HARNESSING AI FOR IDEA GENERATION: PRE-SERVICE TEACHERS' EXPERIENCES USING CHATGPT IN ACADEMIC WRITING

KECERDASAN BUATAN (AI) UNTUK PENJANAAN IDEA: PENGALAMAN GURU PELATIH MENGGUNAKAN CHATGPT DALAM PENULISAN AKADEMIK

Raguna R Arumugam[1]*, Moganashwari Kandasamy[2]
curly_na@hotmail.com[1], moganash@hotmail.com[2]
Institut Pendidikan Guru Kampus Tuanku Bainun[1,2]
*Corresponding Author

Article Info:

Received Date: 06 April 2026

Revised Date: 10 Jun 2026
19 Jun 2026

Accepted Date: 01 Ogos 2026

Published Date: 27 Sept 2026

Abstract:

The integration of artificial intelligence (AI) in education is rapidly changing how students generate, evaluate, and develop ideas in academic writing. This qualitative study examines the cognitive processes of 10 foundation-level TESL pre-service teachers' use of ChatGPT for idea generation with a specific focus on its influence on critical thinking. Grounded in Cognitive Load Theory, the study conceptualises ChatGPT as a cognitive offloading tool that may both support and constrain higher-order thinking during the early stages of writing. Participants used a standardised prompt to generate ideas for self-selected essay topics, followed by a critical evaluation of AI-generated content before composing their essays using the TEEL structure. Data were collected through interviews, student essays, and written reflections and analysed thematically. Findings indicate that while ChatGPT reduced cognitive load associated with idea generation and facilitated initial engagement with writing tasks, the use of ChatGPT also introduced risks of limited depth of cognitive processing, over-reliance, and uncritical acceptance of generated content. Significantly, variation was observed in how participants engaged in evaluating, selecting and refining AI-generated ideas, highlighting differences in critical thinking practices. The study contributes new insight into how AI-mediated cognitive offloading shapes idea development in academic writing, demonstrating that the effectiveness of ChatGPT depends not merely on access to the tool but on students' ability to critically examine and transform its outputs. These findings emphasize the need to position critical thinking as a central component in AI-supported academic writing contexts.

Keywords: *Artificial Intelligence in Education,ChatGPT, Academic Writing, Critical Thinking, Cognitive Load Theory*

Kata Kunci:

Kecerdasan Buatan dalam pendidikan, ChatGPT, Penulisan Akademik, Pemikiran Kritis, teori Beban Kognitif

Abstrak:

Integrasi kecerdasan buatan (AI) dalam pendidikan sedang mengubah cara pelajar menjana, menilai, dan membangunkan idea dalam penulisan akademik secara pesat. Kajian kualitatif ini meneliti proses kognitif 10 orang guru pelatih TESL program persediaan yang menggunakan ChatGPT untuk penjanaan idea, dengan fokus khusus terhadap pengaruhnya kepada pemikiran kritis. Kajian ini berteraskan "Cognitive Load Theory" dan mengkonseptualisasikan ChatGPT sebagai alat "Cognitive Offloading" yang berpotensi menyokong dan pada masa yang sama mengekang pemikiran aras tinggi semasa peringkat awal penulisan. Peserta menggunakan input arahan yang telah disediakan oleh untuk menjana idea bagi topik esei pilihan sendiri. Ini diikuti dengan penilaian kritis terhadap kandungan yang dijana oleh AI sebelum menghasilkan esei menggunakan struktur TEEL. Data dikumpul melalui temubual, refleksi bertulis, dan esei pelajar, dan kemudiannya dianalisis secara bertema. Dapatan kajian menunjukkan bahasa walaupun ChatGPT mengurangkan beban kognitif yang berkaitan dengan penjanaan idea dan memudah cara penglibatan awal dalam tugas penulisan, penggunaan ChatGPT juga mendatangkan risiko dari segi pemprosesan kognitif kritis yang terhad, kebergantungan melampau, dan penerimaan kandungan yang dijana secara tidak kritis. Secara signifikan, terdapat variasi dalam cara penglibatan pelajar memilih, menilai, dan memurnikan idea yang dijana oleh AI, sekaligus menonjolkan perbezaan dalam amalan pemikiran kritis. Kajian ini memberi pandangan baharu tentang bagaimana "Cognitive Offloading" berbantukan AI membentuk pembangunan idea dalam penulisan akademik, serta membuktikan bahawa keberkesanan ChatGPT bukan sekadar bergantung pada

akses kepada alatan tersebut, malah pada keupayaan pelajar untuk meneliti dan mentransformasikan outputnya secara kritis. Dapatan ini menekankan keperluan untuk memposisikan pemikiran kritis sebagai komponen utama dalam konteks penulisan akademik berbantukan AI.

INTRODUCTION

Significant transformations in the global higher education landscape have been initiated by the integration of artificial intelligence (AI), particularly large language models (LLMs) such as ChatGPT. These technologies have revolutionized the academic writing process by acting as intelligent assistants that support brainstorming, improve writing flow, and assist in the complex task of organizing ideas (Haider & Hussain, 2026; Williams et al., 2025). In the context of second-language learning and teacher training. AI tools are increasingly ae increasingly utilised to enhance productivity and time management during the initial stages of writing (Ajiye & Omokhabi, 2025: Williams et al.). Writing is often regarded as a problematic, complex and arduous process, particularly during the phases of planning, structuring and organising ideas (Prereira et al., 2024). Generative AI technologies can automate these specific activities, making the academic writing process more dynamic and accessible (Pereira at al., 2024). Furthermore, these tools offer transformative potential by scaffolding learning for non-native English speakers, helping to overcome significant barriers such as language differences and the time-consuming nature of synthesizing information from various sources (Guo & Zaini, 2024 ; Pereira et al., 2024). By serving as intelligent assistants from brainstorming and drafting, AL models like ChatGPT can significantly improve overall efficiency for researchers in training (Ajiye & Omokhabi, 2925; Williams et al). For pre-service teachers, mastering these tools is becoming essential as they navigate the demands of academic production and prepare to guide future generations within a digital-first educational environment (Darus et el., 2025).

Nevertheless, although AI presents substantial opportunities for enhancing efficiency and personalising learning, its integration into academic writing is tempered by significant challenges and the “paradox of AI’s efficiency” (Pereira et al, 2024). Research suggests that while Chat GPT can facilitate early idea generation, it introduces risks such as over-reliance, which may inadvertently impair the development of critical thinking and independent learning skills (Subedi & Nyamasvisva, 2024). Furthermore, the academic community faces critical concerns regarding academic integrity, including new forms of technology-facilitated plagiarism and complex questions surrounding the authorship and legitimacy of AI-supported content (William et al. 2025). These issues highlight a potential crisis where the focus of writing may shift from a deep cognitive process of knowledge creation to the mere assembly of machine-generated outputs (Rezaei et al., 2024).

In Malaysia, the integration of AI is not only a technological evolution but a deliberate national imperative, strategically embedded within policy framework such as the *Rancangan Pendidikan Malaysia (RPM*) 2026-2035 (Darus et al., 2025). Despite this high-level commitment, there remains a lack of empirical evidence regarding the lived experiences of Malaysian pre-service teachers when using AI for specific high-stakes tasks like idea generation. Thus, by identifying how these students engage with and transform AI-generated ideas, the research aims to inform the pedagogical shifts necessary to ensure that technological advancements in Malaysian higher education prioritise human-centred learning and maintain academic excellence (Darus et al., 2025; Haider & Hussain, 2026).

Statement of Problem

Generative Artificial Intelligence (GAI), particularly Large Language Models such as ChatGPT, has increasingly reshaped academic writing practices by enabling users to brainstorm ideas, organise content and reduce cognitive demands during the writing process (Haider & Hussain, 2026). Despite these advantages, concerns have emerged regarding how pre-service teachers balance AI-assisted productivity with authentic academic engagement. Although AI can function as a useful cognitive support tool, its unstructured use may reduce the mental effort necessary for deep learning and critical thinking (Rezael et al., 2024).

Existing studies also indicate that AI-generated outputs may be overly general, biased or inaccurate, yet students often demonstrate uncritical acceptance of such content (Subedi & Nyamasvisva, 2024; Williams et al., 2025). As a result, the writing process risks shifting from meaningful knowledge construction to the simple assembly of machine-generated ideas, potentially affecting the quality of academic discourse and independent learning. In the Malaysian higher education context, the Rancangan Pendidikan Malaysia (RPM) 2026-2035 emphasised AI integration to ensure a future-ready education system (Darus et al., 2025). However, empirical evidence on how Malaysian TESL pre-service teachers engage with AI during high stakes academic tasks remains limited. Therefore, this study aims to inform pedagogical approaches that support responsible AI integration while maintaining academic excellence.

Research Objectives

1. To explore how do TESL pre-service teachers use ChatGPT in idea generation for academic writing.
2. To investigate how do TESL pre-service teachers evalluate and refine AI-generated ideas and what insights does this provide into their critical thinking?

Research Questions

1. How do TESL pre-service teachers use ChatGPT in idea generation for academic writing?
2. How do TESL pre-service teachers evaluate and refine AI-generated ideas and what insights does this provide into their critical thinking?

This study is limited to 10 foundation-level TESL pre-service teachers from a single teacher education institution, which may restrict the transferability of findings to other contexts or groups. The use of a single AI tool (ChatGPT) and a standardised prompt may not fully capture the range of ways students naturally interact with AI in real academic writing tasks. In addition, the study focuses on short-term engagement with AI during controlled writing activities, rather than long-term development of critical thinking or writing skills. Self-reported data from interviews and reflections may also be influenced by participants' perceptions and willingness to articulate their thinking processes accurately.

Significance of the Study

This study contributes to the growing body of research on artificial intelligence in education by providing insights into how TESL pre-service teachers engage cognitively with AI tools during academic writing. It extends Cognitive Load Theory by illustrating how AI functions as a form of cognitive offloading that can both support and constrain higher-order thinking processes (Sweller et al.,1998; Paas & Van Merrienboer, 2000). The findings are particularly relevant in the context of emerging research on generative AI in writing, which highlights both its potential to enhance idea generation and its risks in reducing deep cognitive engagement if used uncritically (Kasneci et al., 2023; Dwivedi et al., 2023). From a teacher education perspective,

the study underscores the importance of developing pre-service teachers' AI literacy, particularly their ability to evaluate, select and refine AL-generated content critically. This aligns with recent calls for integrating critical digital literacy into teacher preparation programmes in response to rapid AI adoption in education (UNESCO, 2026; Holmes et al., 2022).

On the whole, the study provides evidence-based implications for scaffolding critical engagement with AI tools in academic writing, ensuring that technology use promotes, rather than replaces, higher-order thinking skills in pre-service teachers.

Literature Review

The literature highlights the growing role of Generative AI in reshaping academic writing practices, particularly in relation to cognitive engagement, critical literacy and ethical considerations among learners in higher education contexts.

The Role of Generative AI in the Academic Writing Process

The emergence of Generative Artificial Intelligence (GAI), particularly Large Language Models (LLMs) such as ChatGPT, has transformed AI from a simple proofreading tool to an intelligent assistant that is revolutionising the entire writing workflow. These tools act as "idea laboratories", supporting students in the planning stages of writing by facilitating brainstorming, improving the flow of writing and assisting in the logical organisation of complex arguments (Haider & Hussain, 2026; UNESCO, 2026). More importantly, the integration of AI into academic writing reflects a broader shift in how knowledge is generated and constructed within higher education. For researchers in training and students learning English as a Foreign Language (EFL), AI tools may enhance writing fluency and rhetorical development through immediate feedback and idea expansion (Khampusaen, 2025; Marzuki et al., 2023).
Nevertheless, the existing literature presents a more complex picture than simply portraying AI as a beneficial writing aid. While AI can facilitate idea generation and reduce difficulties associated with initial drafting, concerns remain regarding the extent to which students engage cognitively with the generated content. Subedi and Nyamasvisva (2024) argued that although AI supports structural coherence and linguistics sophistication, excessive dependence on AI-generated responses may encourage surface-level engagement rather than meaningful idea construction. This suggests that the effectiveness of AI in academic writing depends not solely on technological accessibility, but also on students' ability to critically interpret and transform AI-generated ideas into original academic arguments.

Consequently, current discussions increasingly emphasise the need to examine not only what AI can produce, but how students cognitively engage with its outputs during the writing process. Despite the growing body of research on AI-assisted academic writing, limited studies have specifically explored how TESL pre-service teachers experience the use of ChatGPT during idea generation. Existing research has tended to focus on the effectiveness and ethical implications of AI rather than students' cognitive experiences and critical engagement with AI-generated ideas during the writing process. Therefore, further qualitative exploration is needed to understand how TESL pre-service teachers interact with and interpret AI-generated content within academic writing contexts.

Cognitive Load Theory and AI-Mediated "Cognitive Offloading"

Grounded in Cognitive Load Theory (CLT), the use of ChatGPT for idea generation is often understood as a form of cognitive offloading. This process can be beneficial because it reduces the intrinsic cognitive load associated with linguistic production and initial drafting, allowing students to engage more effectively with demanding academic tasks (Sweller et

al.,1998). From this perspective, AI has the potential to function as a supportive scaffold that assists novice writers during the cognitively demanding stages of writing.

However, the relationship between AI assistance and cognitive engagement remains contested in the current literature. Rezaei et al. (2024) described this tension as a "paradox of efficiency", whereby AI simultaneously supports learning while potentially reducing the mental effort required for meaningful knowledge construction. Although cognitive scaffolding may improve writing efficiency, excessive reliance on AI tools has been associated with reduced critical engagement and limited higher-order thinking. In particular, students may accept AI-generated outputs without sufficient questioning, evaluation, or refinement, leading to passive rather than reflective learning experiences.

Furthermore, existing studies have yet to fully explain how students negotiate the balance between cognitive support and cognitive dependence when using AI for academic writing. This gap is particularly significant in teacher education, where critical thinking and independent knowledge construction are essential competencies for future educators. Thus, understanding of how pre-service teachers cognitively engage with AI-generated content is necessary to determine whether AI functions as a meaningful educational scaffold or merely as a shortcut that bypasses deeper intellectual engagement.

Pre-service Teachers and critical AI Literacy

Mastering AI tools is increasingly viewed as an essential skill for pre-service teachers as they prepare for their future roles in a digital-first educational environment (Darus et al., 2025). The effectiveness of AI in education depends heavily on "Critical AI Literacy" which refers to the ability to understand AI's fendamental features, evaluate its inherent biases, and transform its outputs through active human agency (Strauß, 2021; UNESCO, 2026). Hence, AI competence in education extends beyond technical proficiency and requires reflective and critical engagement with AI-generated information.
In this regard, students vary considerably in how they engage with AI-generated content, particularly in their ability to evaluate, refine and apply generated ideas meaningfully in academic writing. This variation indicates that access to AI tools alone does not necessarily promote higher-order thinking or effective learning outcomes. Some students may use AI as a starting point for deeper exploration and refinement, whereas others may rely heavily on AI-generated ideas without sufficient critical evaluation. As a result, concerns have emerged regarding whether the integration of AI into teacher education may unintentionally weaken students' independent thinking and reflective learning practices.

Therefore, teacher education programmes must move beyond viewing AI merely as an automation tool and instead approach it as a socio-technical system that requires reflective and participatory engagement (Dilek et al., 2025; Langran et al., 2025). This is particularly important because pre-service teachers will eventually influence how future learners engage with AI technologies in educational settings. For this reason, developing critical AI literacy among pre-service teachers is increasingly recognised as an essential component of contemporary teacher education.

Ethical Implication and Academic Integrity in the AI Era

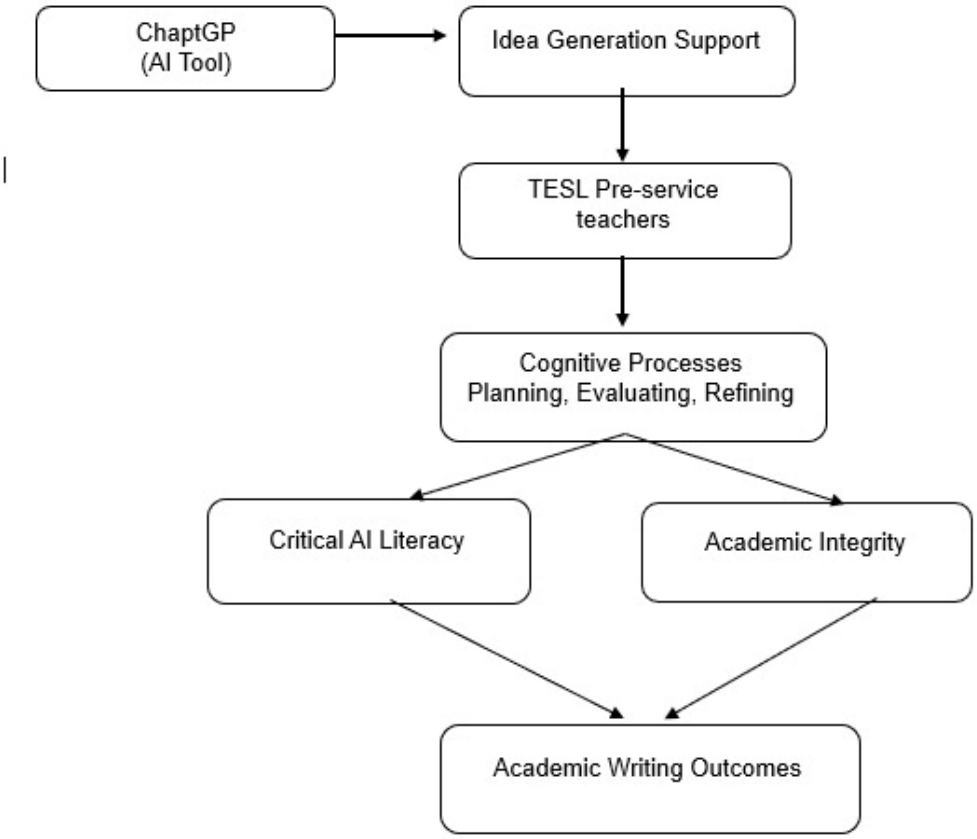
Despite the affordances of GAI, the academic community faces profound ethical challenges regarding the legitimacy and authorship of AI-supported work. Primary concerns include the risk of "hallucinations" where AI generates factually incorrect or biased information, as well as the tendency for students to accept such outputs uncritically (Williams et. al., 2025; Subedi & Nyamasvisva, 2024). These concerns are particularly problematic in academic writing contexts, where accuracy, originality and intellectual responsibility are essential expectations.

Additionally, the use of AI introduces complex questions surrounding academic integrity, including new forms of “technology-enabled plagiarism” and the “pastiche” nature of AI-generated content, which may obscure original human sources (Carleton College, 2023; Pereira et al.,2024). Unlike conventional plagiarism, AI-assisted writing creates ambiguity regarding authorship, ownership of ideas, and the extent of students’ actual cognitive contribution to the final written product. Consequently, the growing accessibility of AI-generated content has challenged traditional understandings of originality and authentic academic work.

To mitigate these concerns, higher education institutions are increasingly advocating for transparent disclosure of AI use and the development of ethical frameworks that prioritise human accountability and intellectual honesty (Darus et al. 2025; Williams et al., 2025). However, existing discussions often focus heavily on policy and regulation while paying comparatively less attention to students’ lived experiences and decision-making processes when using AI during academic writing. For that reason, further research is needed to understand how students navigate ethical considerations while simultaneously engaging with AI-supported writing practices.

Figure 1
Conceptual Framework

Harnessing Ai For Idea Generation: Pre-Service Teachers’ Experiences Using Chatgpt In Academic Writing



Methodology

Research Design

This study employed a qualitative interpretive research design to explore TESL pre-service teachers' cognitive experiences and critical engagement when using ChatGPT for idea generation in academic writing. This qualitative approach enabled to obtain in-depth insights into participants' experiences, perceptions, reflections, and critical thinking practices rather than measure variables quantitatively (Creswell & Poth, 2018). Guided by Cognitive Load Theory (CLT), the study conceptualised ChatGPT as a cognitive offloading tool that may influence higher-order thinking during academic writing.

Sample and Sampling Technique

The sample consisted of 10 foundation-level TESL pre-service teachers from a teacher education institution in Malaysia. Participants were selected using purposive sampling because they had direct experience using ChatGPT for idea generation in academic writing tasks (Patton, 2022). They were considered suitable participants as they were in the process of developing their academic writing skills while beginning to engage with AI tools in educational contexts. The sample size was considered appropriate for qualitative inquiry as the study prioritised depth of understanding rather than statistical generalisation.

Research Instruments

The study utilised three instruments: semi-structured interviews, students' essays and written reflections. The use of multiple instruments enabled methodological triangulation, which enhanced the credibility and trustworthiness of the findings (Lincoln & Guba, 1985). The three instruments were selected to capture different dimensions of participants' engagement with AI-assisted writing, including observable writing outcomes through essays, reported cognitive experienced through interviews, and reflective awareness through written reflections. Semi-structured interviews were conducted to explore participants' experiences, cognitive processes and critical thinking practices when using ChatGPT for idea generation. The open-ended interview questions focused on participants' experiences of using ChatGPT, the perceived benefits and challenges of the tool, cognitive processes during writing and the evaluation of AI-generated outputs.

Participants were required to compose an academic essay using the TEEL structure after interacting with ChatGPT for idea generation. The essays provided evidence of how participants selected, modified, refined and transformed AI-generated ideas within their writing.

Written reflections were collected to examine participants' internal thought processes, decision-making, and experiences during AI-assisted writing activities. Reflective writing enabled participants to describe their cognitive and metacognitive engagement with AI-generated content, unearthing how they negotiated authorship and exercised cognitive agency when navigating automated suggestions (Lodge et al., 2023).

Data Collection Method

Data collection was conducted in several stages. First, participants were briefed on the objectives and procedures of the study, including issues related to confidentiality, anonymity, voluntary participation, and informed consent. Participants were instructed to use ChatGPT for idea generation based on a standardised prompt. After evaluating the AI-generated outputs, participants composed academic essays using the TEEL structure and subsequently

completed written reflections describing their experiences and cognitive processes during the activity. Semi-structured interviews were conducted after the completion of the writing tasks to obtain deeper insights into participants' perceptions and critical engagement with AI-generated ideas. All interviews were audio-recorded with participants' consent and later transcribed verbatim for analysis.

Data Analysis Method

The data were analysed using Braun and Clarke's (2006) six-phase thematic analysis framework. The first phase involved familiarisation with the interview transcripts, essays and reflections through repeated reading. Audio recordings were transcribed verbatim to ensure accuracy. The second phase involved generating initial codes related to cognitive processing, cognitive offloading, critical thinking, AI dependence and refinement. In the third phase related codes were grouped into broader categories to form preliminary theme. The fourth phase involved reviewing and refining the themes to ensure coherence and alignment with the research objectives and Cognitive Load Theory. The fifth phase focused on defining and naming the themes, while the final phase involved interpreting and discussing the findings in relation to existing literature on AI-assisted academic writing and critical thinking. To enhance trustworthiness, the study employed methodological triangulation.

Findings and Discussions

The data obtained from semi-structured interviews, written reflections, and students' essays were analysed using Braun and Clarke's (2022) thematic analysis framework. The analysis addressed two research questions related to TESL pre-service teachers' use of ChatGPT for idea generation in academic writing and their evaluation and refinement of AI-generated ideas. Four major themes emerged from the analysis. The first theme focused on, ChatGPT as a cognitive and organisational support tool. The second theme is the evaluation and verification of AI-generated ideas, the third theme is the refinement and personalisation of AI-generated content, and the fourth theme examined the tensions between cognitive support and cognitive dependence.

Research Question 1

How do TESL pre-service teachers use ChatGPT in idea generation for academic writing?

Analysis of the interview, reflection and essay data revealed that pre-service teachers primarily used ChatGPT as a brainstorming and organisational support tool during the academic writing process. Participants frequently relied on ChatGPT during the early stages of writing to generate ideas, organise essay structures, develop outlines and overcome writer's block.

Interview data indicated that participants perceived ChatGPT as a useful cognitive scaffold that reduced the difficulty of initiating academic writing tasks. Several participants reported using Chat GPT when they experienced difficulties generating ideas or organising their thoughts coherently. The tool assisted participants by suggesting relevant discussion points, examples and essay structures, enabling them to begin writing with greater confidence and direction. Reflection data further supported these findings, as many participants described the writing process as becoming less stressful and more manageable after interacting with ChatGPT.

The essays also demonstrated substantial evidence of AI-assisted idea generation and organisation. Most participants utilised AI-generated main ideas as the foundational structure of their essays before elaborating on them independently. For example, Student 8 (S) 8 utilised generated ideas related to financial literacy, socioeconomic gaps and digital economy

adaptation as the basis for organising the essay into separate thematic paragraphs. Similarly, S6 structured the essay around AI-generated points concerning early screening, learning difficulties and support strategies for students with ADHD and dyslexia. These findings suggest that ChatGPT functioned as a cognitive support mechanism that assisted participants in planning and organising academic discussions systematically.

Furthermore, the analysis showed that participants did not simply reproduce AI-generated points directly. Instead, most students expanded the generated ideas through explanation, contextualisation and supporting examples. In several essays, participants incorporated academic references, real-world examples and contextual discussions that extended beyond the original generated prompts. This demonstrates that ChatGPT primarily served as an initial idea-generation and organisational tool rather than a direct replacement for students' own writing processes.

Table 1

TESL Pre-service Teachers' Use of ChatGPT in Idea Generation of Academic Writing

Theme	Evidence Across Data Sources	Interpretation
ChatGPT as a brainstorming tool	Participants used ChatGPT to generate ideas, essay directions and examples.	ChatGPT functioned as a cognitive scaffold during the planning stage of writing.
Organisation support	Participants used ChatGPT to organize main points and structure essays logically.	AL supported participants in structuring academic discussions systematically.
Reduction of writing anxiety	Reflection data showed that participants felt less stressed and more confident during writing.	ChatGPT reduced cognitive burden during idea generation.
Faster idea generation	Participants reported overcoming writer's block and generating ideas more efficiently.	AL enhanced writing efficiency and cognitive offloading during idea generation.
Expansion of generated Ideas.	Essays demonstrated elaboration, contextualization and use of supporting evidence.	Participants actively engaged with and developed AL-generated ideas.

Research Question 2

How do TESL pre-service teachers evaluate and refine AI-generated ideas and what insights does this provide into their critical thinking?

The findings revealed that TESL pre-service teachers engaged in varying levels of evaluation, refinement and critical engagement when using AI-generated ideas during academic writing. Interview and reflection data indicated that many participants were aware that ChatGPT-generated content could contain inaccuracies, irrelevant information, repetitive ideas or ovely general explanations. As a result, participants reported evaluating AI-generated outputs before incorporating them into their essays.

The essays provided direct evidence of participants' refinement and transformation of Ai-generated ideas. Stronger essays demonstrated substantial elaboration, synthesis, contextual adaptation and evaluative discussion. For example, S7 expanded AI-generated ideas on astrobiology by integrating scientific discoveries, ethical concerns and technological limitations into a cohesive academic discussion. Similarly, S8 contextualised AI-generated ideas regarding financial literacy within Malaysia's digital economy and socioeconomic context. These essays reflected higher-order thinking through synthesis, interpretation and

independent elaboration. However, the findings also revealed variations in participants' levels of critical engagement. While some participants demonstrated strong evaluative and analytical thinking, others remained closely dependent on AI-generated organisational structures and produced more descriptive writing. In essays such as those written by S5 and S4, repetition of ideas and conventional paragraph development suggested partial reliance on AI-generated structures and weaker critical transformation of content.

Interview and reflection data additionally revealed a tension between cognitive support and cognitive dependence. Although many participants believed that ChatGPT enhanced for idea development and critical engagement, some acknowledged that excessive reliance on AI could weaken independent thinking and reduce originality in writing. These findings suggest that the effectiveness of ChatGPT in academic writing depends significantly on students' ability to critically evaluate, refine, and transform generated content rather than passively reproducing AI outputs.

Table 2
Evaluation and Refinement of AI-Generated Ideas and Insights into Critical Thinking

Emerging Themes	Evidence from Data	Interpretation
Evaluation of relevance and accuracy	Participants checked AL-generated ideas against assignments requirement and external sources.	Students demonstrated evaluative judgement and selective acceptance of content.
Fact-checking and paraphrasing	Students acknowledged inaccuracies and verified information independently.	Participants showed awareness of AL limitations.
Refinement and paraphrasing	Participants modified, paraphrased and personalized generated content	Students actively transformed AI-generated ideas to maintain originality.
Evidence of higher-order thinking	Essays demonstrated synthesis, contextualization and evaluative discussion.	Some participants engaged critically and independently with AI-generated ideas.
Dependence on AI-generated structures	Certain essays remained descriptive and closely followed generated patterns.	Levels of critical engagement varied among participants.
Awareness of cognitive dependence	Reflections and interview data revealed concerns about overreliance on AI.	Participants recognized the risks of passive dependence on AI-supported writing.

The findings of this study demonstrated that TESL pre-service teachers primarily used ChatGPT as a cognitive and organisational support tools during idea during idea generation in academic writing. Across the interviews, reflections and essays, participants consistently described ChatGPT as useful for brainstorming, generating outlines, organising arguments and overcoming difficulties in initiating academic writing tasks. These findings support existing literature which positions Generative AI as an "intelligent assistant" that facilitates planning, idea expansion and organisational development during the writing process (Haider & Hussain, 2026; UNESCO, 2026). Similar to previous studies, the present findings indicate that ChatGPT reduced the cognitive burden associated with the initial drafting and enabled participants to approach writing tasks with greater confidence and direction.

The findings also align closely with Cognitive Load Theory (Sweller et al,1998), particularly the concept of cognitive offloading. Many participants viewed ChatGPT as a supportive

scaffold that reduced mental effort during the early stages of writing. Participants reported that AI-assisted brainstorming allowed them to generate more efficiently, organise discussions more systematically and reduce writing anxiety. This suggests that ChatGPT functioned as a cognitive support mechanism that helped novice academic writers manage the demands of academic writing more effectively. In several essays, AI-generated ideas clearly served as foundational frameworks that participants later elaborated upon independently. This supports the argument that AI tools may facilitate cognitive efficiency by assisting learners during cognitively demanding stages of writing.

However, the findings further reveal that the relationship between AI assistance and cognitive engagement is considerably more complex. This is because although the participants benefited from AI-supported idea generation, varying levels of critical engagement emerged across the dataset. Although participants benefited from AI-supported idea generation, varying levels of critical engegement emerged across the dataset. This findings support Subedi and Nyamasvisva's (2024) assertion that AI may simultaneously support writing development while also encouraging surface-level engagement when students rely excessively on generated responses. Some participants critically evaluated, refined and contextualised AI-generated ideas before incorporating them into their essays. These students demonstrated higher-order thinking through synthesis, elaboration, evaluative discussion and contextual adaptation of generated content. For example, several essays expanded beyond AL-generated prompts by integrating academic references and contextualised explanations relevant to Malaysian gslobal issues.

At the same time, other participants demonstrated greater dependence on AI-generated organisational structures and conceptual sequencing. However, certain essays remained descriptive and closely mirrored the structure suggested by ChatGPT, with limited evidence of deeper analytical transformation. This variation supports existing literature suggesting that access to AI tools alone does not necessarily guarantee meaningful critical thinking development (Strauβ, 2021; UNESCO, 2026). Instead, students appear to differ in their ability to critically interpret, refine and transform AI-generated content into academic arguments.

The findings additionally reinforce Rezaei et al.'s (2024) concept of the ‘'paradox of efficiency", where ChatGPT appeared to simultaneously function as both a cognitive support tool and a potential source of cognitive dependence. Some participants admitted that it was tempting to accept generated ideas without sufficient questioning or evaluation because the tool provided immediate and coherent responses. This suggests that though AI may reduce cognitive load, it may also unintentionally reduce the level of mental effort invested in deeper knowledge construction when used uncritically.

Notably, the study highlights the growing significance of Critical AI Literacy among pre-service teachers, as many participants demonstrated awareness of AI limitations, including concerns regarding factual inaccuracies, overgeneralised information and lack of originality. Participants also frequently reported verifying AI-generated content against external academic sources, paraphrasing outputs into their own words and modifying ideas to align with assignment requirements. These practices indicate the emerging forms of critical AI literacy, where students do not simply consume AI-generated information passively but instead engage in selective evaluation and refinement. These findings support Dilek and Langran's (2025) argument that AI should be approached not merely as an automation tool, but as a socio-technical system requiring reflective and participatory engagement.

Nevertheless, the findings also suggest that critical AI literacy remains uneven among TESL pre-service teachers. Some participants demonstrated strong evaluative judgement and independent adaptation of AI-generated ideas, whereas others relied more heavily on generated structures and descriptive content. This inconsistency indicates that teacher

education programmes cannot assume that students naturally possess the skills required to critically engage with AI-supported writing. Instead, explicit instructional support may be necessary to help pre-service teachers develop skills related to evaluating AI-generated information, identifying bias or inaccuracies, maintaining originality and engaging in reflective academic thinking.

Another significant finding relates to ethical awareness and academic integrity. Participants demonstrated an awareness of plagiarism concerns and the importance of maintaining authenticity in academic writing. Many students intentionally paraphrased AI-generated content, integrated personal examples, and modified; explanations to preserve ownership of their work. These findings correspond with current literature highlighting growing concerns surrounding AI-assisted authorship ambiguity and intellectual responsibility in higher education (Pereira et al., 2024); Williams et al., 2025). However, unlike much of the existing literature that focuses primarily on institutional policy and regulation, the present study provides insights into how students themselves navigate these ethical tensions during actual writing practices. The findings suggest that participants were not entirely passive users of AI but were actively negotiating issues of originality, authenticity and responsible AI use throughout the writing process.

In sum, the findings show that ChatGPT functions most effectively when used as a supportive brainstorming and scaffolding tool rather than as a substitute for independent cognitive engagement. The educational value of AI in academic writing appears to depend not solely on technological access but on students' ability to critically evaluate, refine and transform AI generated content meaningfully. For TESL pre-service teachers specifically, these findings are particularly important because future educators will eventually influence how younger learners engage with AI technologies in educational settings. Therefore, teacher education programmes should move beyond simply introducing AI tools and instead prioritise the development of critical AI literacy, reflective thinking, ethical awareness, and responsible AI integration within academic and professional contexts.

Implications of the Study

The pedagogical value of AI in academic writing depends not solely on technological access, but on students' ability to critically evaluate and transform the generated content. Therefore, teacher education programmes must explicity integrate "Critical AI Literacy" and instructional support into their curricula, rather than assuming pre-service teachers naturally possess the skills to navigate AI tools independently. Theoretically, this study extends Cognitive Load Theory by demonstrating that while ChatGPT successfully acts as a cognitive offloading tool, that reduces writing anxiety and initial mental burdens during brainstorming, it simultaneously introduces a "paradox of efficiency". If left unchecked, this paradox risks fostering passive over-reliance and surface-level cognitive processing among pre-service teachers. Finally, from a policy perspective, higher education institutions should move away from rigid restrictions and instead develop ethical frameworks that support transparent disclosure, human accountability, and responsible AI-supported writing practices.

Recommendations for Future Research

To build upon these findings, future research should move beyond short-term, controlled writing activities by adopting longitudinal research designs that track the long-term effects of generative AI on the development of students' critical thinking in a more consistent and comprehensive manner. Additionally, as this qualitative inquiry was limited to a small sample of 10 foundation-level PISMP TESL students from a single Institute of Teacher Education, future studies should broaden the scope by increasing the number of participants and including students from a wider range of higher education institutions to enhance transferbility

of the findings. Finally, comparative studies examining different generative AI tools and prompting techniques are recommended to determine how these variations influence the depth and quality of students' cognitive engagement during the writing process.

Conclusion

This study explored how TESL pre-service teachers used ChatGPT for idea generation in academic writing and how they evaluated and refined AI-generated content. The findings showed that ChatGPT primarily functioned as a cognitive and organisational support tool that assisted participants in brainstorming structuring ideas, and reducing difficulties during the writing process. However, varying levels evaluated and transformed were observed, as some participants actively evaluated and transformed AI-generated ideas while others relied more heavily on generated structures.

The study also highlights the importance of critical AI literacy among pre-service teachers. The findings suggest that the educational value of AI depends not only on access to technology, but also on students' ability to critically evaluate, refine and use AL-generated content responsibly. Therefore, teacher education programmes should prioritise reflective thinking, ethical awareness and responsible AI integration in academic writing practices.

Acknowledgements:	The authors sincerely thank the TESL trainees of IPG Kampus Tuanku Bainun for providing the necessary resources, facilities, and support throughout this research. We also extend special appreciation to colleagues and peers who contributed valuable insights and constructive feedback, which greatly enhanced the quality of this paper.
Funding Statement:	This research received no financial support or funding from any agency.
Conflict of Interest Statement:	The authors declare that there is no conflict of interest regarding the publication of this paper. All authors have contributed to this work and approved the final version of the manuscript for submission to the Jurnal Paradigma.
Ethics Statement:	The authors confirm that the research was conducted in accordance with accepted academic integrity and ethical publishing standards.
Author Contribution Statement:	All authors contributed significantly to the development of this manuscript. Raguna a/p R Arumugam was responsible for the conceptualization, methodology, overall supervision of the study and the initial drafting of the manuscript. Dr Moganashwari Kandasamy handled the database searching.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3(2),* 77-101. https://doi.org/10.1191/1478088706qp063oa

Carleton College. (n.d.). *Ethical issues in working with artificial intelligence.* Writing Across the Curriculum.https://www.carleton.edu/writing/resources-for-faculty/working-with-ai/ethical-issues/

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches (4th ed.).* Sage.

Dilek, M., & Dilekci, Ü. (2025). Academicians' perceptions of artificial intelligence: A metaphorical review. *Kastamonu Education Journal, 33 (4),* 726-737. https://doi.org/10.24106/kefdergi.1795785

Holmes, W., & Tuo,i, I. (2022). State of the art and practice in AI in education. *European Journal of Education,* 57 (4), 542-570. https://doi.org/10.1111/ejed.12533

Khampusaen, D. (2024). The impact of chatGPT on academic writing skills and knowledge: An investigation of its use in argumentative essays. *LEARN Journal: Language Education and Acquisition Research Network, 18(1),* 963-988. https://doi.org/10.70730/PGCQ9242

Lincoln, Y. S., & Guba, E. G (1985). Naturalistic inquiry. Sage. https://doi.org/10.1016/0147-1767(85)90062-8

Lodge, J, M., Yang, S., Furze, L., & Dawson, P (2023). It's not like a calculator, so what is the relationship between learners and generative artificial intelligence? *Learning*: *Research and Practice, 9*(2), 117-124. https://doi.org/10.1080/23725082.2023.2261106

Marzuki, M., Widiati, U., Rusdin, D,. Darwin, D., & Indrawati, I. (2023). The impact of writing tools on the content and organisation of students' writing: EFL teachers' perspective. *Cogent Education, 10(2),* Article 2236469. http://doi.org/10.1080/2311186X.2023.2236469

Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd ed.).* Sage.

Pereira, R., Reis, I. W., Ulbricht, V., & Dos Santos, N. (2024). Generative artificial intelligent and academic writing: An analysis of the perceptions of researchers in training. *Management Research: Journal of the Iberoamerican Academy of Management, 22*(4)*,* 429-450. https://doi.org/10.1108/MRJIAM01-2024-1501

Searson, M.Langran, E.,Trumble, J. (Eds). (2024). *Exploring new horizons: Generative artificial intelligence and teacher education.* Association for the Advancement of Computing in Education. https://www.leartechlib.org/p/223928/

Strauß, S. (2021). "Don't let me be misunderstood": Critical AI literacy for the constructive use of AI technology. *TATuP – Zeitschrift für Technikfolgenabschätzung in Theorie und Praxis, 30*(3), 44-49. https://doi.org/10.14512/tatup.30.344

Sweller, J., van Merriënboer, J.J.G., & Paas, F. G. W. C. (1988). Cognitive architecture and instructional design. *Educational Psychology Review, 10*(3), 251-296.

United Nations Educational, Scientific and Cultural Organization. (n.d.). *Artificial intelligence in education.* https://www.unesco.org/en/digital-education/artificial-intelligence