenAI ChatGPT, scientific paper, writing, thesis

To cite this article: Fitria, T. N. (2026). The ability of ChatGPT as an AI-powered chatbot in writing an English scientific paper. *SALEE: Study of Applied Linguistics and English Education*, *7*(2), 187–211. https://doi.org/10.35961/salee.v7i2.2029

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1. Introduction

Academic writing may incorporate the use of AI tools such as OpenAI's ChatGPT as a supportive resource rather than a primary author. In this context, ChatGPT can assist writers during preliminary stages of the writing process, including brainstorming research topics, generating outlines, paraphrasing sentences, improving grammar, and suggesting academic vocabulary. Writing academic writing necessitates acquiring the outcome of contemporary issues or phenomena (Fitria, 2022). Students who will compose a thesis must also pay close attention to their knowledge of the aspects of writing scientific papers. Thesis writing requires not only the expression of ideas and thoughts but also the research title, the citation of writing techniques, previous research studies, the research method, and the technique of collecting and analyzing data.

Academic writing, especially the writing of research articles, dissertations, and theses, is often viewed in the literature as 'writing up'. It is as if first comes the research, an active creation of new knowledge, and then comes the writing, a relatively passive assembling of what has already been achieved (Badley, 2009). Al-Fadda (2012) explains that English as a second language (ESL) students face many difficulties and stresses in their academic writing, such as difficulty distinguishing between spoken and written English, making an outline before writing a draft, identifying the skills needed for successful writing, and avoiding cliché words and phrases. Furthermore, Budjalemba & Listyani (2020) analyze factors contributing to students' difficulties in an Academic Writing course based on the students' perceptions. Based on the findings, two factors caused students difficulties in writing academically. The two factors were internal and external. Internal factors consisted of self-motivation, self-confidence, lack of knowledge, and feeling of being under pressure. External factors consisted of the teacher's teaching style, classroom atmosphere, materials, and writing aspects. This research hopefully can help teachers and instructors in developing appropriate teaching techniques in academic writing and minimize students' difficulties in academic writing.

Educational technology integration in academic writing can be seen in the use of AI tools to support language learning and writing development. Teachers can integrate AI tools such as OpenAI's ChatGPT to assist students throughout the academic writing process (Fitria, 2024a). For example, students may use ChatGPT to brainstorm research topics, generate outlines, refine thesis statements, improve grammar and academic vocabulary, and receive suggestions for revising drafts. In this context, the technology functions as a cognitive and linguistic support tool that enhances writing efficiency and quality, while teachers still guide students to maintain critical thinking, originality, and academic integrity.

The arrival of generative Artificial Intelligence (AI) in educational settings offers a unique opportunity to explore the intersection of human cognitive processes and AI, especially in complex tasks like writing (Nguyen, Ilesanmi, et al., 2024). Furthermore, the Artificial

Intelligence (AI)-assisted academic writing platform is a digital tool that leverages the use of artificial intelligence (AI) technology to help the platform users, i.e., students, teachers, and professionals in various aspects of academic writing (Qureshi et al., 2025). The AI-assisted writing framework is closely related to academic writing because both emphasize a structured, goal-oriented, and process-based approach to producing knowledge. Academic writing requires writers to generate ideas, organize arguments logically, support claims with evidence, and present information using formal language conventions. The AI-assisted writing framework supports these same stages by positioning artificial intelligence as a scaffolding tool that helps writers navigate complex academic writing tasks without replacing their intellectual responsibility.

ChatGPT is a variant of the GPT (Generative Pre-training Transformer) language model developed by OpenAI. ChatGPT is an OpenAI-developed variant of the GPT (Generative Pre-training Transformer) language model. It is designed particularly for chatbot applications and is capable of generating human-like responses to user inputs (Nkwocha, 2023; West, 2023). ChatGPT communication is similar to human communication and not like a conversation with a robot. Since it was first released to the public on November 30, 2022, by a technology and internet company known as OpenAI, and attracted the interest of people immediately. (Gade, 2023; Wali, 2023). In its original form, ChatGPT performs tasks such as playing audio/ video, transferring data, talking, and even having discussions just like humans do. Within the first five weeks of 2023, the app had 100 million users (Kramer, 2023). The global community is beginning to recognize this new phenomenon and experiment with it (Leib, 2023).

OpenAI used "pre-training" to teach the model to comprehend and generate natural language to construct ChatGPT (Gaum, 2023; Haleem et.al., 2022; West, 2023). Pre-training entails training the model using a large dataset of human-generated text and machine-learning algorithms to learn the language's patterns and structures. ChatGPT is trained on a large corpus of text and can comprehend and generate text that resembles human language, significantly better than GPT-3 (Tsipursky, 2023). The resulting model can then generate text that resembles the text in the training set. OpenAI ChatGPT is an AI powerful and sophisticated AI tool that is capable of providing advanced natural language processing capabilities (NeSmith, 2023; Wildman, 2023). This innovation allows it to be used to answer queries, offer guidance, and provide personalized advice on a variety of subjects.

Discussion of the presence of ChatGPT in this social network is electrifying (Fitria, 2024b). This chatbot can do student assignments with one command and respond to problems given by users. ChatGPT can assist students during the pre-writing stage by suggesting research topics, helping formulate research questions, and generating outlines; during drafting by supporting grammar, academic vocabulary, and coherence; and during revision by offering feedback, paraphrasing options, and structural improvements. Artificial

Intelligence (AI) has increasingly influenced higher education, notably in academic writing, where AI-powered assisting tools offer both opportunities and challenges (Nguyen, Hong, et al., 2024). ChatGPT capabilities can inform students by providing tools to help them prepare for their exams. In addition, ChatGPT can assist students in completing tasks such as writing essays and even academic papers. For example, a student needs the ChatGPT platform to understand the subject matter to be discussed and to assist students in guiding them when they are preparing their essays by recommending articles or other sources that are directly related to the subject matter to be discussed. It can also help students in preparing answers that will be applied by the lecturer. If students continue to use ChatGPT, this situation will become a problem for lecturers and students themselves. That is, students do not carry out assignments according to their abilities and get grades that do not reflect their achievements. The continuous use of ChatGPT is continuously used tends to make students lose motivation while studying. So, tasks that can be given can be done easily by machines. Cases like this will have a negative impact on students and teachers during the learning process. Educators have the challenge to overcome this by introducing a curriculum that emphasizes students' creative thinking and analytical skills.

ChatGPT is an artificial intelligence application capable of generating human-like text in response to basic keywords entered by users (Lawrence, 2023). It means that ChatGPT can generate human-like text based on the input provided (Anderson, 2023; Wiles, 2023). (West, 2023) ChatGPT is trained on a large corpus of human conversation, allowing it to comprehend and utilize natural language similarly to how humans do. This includes acquiring the language's structure and norms, as well as the meanings of words and phrases. According to Luberisse (2023), ChatGPT can be used for a variety of purposes.

The function of ChatGPT is to perform tasks related to natural languages (Fitria, 2022), such as: 1) Generating text: ChatGPT can be used to generate text that fits the given context. 2) Language understanding: ChatGPT can be used to understand the natural language spoken by the user and extract relevant information from the received text. 3) Dialogue systems: ChatGPT can develop chat systems that can answer questions and complete tasks assigned by users. 4) Language translation: ChatGPT can be used to translate text from one language to another. 5) Text summarization: ChatGPT can be used to simplify long and complex texts into easy-to-read summaries. 5) Text completion: ChatGPT can complete missing/ incomplete text.

Shidiq (2023) states that the ChatGPT system, an AI-based chatbot with the capacity to generate text in a variety of contexts (formal, informal, or creative writing), poses challenges to the education sector. By utilizing ChatGPT, we as users can save a substantial amount of time that would have been spent researching and writing. Ryan & Diorio (2023) state that ChatGPT is an AI platform where the user simply asks questions or has a conversation with the AI, such as a teacher or student, to ChatGPT. ChatGPT can also comprehend the context

of a conversation and generate responses that are appropriate for the context and follow the conversation's flow. So, ChatGPT is an AI-powered chatbot capable of engaging in conversations with humans in natural language. This innovation allows it to be used to answer queries, offer guidance, and provide personalized advice on a variety of subjects (NeSmith, 2023).

ChatGPT is capable of generating text based on context, enhancing the coherence and relevance of the generated text. It provides an API for simple access to the model, allowing developers to integrate it into their applications with minimal effort (Fitria et al., 2023). The model was trained on a wide variety of Internet texts, which provides it with a broad range of knowledge and comprehension of various topics, allowing it to generate text on a wide variety of subjects (Gaum 2023). ChatGPT can even rewrite content in different voices, perspectives, and audiences (Skrabut, 2023).

In a groundbreaking new study, scientists drive ChatGPT by using a series of prompts and questions to produce scientific papers, such as essays, theses, or dissertations, or academic publications such as scientific journals (Fitria, 2024c). ChatGPT's ability to write theses and other scientific works has begun to be debated. It can also be the opportunities and challenges it poses for the academic community. On the other hand, the ability of AI also raises questions, because it could be a threat to the academic world. In higher education, writing a thesis is an obligation for students before graduating from their studies.

As stated above, OpenAI's ChatGPT was released in late 2022, and now many articles have been written about its use across education and professions (Duin & Pedersen, 2023). The use of chatbots, specifically ChatGPT, to produce academic essays in schools and universities has sparked concern among academics (Khalil & Er, 2023). First, Supriyadi (2022) states that ChatGPT is a tool for creating educational research articles in mathematics, in the process of writing research articles. It is necessary to double-check to be sure that the resulting article does not contain plagiarism. Second, Setiawan and Luthfiyani (2023) state that using ChatGPT can produce writing totaling 693 words, and these results can still be developed further for the next assignment for students. The total time needed to complete this experiment is approximately 7 minutes, including the time to document the ChatGPT processing results, but does not include the time to formulate two good and effective prompts before the experiment is carried out. The previous studies show that two previous studies discuss the ability of ChatGPT in writing essays, but they do not discuss its ability to write a thesis.

The research gap identified from previous studies is that, although they explore ChatGPT’s capability in generating academic essays and research articles, they do not specifically address its effectiveness in assisting with thesis writing. Existing research mainly focuses on ChatGPT’s role in essay production, its ability to generate large amounts of text, and concerns related to plagiarism. However, these studies have not examined how ChatGPT

can contribute to structuring, developing, and refining a complete thesis. As a result, there remains a limited understanding of how ChatGPT can support students in more complex academic writing tasks, such as thesis development, which requires critical thinking, sustained argumentation, and coherence across multiple chapters.

This research also serves as a follow-up to a previous study by Fitria (2023), which discussed ChatGPT's ability to write English essays in a work entitled "Artificial Intelligence (AI) Technology in OpenAI ChatGPT Application: A Review of ChatGPT in Writing English Essays." Building on that study, the present research expands the focus to scientific academic writing in the form of undergraduate theses. The researcher is interested in examining ChatGPT's capability in supporting thesis writing more deeply. Therefore, the objective of this study is to describe ChatGPT's ability to assist in producing English scientific academic work, particularly undergraduate theses.

The novelty of this study lies in its contribution to the field of AI-assisted academic writing by moving beyond the common focus on short academic texts, such as essays and articles, to examine the role of AI in supporting complex academic writing, specifically undergraduate thesis development. This research provides new knowledge by systematically evaluating how AI supports multiple components of thesis writing, including topic formulation, background development, literature review construction, research methodology design, data interpretation, and conclusion writing. The findings demonstrate that AI functions not merely as a text generator but as a cognitive scaffolding tool that helps students organize ideas, structure arguments, and maintain coherence across chapters. At the same time, the study identifies important limitations related to critical analysis, methodological accuracy, and ethical concerns surrounding academic integrity.

In addition, this research extends existing scholarship by shifting the perspective from product-oriented evaluation toward a process-oriented understanding of AI use throughout the entire academic writing cycle, from planning and drafting to revising and refining. A major contribution of the study is the development of a conceptual framework called the AI-Mediated Academic Writing Support Model, which positions AI as operating through three interconnected roles: cognitive support, linguistic support, and metacognitive support. Together, these roles conceptualize AI not as a replacement for human academic work but as a scaffolding system that enhances student autonomy, supports critical thinking development, and strengthens academic writing competence in complex scholarly tasks.

2. Method

This research applies a content analysis approach to examine the textual outputs generated by ChatGPT in response to academic thesis-related prompts. Although initially framed as

descriptive qualitative, this study does not involve human participants or experiences, which are central to traditional qualitative inquiry. Therefore, it is more accurately positioned as a qualitative document or content analysis, focusing on the structure, clarity, relevance, and academic appropriateness of the AI-generated texts.

The object of analysis in this study is the text produced by ChatGPT, not as a participant but as a source of digital documentation. The documentation method is appropriate in this context, as it involves the collection and analysis of written or digital materials (Mardawani, 2020). As stated by Sarosa (2021), electronic documents are all documents stored in digital format, including AI-generated content. The decision to use ChatGPT as the subject of analysis is based on its increasing role in academic contexts, particularly as a writing assistant used by students and researchers.

To collect data, the researcher developed 13 academic prompts corresponding to essential sections of a thesis. These include prompts for both qualitative and quantitative title creation, background of the study, literature review, previous studies, research methods, findings, discussion, conclusion, suggestions, and references. Each prompt was input into the official ChatGPT platform at https://chat.openai.com using the GPT-4 model. The outputs were recorded through screenshots and textual transcriptions. Before formal data collection, a pilot phase was conducted to ensure that all prompts reflected authentic academic writing tasks and followed widely accepted thesis-writing conventions. This pre-testing helped assess the clarity, tone, and relevance of the prompts, and revisions were made as needed to improve their effectiveness and remove ambiguity. Additionally, metadata such as the date, version of ChatGPT (GPT-4), and time of input were noted to ensure transparency and replicability, given the dynamic nature of AI responses.

To systematically evaluate ChatGPT's performance, the study employed a three-indicator rubric, focusing on: Accuracy (how well the content aligns with academic norms), Clarity (the coherence, fluency, and readability of the output), and Relevance (the degree to which the response addresses the specific thesis section requested). Each indicator was scored using a three-point scale: 3 for high performance, 2 for moderate, and 1 for low. This rubric was applied consistently across all 13 outputs. To enhance the reliability of the analysis and reduce potential bias, two independent evaluators assessed a subset of the responses. Any disagreements were discussed and resolved through reflection and consensus.

The analysis followed the interactive model of Miles, Huberman, and Saldana (2018), which consists of three key steps: data reduction, data display, and conclusion drawing. During data reduction, the researcher filtered and selected relevant parts of each ChatGPT response according to the research focus. The reduced data were then organized in tables and matrices to display patterns and enable clear interpretation. Conclusions were drawn based on recurring trends, strengths, and weaknesses in ChatGPT's performance across various thesis components. Unlike anecdotal screenshot-based analysis, this study presents a more

systematic and cohesive evaluation. A matrix (Table 6.1) was used to summarize the results of all 13 prompts, showing the scores for each indicator. This structured presentation provides a clear overview of ChatGPT's academic writing capabilities, contributing to a more reliable and meaningful interpretation of the data.

3. Findings and Discussion

In this research, the researcher describes ChatGPT's ability to write an English thesis. The use of ChatGPT can be seen below:

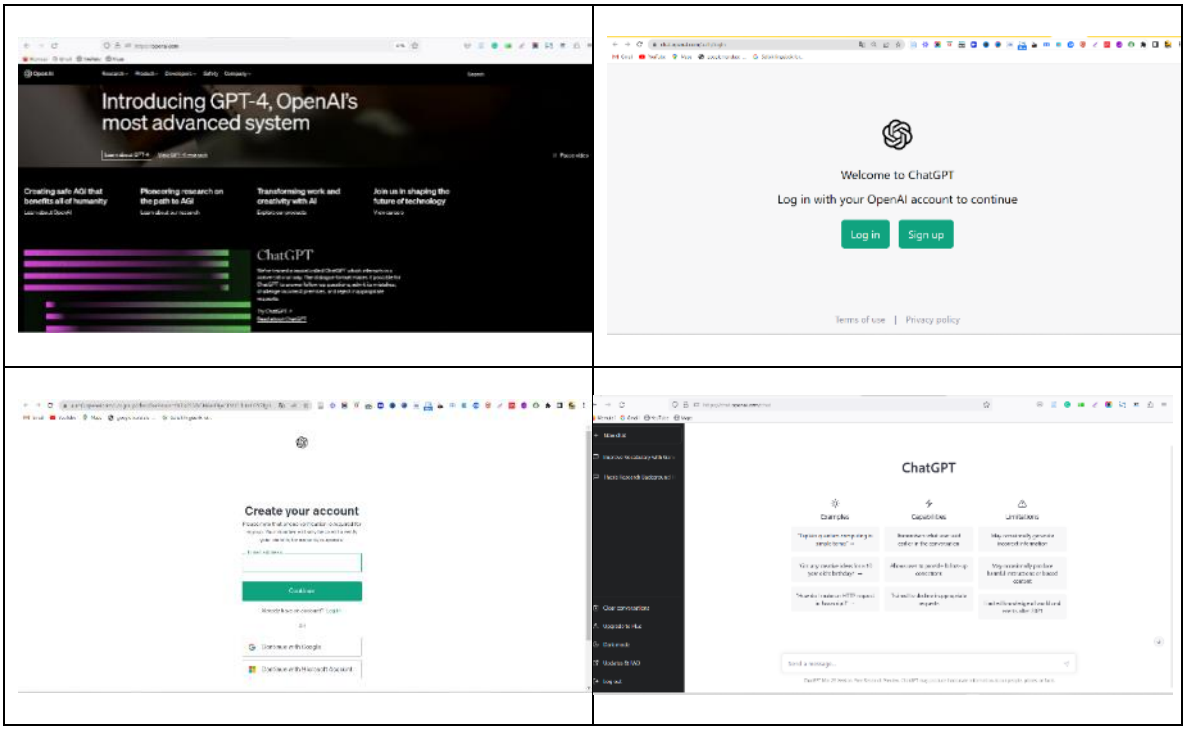

Figure 1. Open AI ChatGPT View

ChatGPT can be accessed via https://chat.openai.com/. Several steps can be taken, namely: Opening a browser and entering the URL address https://chat.openai.com/ into the address bar. There will be the menu "Log in" and "Sign up". We can create an account by using a Google account or a Microsoft Account. Log in with our account. We will be directed to the main page of OpenAI Chat. We can type the question or command we want to run in the text box provided. We click the "Submit" button or press Enter to submit our request. 6) We will receive answers from the ChatGPT model developed by OpenAI. We can also access

specific commands by typing specific commands, such as "help" to get a list of available commands.

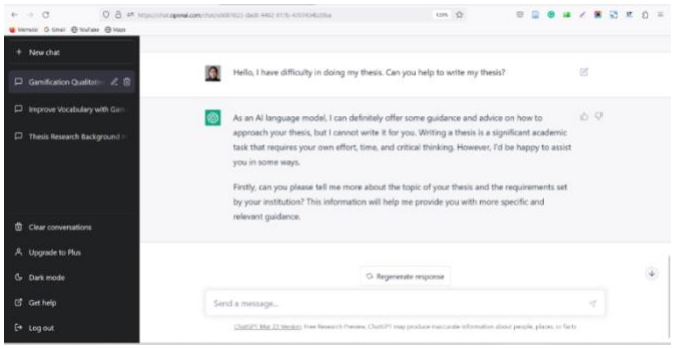

Figure 2. Open AI ChatGPT's Responses to Writing a Thesis

Figure 2 above shows that the researcher asks, "Hello, I have difficulty in doing my thesis. Can you help me write my thesis?" ChatGPT answered by writing, "As an AI language model, I can offer some guidance and advice on how to approach your thesis, but I cannot write it for you. Writing a thesis is a significant academic task that requires effort, time, and critical thinking. However, I'd be happy to assist you in some ways. Can you please tell me more about the topic of your thesis and the requirements set by your institution? This information will help me provide you with more specific and relevant guidance".

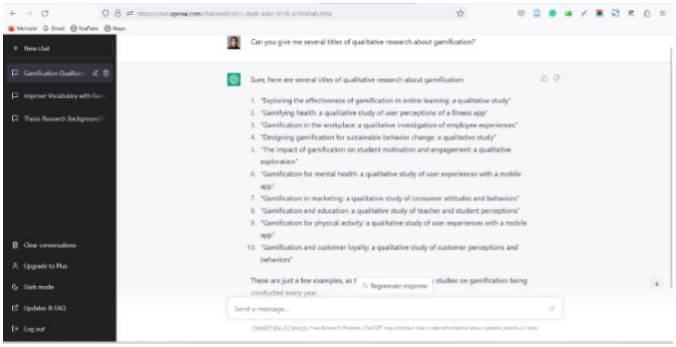

Figure 3. The Question to ChatGPT about Thesis Title (Part 1)

Figure 3 above shows that the researcher tries to ask Chat GPT by typing the question or command in the text box provided: "Can you give me several titles of qualitative research about gamification?" ChatGPT then answers, "Sure, here are several titles of qualitative research about gamification". ChatGPT writes ten thesis titles with a qualitative approach. ChatGPT also adds that "These are just a few examples, as there are many qualitative studies on gamification being conducted every year". It shows that ChatGPT can give a

recommendation for a thesis title to the researcher related to the previous studies that have been conducted every year.

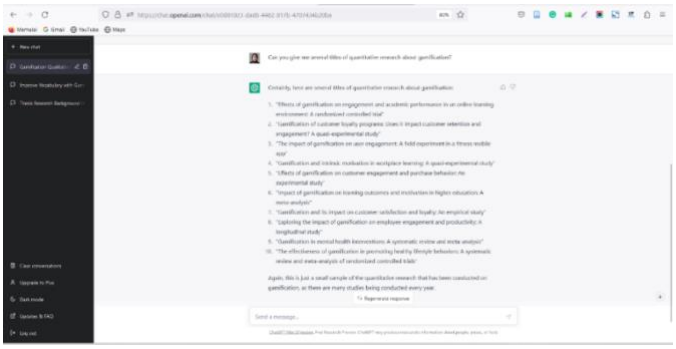

Figure 4. Question to ChatGPT about Thesis Title (Part 2)

Figure 4 above shows that the researcher tries to ask Chat GPT by typing the question in the text box provided, “Can you give me several titles of quantitative research about gamification?” ChatGPT then answers, “Sure, here are several titles of quantitative research about gamification”. ChatGPT writes ten thesis titles with a qualitative approach. ChatGPT also adds that “Again, this is just a small sample of the quantitative research that has been conducted on gamification, as many studies are being conducted every year.” It shows that ChatGPT can give a recommendation of a thesis title to the researcher related to the previous studies that have been conducted every year.

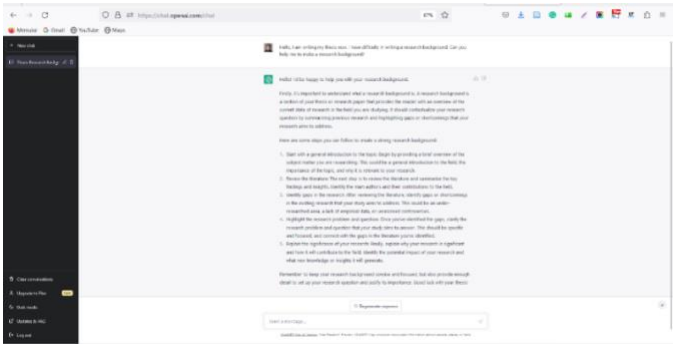

Figure 5. Question to ChatGPT about Research Background (1)

Figure 5 above shows that the researcher tries to ask Chat GPT by typing the question in the text box provided. When the researcher asks ChatGPT, “Hello, I am writing my thesis now. I have difficulty writing a research background. Can you help me make a research background?” Then, ChatGPT answers, “Hello! I'd be happy to help you with your research background”. Before making a research background, even ChatGPT answers “Firstly, it's important to understand what a research background is” and explains first about “research

background". ChatGPT explains in a paragraph that "A research background is a section of your thesis or research paper that provides the reader with an overview of the current state of research in the field you are studying. ChatGPT answers by giving tips in writing a research background: "Here are some steps you can follow to create a strong research background." Such as "start with a general introduction to the topic, reviewing the literature, identifying gaps in the research, highlighting the research problem and question, explain the significance of your research".

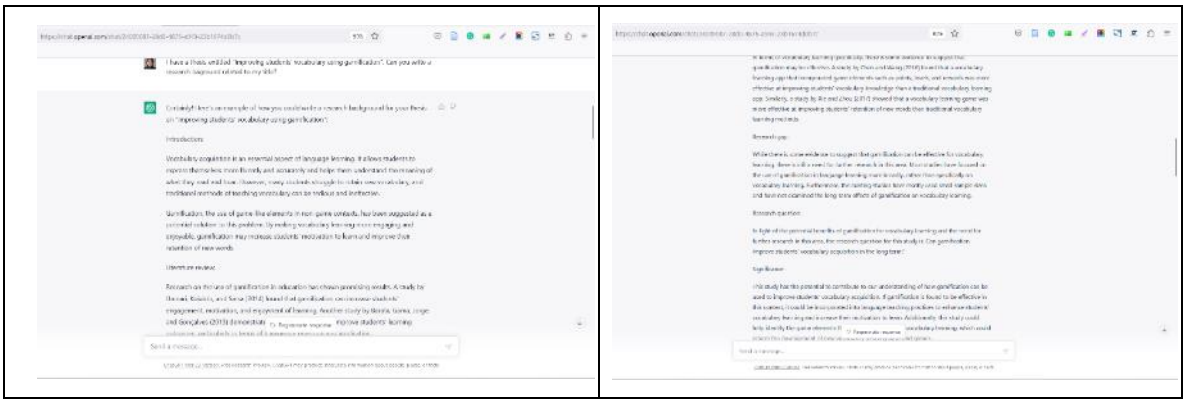

Figure 6. Question to ChatGPT about Research Background (2)

Figure 6 above shows that the researcher asked ChatGPT, "I have a thesis entitled 'Improving students' vocabulary using gamification'. Can you write a research background related to my title?" ChatGPT answers, "Certainly! Here's an example of how you could write a research background for your thesis on 'Improving students' vocabulary using gamification"

ChatGPT continues to write a research background related to the thesis title given. ChatGPT writes several paragraphs and an orderly introduction, literature review (previous studies), research gap, research question, and significance. In the introduction section, there are two paragraphs. ChatGPT writes "Vocabulary acquisition' in the first paragraph, then writes "gamification" in the second paragraph. In the literature review section, ChatGPT, there are two paragraphs. ChatGPT writes about "research on the use of gamification in education has shown promising results" in the first paragraph, then writes "some evidence to suggest that gamification may be effective" in the second paragraph. In the research gap section, ChatGPT writes the research gap "While there is some evidence to suggest that gamification can be effective for vocabulary learning, there is still a need for further research in this area…". In the research question section, ChatGPT writes a research question "Can gamification improve students' vocabulary acquisition in the long term?". Then, in the significance, ChatGPT writes a research significance "This study has the potential to contribute to our understanding of how gamification can be used to improve students'

vocabulary acquisition…". It shows that ChatGPT can write a research background in several paragraphs related to the thesis title given.

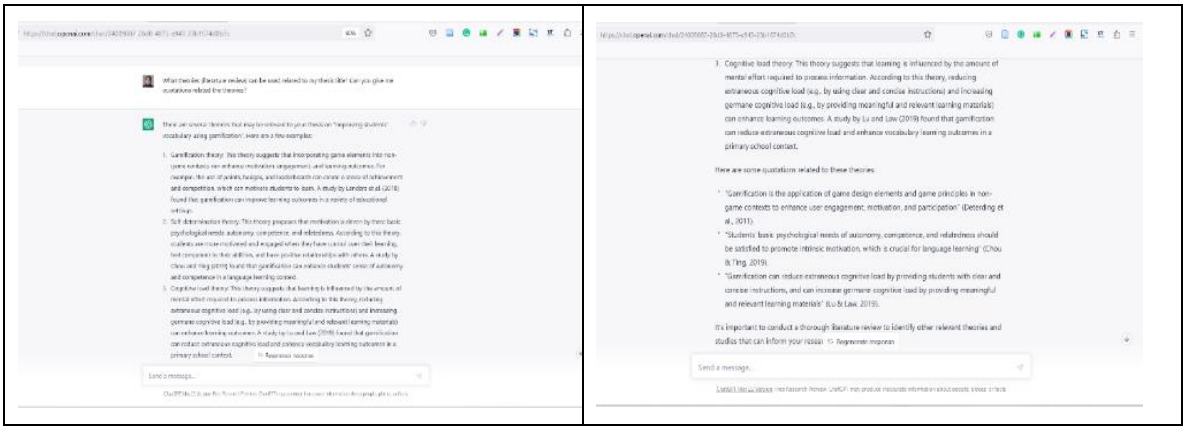

Figure 7. Question to ChatGPT about Literature Review

Figure 7 above shows the question to ChatGPT. The researcher tries to ask Chat GPT by typing the question or command in the text box provided. When the researcher asks ChatGPT, "What theories (literature review) can be used related to my thesis title? Can you give me quotations related to the theories?" Then, ChatGPT answers, "There are several theories that may be relevant to your thesis on 'Improving students' vocabulary using gamification'. Here are a few examples:" ChatGPT answers by writing several theories, such as "Gamification theory, Self-determination theory, and Cognitive load theory," with indirect quotations at the beginning of the sentences. Besides that, ChatGPT also adds "Here are some quotations related to these theories:". ChatGPT then gives the quotation references. Related to the theories given. ChatGPT adds that "It's important to conduct a thorough literature review to identify other relevant theories and studies that can inform your research".

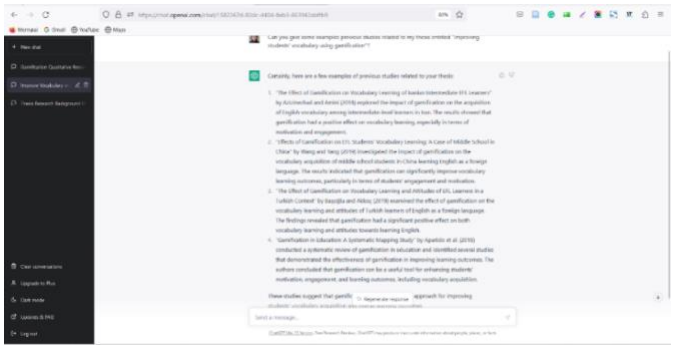

Figure 8. Question to ChatGPT About Previous Studies

Figure 8 above shows the question to ChatGPT. The researcher tries to ask Chat GPT by typing the question or command in the text box provided. When the researcher asks

ChatGPT, “Can you give some examples of previous studies related to my thesis entitled 'Improving students' vocabulary using gamification?” Then, ChatGPT answers, “Certainly, here are a few examples of previous studies related to your thesis: " ChatGPT answers by writing four examples of previous studies about gamification such as 1) The Effect of Gamification on Vocabulary Learning of Iranian Intermediate EFL Learners, 2) Effects of Gamification on EFL Students' Vocabulary Learning: A Case of Middle School in China, 3) The Effect of Gamification on Vocabulary Learning and Attitudes of EFL Learners in a Turkish Context, 4) Gamification in Education: A Systematic Mapping Study. Besides, ChatGPT writes each of the research findings of the previous studies. The previous studies above were written in 2018 and 2019. It shows that ChatGPT can give previous studies about gamification in the past 5 years.

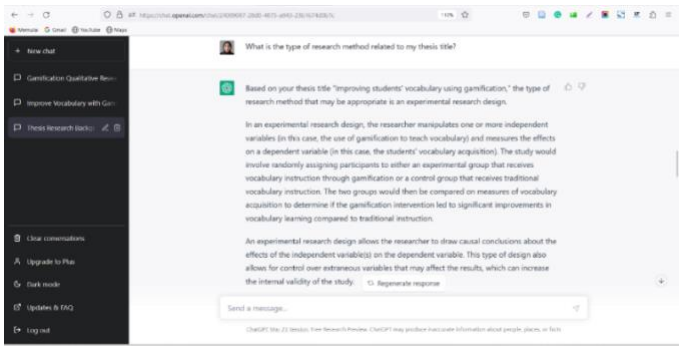

Figure 9. Question to ChatGPT About Research Type (Research Design)

Figure 9 above shows the question to ChatGPT. The researcher tries to ask Chat GPT by typing the question or command in the text box provided. When the researcher asked ChatGPT, “What is the type of research method related to my thesis title?” Then, ChatGPT answers, “Based on your thesis, the type of research method that may be appropriate is an experimental research design”. ChatGPT explains more about an experimental research design, such as characteristics, subjects, and variables (dependent and independent). Besides, ChatGPT explains more that “The study would involve randomly assigning participants to either an experimental group that receives vocabulary instruction through gamification or a

control group that receives traditional vocabulary instruction". It shows that ChatGPT can write a research design appropriate to the thesis.

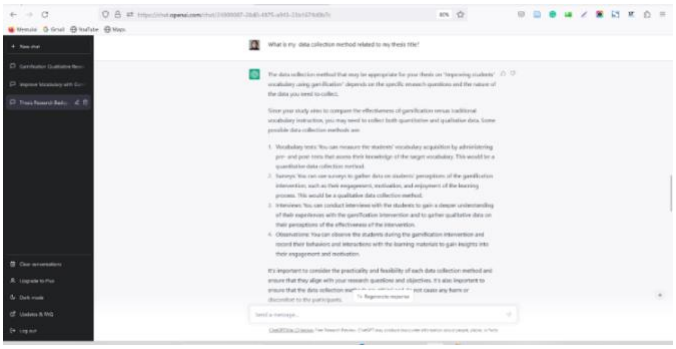

Figure 10. Question to ChatGPT About Data Collecting Method

Figure 10 above shows the question to ChatGPT. When the researcher asked ChatGPT, "What is my data collection method related to my thesis title?" Then, ChatGPT answers, "Certainly, here are a few examples of previous studies related to your thesis: " ChatGPT answers by writing "The data collection method that may be appropriate for your thesis on 'Improving students' vocabulary using gamification' depends on the specific research questions and the nature of the data you need to collect". ChatGPT adds, "Some possible data collection methods are: vocabulary tests, surveys, interviews, and observation". In a test, ChatGPT explains that it measures the students' vocabulary acquisition by administering pre- and post-tests. In surveys, ChatGPT gathers data on students' perceptions of gamification, such as engagement, motivation, and enjoyment of the learning process. In an interview, ChatGPT explains that it gains from students' experiences and perceptions of the effectiveness of the intervention. While in observation, ChatGPT explains that observation of students' behaviors and interactions with the learning materials is. ChatGPT adds that "It's important to consider the practicality and feasibility of each data collection method and ensure that they align with your research questions and objectives. It is also important to ensure that the data collection methods are ethical and do not cause any harm or discomfort

to the participants". It shows that ChatGPT can explain the method of collecting data related to research purposes and the research design of the thesis.

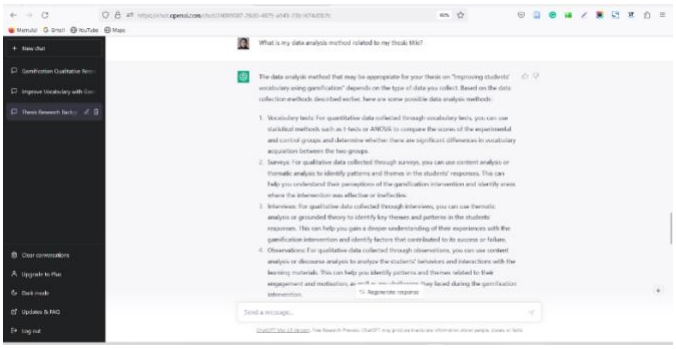

Figure 11. Question to ChatGPT About Data Analyzing Method

Figure 11 above shows the question to ChatGPT. When the researcher asked ChatGPT, "What is my data analysis method related to my thesis title?" Then, ChatGPT answers by writing "The data analysis method … depends on the type of data you collect. Based on the data collection methods described earlier, here are some possible data analysis methods". ChatGPT explains more about the analysis method, such as: 1) in a vocabulary test, we can use statistical methods (t-tests or ANOVA) to compare the scores of the experimental and control groups and determine significant differences in vocabulary acquisition between the two groups. 2) In a survey, we can use content analysis or thematic analysis to identify patterns and themes in the students' responses. 3) In an interview, we can use thematic analysis or grounded theory to identify key themes and patterns in the students' responses. 4) In observation, we can use content analysis or discourse analysis to analyze the students' behaviors and interactions with the learning materials. ChatGPT adds, "It's important to ensure that the data analysis method you choose aligns with your research questions and objectives and is appropriate for the type of data you collected. You may also need to use multiple data analysis methods to triangulate your findings and ensure that your conclusions are well-supported by the data". It shows that ChatGPT can explain the method of analyzing data related to the thesis.

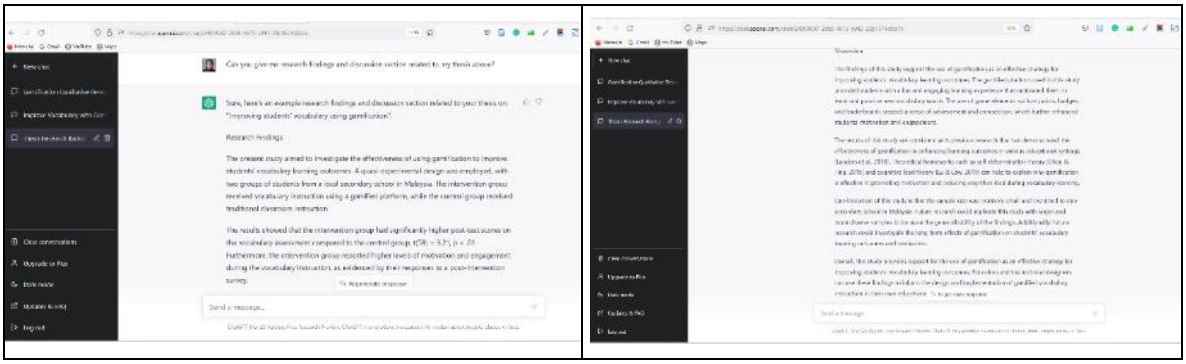

Figure 12. Question to ChatGPT About Research Findings and Discussion

Figure 12 above shows the question to ChatGPT. The researcher tries to ask Chat GPT by typing the question or command in the text box provided. When the researcher asked ChatGPT, "Can you give me research findings and a discussion section related to my thesis above?" Then, ChatGPT answer by writing "Sure, here's an example research findings and discussion section related to your thesis on "Improving students' vocabulary using gamification". ChatGPT write two paragraphs about research findings such as "…A quasi-experimental design was employed, with two groups of students from a local secondary school in Malaysia". ChatGPT also adds "The results showed that the intervention group had significantly higher post-test scores on the vocabulary assessment compared to the control group". ChatGPT writes four paragraphs about the discussion, such as 1) The findings of this study support the use of gamification as an effective strategy for improving students' vocabulary learning outcomes. 2) The results of this study are consistent with previous research that has demonstrated the effectiveness of gamification in enhancing learning outcomes. 3) One limitation of this study is that the sample size was relatively small and restricted to one secondary school in Malaysia. 4) Overall, this study provides support for the use of gamification as an effective strategy for improving students' vocabulary learning outcomes. The results of this finding are uncertain because the research subjects and setting have not been determined by the researchers, the research has not been carried out so the finding data has not been found either, then there is a different research focus in the research background (using gamification to improve students' vocabulary) but in the discussion, section shows using gamification to improve student's learning outcomes.

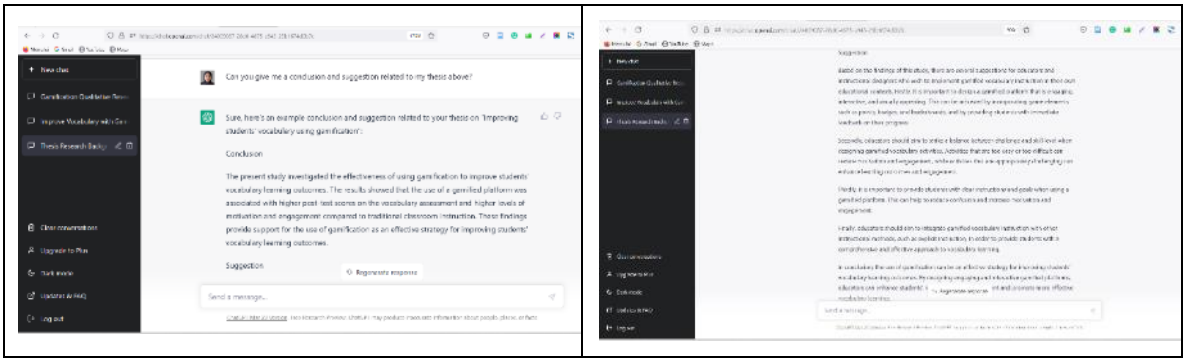

Figure 13. Question to ChatGPT About Conclusion and Suggestion

Figure 13 above shows the question to ChatGPT. When the researcher asked ChatGPT, "Can you give me a conclusion and suggestion related to my thesis above?" ChatGPT answers by writing the conclusion and a suggestion. In conclusion, ChatGPT writes, "The results showed that the use of a gamified platform was associated with higher post-test scores on the vocabulary assessment and higher levels of motivation and engagement compared to

traditional classroom instruction". ChatGPT adds, "In conclusion, the use of gamification can be an effective strategy for improving students' vocabulary learning outcomes. By designing engaging and interactive gamified platforms, educators can enhance students' motivation and engagement and promote more effective vocabulary learning. While in suggestion, ChatGPT answers "Based on the findings of this study, there are several suggestions for educators and instructional designers who wish to implement gamified vocabulary instruction in their educational contexts". It shows that ChatGPT equates a conclusion with research findings that gamification is to improve student learning outcomes, even though the research objectives clearly state that the research is to improve students' vocabulary skills. Conclusions cannot be written because the findings and discussion related to the research have not been obtained.

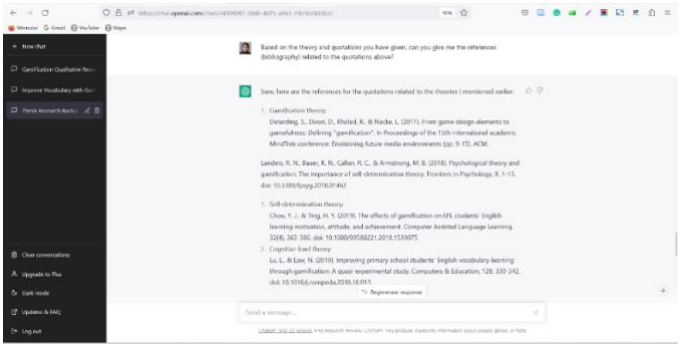

Figure 14. Question to ChatGPT About References (Bibliography)

Figure 14 above shows the question to ChatGPT. When the researcher asks ChatGPT, "Based on the theory and quotations you have given, can you give me the references (bibliography) related to the quotations above?" ChatGPT answers by writing the conclusion and a suggestion. In conclusion, ChatGPT writes, "Sure, here are the references for the quotations related to the theories I mentioned earlier". ChatGPT mentions the references based on the theories in the literature review, such as: In Gamification theory use a reference from the article journal entitled 1) "From game design elements to game-fullness: Defining "gamification" at 2011, 2) The importance of self-determination theory at 2019. In Self-determination theory uses references from the article journal entitled "The effects of gamification on EFL students' English learning motivation, attitude, and achievement" at 2019. Then, in Cognitive load theory use a reference from the article journal entitled "Improving primary school students' English vocabulary learning through gamification". It shows that ChatGPT writes references related to the quotations in the literature reviews. All

references are from international journals; there are no references from national journals or books.

This section synthesizes the interaction between the researcher and ChatGPT during the process of developing a thesis titled "Improving Students' Vocabulary Using Gamification". The analysis focuses not on describing each screenshot, but on identifying emerging themes and patterns in ChatGPT's responses across various research stages. To provide a structured analysis, findings are categorized into thematic components of thesis writing: Topic Development, Theoretical Support, Methodology Design, and Thesis Drafting. The effectiveness of ChatGPT is evaluated in each theme using a table that summarizes strengths and weaknesses.

3.1. Effectiveness of ChatGPT in supporting thesis writing

Thesis Component	Prompt Example	ChatGPT Response	Effectiveness	Notes	Thesis Component
Thesis Title Suggestions	"Can you give me several titles of quantitative research?"	Gave 10 relevant titles (both qualitative and quantitative)	✅ Effective	Demonstrates the ability to generate ideas quickly and appropriately	Thesis Title Suggestions
Background of the Study	"Can you help me write a research background?"	Provided structured background: intro, lit review, gap, question, significance	✅ Effective	Aligned with academic conventions, customizable	Background of the Study
Literature Review	"What theories can I use?"	Offered 3 theories with indirect quotations and references	✅ Partially effective	Indirect sources; references need verification	Literature Review
Previous Studies	"Give examples of previous studies."	Listed 4 international studies with findings	✅ Effective	All from recent years; helpful for framing relevance	Previous Studies
Research Methodology	"What is my research method?"	Recommended experimental design with rationale	✅ Effective	Clear, aligned with the topic; well-contextualized	Research Methodology
Data Collection Methods	"What is my data collection method?"	Suggested tests, interviews, surveys, and observations	✅ Effective	Covered both qualitative and quantitative options	Data Collection Methods
Data Analysis Methods	"How do I analyze the data?"	Suggested statistical tests (t-test, ANOVA) and qualitative techniques (thematic)	✅ Effective	Shows variety; appropriate to the chosen method	Data Analysis Methods
Findings and Discussion	"Can you give me a findings and discussion section?"	Provided fabricated results and general discussion	❌ Ineffective	Contradicted initial research focus; findings are fictional and misleading	Findings and Discussion
Conclusion and Suggestions	"Can you give a conclusion and suggestions?"	Summarized fabricated findings and made generalized suggestions	❌ Ineffective	Misaligned with real research objectives; unsupported conclusion	Conclusion and Suggestions
References	"Can you give	Provided references	✅ Partially	All references are	References

	references for the quotations?"	based on the discussed theories	effective	international; no national or book sources	
Thesis Component	Prompt Example	ChatGPT Response	Effectiveness	Notes	Thesis Component

The evaluation shows that ChatGPT is generally effective in supporting the early and structural stages of thesis writing but is less reliable in producing final research outputs. It performs well in generating thesis title suggestions, writing structured research backgrounds, recommending methodologies, and proposing data collection and analysis methods, demonstrating strong alignment with academic writing conventions. It is partially effective in assisting with literature reviews and references because the generated citations often require verification. However, ChatGPT is ineffective in producing findings, discussions, and conclusions because it tends to generate fabricated data and unsupported claims. Therefore, while ChatGPT can function as a valuable cognitive and structural support tool, its outputs must be critically evaluated and independently validated by users.

To ensure the rigor of the evaluation process, the assessment rubric used in this study was systematically developed and validated before being applied. The rubric criteria were derived from established academic writing standards commonly used in undergraduate thesis guidelines, including clarity of structure, relevance to research objectives, coherence of arguments, methodological appropriateness, and accuracy of academic conventions. These standards were adapted from widely recognized thesis writing frameworks in higher education and English academic writing assessment practices.

The validation of the rubric was conducted through expert judgment involving two senior lecturers in English Language Teaching and academic writing. They reviewed the clarity, relevance, and representativeness of each rubric criterion in relation to thesis writing components. Based on their feedback, several descriptors were refined to ensure alignment with academic writing expectations and to improve the clarity of performance indicators.

To enhance the reliability of the evaluation, inter-rater reliability procedures were also implemented. Two independent raters assessed ChatGPT’s responses using the same rubric. The consistency between raters was measured using an inter-rater agreement approach, which showed a high level of consistency, indicating that the rubric provided clear and

objective evaluation criteria. This process ensured that the assessment results were not solely dependent on a single evaluator's subjective judgment.

3.2. Thematic analysis of ChatGPT responses

From the above table, the following themes emerge:

a. High Utility in Idea Generation and Structuring: ChatGPT is notably effective in the early stages of thesis development, generating titles, research questions, and providing structures for research background, literature review, and methodology.
b. Surface-Level Academic Support: ChatGPT responses are mostly descriptive, lacking critical depth. While useful for outlining, they require validation, enrichment, and synthesis from scholarly sources.
c. Fictional or Unfounded Data in Later Stages: In thesis drafting components like Findings, Discussion, and Conclusion, ChatGPT produces content that is not based on real data. These sections are speculative and, if used uncritically, could mislead the researcher.
d. Lack of Contextual/Localized Sources: All references provided are from international journals. ChatGPT did not cite national or regional journals or books, which are often necessary for contextual grounding.

3.3. Synthesis with research question

ChatGPT provides significant support in several aspects of academic writing, particularly in the early stages, such as planning and idea development. However, this tool cannot replace the crucial roles of critical thinking, in-depth analysis, and empirical data collection, which are the core of any research. The findings of this study partially answer the main research question: "To what extent can ChatGPT assist students in writing a thesis?" The answer to this question is complex. On one hand, ChatGPT has proven to be effective as a writing assistant, especially in the initial stages such as title creation, background writing, and literature review. On the other hand, for sections that require empirical data, such as findings, discussion, and conclusion, ChatGPT is still unreliable, as it cannot replace the actual field research process.

3.4. Summary of strengths and weaknesses

Strengths	Weaknesses
Quick idea generation and structured outlines	Lacks analytical depth
Clear guidance on methodology and research design	Fictional findings and unsupported conclusions
Ability to simulate thesis sections for inspiration	No thematic or interpretive synthesis across queries
Helpful in identifying basic theories and references	Cannot provide locally contextualized sources or nuanced academic debate

ChatGPT excels in the early stages of thesis writing by quickly generating ideas, creating structured outlines, guiding methodology design, and offering basic theoretical references. However, its key limitations include a lack of analytical depth, the tendency to produce fictional or unsupported findings, and the inability to synthesize content across prompts. It also lacks localized references and does not engage in nuanced academic discussion, making it less reliable for advanced or context-specific tasks.

4. Conclusion

This study provides an analytical synthesis of how ChatGPT functions across different stages of thesis writing rather than merely describing individual interactions. The findings reveal a clear functional pattern: ChatGPT demonstrates strong performance in the cognitive-structural phases of academic writing but shows substantial limitations in analytical, empirical, and interpretive dimensions. In particular, the tool consistently supports idea generation, structural organization, and procedural guidance, indicating that its primary value lies in scaffolding rather than knowledge production. This pattern suggests that AI writing assistance operates most effectively at the pre-writing and drafting stages, where tasks involve organizing information rather than generating original scholarly insight.

From an analytical perspective, the results indicate that ChatGPT's contributions can be categorized into three levels of support: structural facilitation, procedural guidance, and linguistic enhancement. At the structural level, ChatGPT effectively generates research titles, organizes background sections, and outlines literature reviews, reflecting its ability to model conventional academic formats. At the procedural level, it provides coherent suggestions for research methodologies, data collection, and analysis strategies. At the linguistic level, it enhances academic tone, coherence, and clarity of expression. However, these strengths remain largely surface-level because they rely on pattern recognition rather than genuine understanding, resulting in limited critical synthesis and weak theoretical integration.

The most critical limitation emerges in the empirical reasoning domain. ChatGPT's responses during the findings, discussion, and conclusion stages reveal a systematic tendency to generate fabricated or hypothetical data. This indicates that the AI lacks epistemic grounding—the ability to distinguish between actual evidence and plausible-sounding constructs. Such limitations confirm that AI-assisted writing cannot substitute for core academic competencies such as data interpretation, critical argumentation, and contextual evaluation. Consequently, ChatGPT functions as a productivity enhancer but not as a knowledge generator within scholarly research processes.

From an academic integrity perspective, these findings must be interpreted within established ethical frameworks. According to widely recognized academic integrity principles—such as transparency, authorship accountability, and intellectual responsibility—AI-generated content raises significant ethical concerns. The results demonstrate that without

clear attribution practices, students may unknowingly submit AI-produced text that lacks original intellectual contribution. This aligns with formal academic integrity models that emphasize originality, proper citation, and the ethical use of external assistance. Therefore, AI usage in academic writing should be governed by explicit disclosure requirements and guided by institutional integrity standards.

Beyond individual ethics, the findings also intersect with broader institutional AI governance debates. Universities worldwide are currently transitioning from prohibition-based approaches toward regulated integration models. The patterns observed in this study support governance frameworks that treat AI as a supervised learning tool rather than an autonomous author. Institutional policies should therefore focus on developing AI literacy, clarifying acceptable use boundaries, and establishing assessment designs that prioritize critical thinking over text production. Without such governance mechanisms, AI adoption risks undermining assessment validity, student engagement, and academic credibility.

Furthermore, the findings highlight an emerging pedagogical shift in higher education. AI tools like ChatGPT are redefining the nature of academic writing from a purely productive activity to a collaborative human-AI process. This shift necessitates a reorientation of instructional priorities—from evaluating writing outputs toward assessing cognitive processes such as reasoning, synthesis, and reflective judgment. In this context, educators must reposition AI as a metacognitive support system that enhances learning while preserving intellectual autonomy.

In synthesis, this study demonstrates that ChatGPT's effectiveness in thesis writing is conditional and domain-specific. It excels in supporting structural planning, procedural guidance, and linguistic refinement but remains unreliable in generating empirical analysis and critical interpretation. These findings reinforce the view that AI should be conceptualized not as a replacement for academic labor but as a scaffold that supports, rather than substitutes, scholarly thinking.

However, this study has several limitations. It examined a limited number of prompts within a single disciplinary context and focused on one AI system. Future research should explore cross-disciplinary applications, compare multiple AI tools, and investigate long-term impacts on students' cognitive development and academic integrity practices. Additionally, further studies are needed to develop robust institutional AI governance models that balance innovation with ethical accountability.

In conclusion, ChatGPT represents a transformative yet constrained tool within academic writing ecosystems. Its role is best understood as an efficiency-enhancing scaffold that supports early writing processes while requiring strong human oversight in analytical and ethical dimensions. Effective integration of AI in higher education, therefore, depends not

only on technological capability but also on the development of clear integrity frameworks, governance policies, and pedagogical adaptations.

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