

Research Article:

Strategies for AI Use in Thesis Writing among Undergraduate Language Students: A Think-Aloud Protocol

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ABSTRACT

Thesis writing has always been regarded as a complex process. However, the emergence of Artificial Intelligence (AI) is assumed to be helpful as it would enable students to simplify the process of thesis writing. The use of AI tools in thesis writing among students is becoming more prevalent, but there is limited understanding of how these tools are being integrated into the writing process and how students balance their own involvement with AI support during the writing process. Thus, there is a need to explore the strategies students employ when interacting with AI tools, and how these strategies impact their writing process. Understanding these dynamics is essential for improving the way AI can be utilised in thesis writing. This study aims to explore areas of AI utilisation in undergraduate students' thesis writing and the AI tools they employ, and to analyse the strategies undergraduate students employ in the thesis writing process. The study employed a qualitative approach where the primary method was a semi-structured interview. The interview included a Retrospective Think-Aloud (RTA) protocol where the participants shared their thoughts and strategies in completing the thesis. The participants were eight final-year undergraduate students majoring in Arabic and English language studies from a language faculty in a selected higher learning institution in the central region of Malaysia. Findings revealed four interconnected strategies – AI as Assistive Tool, AI as Intelligent System, AI as Cognitive and Affective Partner, and Delegated Autonomy. Mapped across the domains of AI literacy – Engaging, Creating, Managing, and Designing – these strategies represent a developmental continuum from mechanical aid to critically regulated collaboration. Among them, delegated autonomy emerged as a key theoretical contribution, describing students' deliberate management of human–AI interdependence through ethical judgement and metacognitive control. These identified strategies could act as a framework to effectively use AI in thesis writing, contributing to the enhancement in the writing process and the development of students' writing skills.

Keywords: Artificial Intelligence, thesis writing, undergraduate students, AI utilisation strategies, academic integrity

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INTRODUCTION

Writing skills are essential to academic achievement, especially for undergraduate language students who are required to produce well-structured and coherent thesis papers. Writing is not merely about conveying information but also about organising thoughts, presenting ideas clearly, and ensuring that the final document meets academic standards. To excel in academic writing, students must not only understand the content they are discussing but also possess the ability to structure their work, revise effectively, and present their arguments persuasively (Barasa, 2024). Writing skills are further enhanced through the use of various strategies (Mu, 2005) – rhetorical, cognitive, metacognitive, communicative, and social/affective – ensuring that students are actively engaged in the writing process. This will hopefully produce writing output with quality outcomes.

However, recent technological developments have introduced new dynamics into students' writing processes. The rapid emergence of generative Artificial Intelligence (AI) has begun to reshape how students engage with academic tasks, including thesis writing. Studies have shown that AI-supported tools provide immediate language feedback, idea generation, structural guidance, and preliminary literature organisation (Roe et al., 2023; Fathi & Rahimi, 2026). This growing integration of AI in academic work has prompted discussions about AI's role in supporting and potentially altering students' writing processes. Nevertheless, existing research on AI in academic writing has primarily focused on students' attitudes, ethical concerns, perceived usefulness, or broad classroom applications (Wang, 2025; Eleftheriou et al., 2025). Much less is known about the specific processes by which students use AI during extended and high-stakes writing tasks such as in their undergraduate theses.

Although recent frameworks such as AI literacy (Long & Cope, 2021; OECD, 2025) and human-AI feedback models like Peer and AI Review + Reflection (PAIRR) (Sperber et al., 2025) offer conceptual grounding for understanding critical engagement with AI, empirical studies examining how students apply these principles in authentic thesis-writing contexts remain limited. In particular, there is insufficient evidence on how students strategically delegate tasks to AI tools, how they filter or evaluate AI outputs, how AI use varies across thesis chapters, and how students maintain autonomy and academic integrity when working with generative systems. This gap is especially evident in language-based disciplines where AI could influence both linguistic expression and cognitive engagement with writing.

To address this gap, this study investigates the areas of thesis writing in which undergraduate language students employ AI tools and the specific strategies they adopt when interacting with these tools. By focusing on students' real experiences in the strategies they employ, this research provides detailed insights into the role of AI in shaping thesis-writing behaviours, decisions and challenges. Such findings are expected to contribute to the ongoing discourse

on AI literacy, responsible AI use and academic writing support in higher education. The study is guided by two research questions:

RQ1: What are the areas in the thesis in which students utilise AI tools, and what AI tools do they employ?

RQ2: What strategies do the students use in utilising AI for thesis writing?

LITERATURE REVIEW

This section reviews key literature surrounding AI use in academic writing among undergraduate language students. It outlines the conceptual frameworks that guide the present study – AI Literacy and the PAIRR model. Together, these frameworks guided the design of research questions, the development of the Retrospective Think-Aloud (RTA) protocol, and the interpretive analysis of how students employ AI tools in their thesis writing. Specifically, AI Literacy provides the foundation for understanding students' abilities to interact critically and ethically with AI, while PAIRR offers an interpretive model for analysing reflective engagement and feedback integration during the writing process.

AI Literacy

The growing prevalence of generative AI has caused a re-evaluation of the competencies required for effective academic engagement. Within this growing landscape, AI literacy emerges as a critical construct, which requires an expansion to technological proficiency to distinguish AI's capabilities, limitations, ethical implications, and societal impact (Long & Cope, 2021; UNESCO, 2019). For undergraduate language students who face complexities in thesis writing, they need to develop AI literacy to ensure responsible, effective, and independent use of these tools.

In general, AI literacy can be defined as a set of knowledge, skills, and attitudes that enable individuals to understand, interact with, and critically evaluate AI systems in various contexts. It moves beyond a superficial understanding of AI as a black box, encouraging users to grasp fundamental AI concepts, recognise its applications and limitations, and engage with it ethically and responsibly (Ng et al., 2021; Tuomi, 2018). This includes the ability to convey effective prompts, interpret AI outputs, identify potential biases or inaccuracies, and understand the AI output. As thesis writing involves research for academic purposes, AI literacy requires students to distinguish between when and how AI can genuinely strengthen intellectual processes without compromising originality or critical thought.

AI Literacy Framework

The AI Literacy Framework (OECD, 2025) emphasises the development of essential knowledge, skills, and attitudes that are vital for students to navigate the age of AI responsibly and effectively. One of the central elements of this framework is understanding how AI works, and this includes recognising its capabilities and limitations. AI systems rely heavily on data and algorithms to generate predictions, content, or recommendations. This technical knowledge serves as the foundation for students to critically assess AI-generated content, ensuring that they do not accept outputs blindly but instead engage with them thoughtfully.

A key focus of the AI Literacy Framework is on developing the four domains of AI literacy – Engaging with AI, Creating with AI, Managing AI, and Designing AI (OECD, 2025). Each domain conceptualises a distinct dimension of human–AI interaction (OECD, 2025):

1. Engaging with AI involves learners using AI as a tool to access content, information, or recommendations. In this domain, students develop critical thinking skills to assess the accuracy and relevance of AI outputs, helping them to engage with the technology thoughtfully.
2. Creating with AI allows students to collaborate with AI systems to generate and refine ideas, solve problems, and express creativity. Here, learners are encouraged to reflect on ethical issues like content ownership and attribution while using AI to enhance their creative work.
3. Managing AI focuses on helping students understand how to delegate structured tasks to AI systems, optimising workflows while maintaining human control over decision-making. This domain emphasises skills like problem-solving, computational thinking, and collaboration, ensuring that students use AI in a way that augments rather than replaces human capacities.
4. Designing AI empowers learners to understand the principles behind AI systems by engaging in activities like data curation and model training. Students reflect on the societal impacts of AI technologies and are encouraged to design systems that align with human-centred values, promoting fairness, transparency, and accountability.

Together, these domains provide a comprehensive framework for fostering AI literacy. They ensure that students develop technical skills, cultivate ethical awareness, and build creative problem-solving abilities, enabling them to navigate and shape an AI-driven world. This approach is essential for preparing learners to contribute to and lead in a world where AI plays an increasingly central role.

Recent research has begun to explore the practical implementation and impact of AI literacy frameworks, including those influenced by the OECD's recommendations. Studies are increasingly focusing on the development of pedagogical approaches that integrate AI literacy across various disciplines, moving beyond mere technical instruction to foster critical thinking and ethical awareness (Ng et al., 2023; Zhou et al., 2024). For instance, research in higher education is examining how students perceive the trustworthiness and utility of AI tools, highlighting varying levels of critical engagement that directly correlate with their emerging AI literacy skills (Chen & Wang, 2023). Smith et al. (2024) focused on piloting curricula designed to equip students with the ability to distinguish AI-generated content, understand algorithmic biases, and apply ethical reasoning when using AI for academic tasks. These researches employed qualitative and mixed-methods approach as they delved into students' understanding and application of AI literacy, providing insights on the challenges and successes of fostering responsible AI engagement in diverse learning environments. However, there is a critical need to investigate the explicit instruction and practical application that cultivate AI literacy among students preparing for academic and professional futures.

In this study, the AI Literacy Framework functions as a conceptual and analytical reference point. It guided the construction of interview and RTA prompts that explored students' awareness, critical engagement, and ethical reasoning when employing AI tools. During analysis, the four domains were used to categorise and interpret students' behavioural evidence – how they prompted AI, evaluated its suggestions, managed workflows, and reflected on limitations. Thus, AI literacy serves as an analytical lens for understanding students' strategic competence and conscious balancing of automation with academic responsibility.

Peer and AI Review + Reflection (PAIRR)

Conceptually, the PAIRR model can be aligned with cognitivist theory, as both emphasise the active engagement of students in cognitive processes such as reflection, evaluation and decision-making during learning tasks. This alignment is evident in how PAIRR structures feedback as a cognitive activity, where students process, interpret and integrate information from both human and AI sources to construct meaning and improve their writing performance. The integration of AI into formative feedback systems, particularly in writing, has garnered significant interest in recent years. Introduced by Sperber et al. (2025), the PAIRR model is a human-centred approach that combines the strengths of peer feedback with the utility of AI-generated insights. The model emphasises not just the collection of feedback but also critical reflection and self-assessment, key elements for developing students' metacognitive skills and writing agency. By involving students in the process of assessing AI-generated feedback, the PAIRR model encourages a deeper understanding of the affordances and limitations of AI. This not only enhances students' writing processes but also promotes the development of AI literacy. Students are positioned as active participants in their learning process, ensuring that AI feedback is not passively

accepted but instead evaluated in alignment with their writing goals (Sperber et al., 2025). Figure 1 presents the PAIRR model (Sperber et al., 2025).



Figure 1. The PAIRR model by Sperber et al. (2025)

The PAIRR model complements the AI Literacy Framework by providing a human-centred approach to feedback and reflection in writing. While the AI Literacy Framework conceptualises what students should know and do when engaging with AI, PAIRR guides how students interact with feedback and integrate it into revision processes.

The model integrates human and machine feedback through a sequence of five iterative stages: Draft → Peer Feedback → AI Feedback → Reflect → Revise. It promotes continuous interaction between learner cognition and technological mediation, positioning students as active agents who critically assess AI outputs rather than passively accept them. This model underpins the interpretive stage of data analysis in the current study, particularly in understanding students’ sense-making when comparing or reconciling their judgement with AI-generated suggestions.

Thus, while the AI Literacy Framework provides the macro-level structure for understanding the cognitive and ethical capacities underpinning students’ AI use, the PAIRR model provides the micro-level process model for interpreting their reflection and

adaptation behaviours. The dual application of these frameworks ensures a comprehensive analytical perspective – linking the knowledge domains of AI literacy with the behavioural and reflective dimensions of academic writing practice. This theoretical foundation allows the research to move beyond surface descriptions of AI use, providing interpretive depth into how and why students apply AI strategically throughout the thesis writing process. By situating empirical findings within these frameworks, the study contributes to the broader understanding of AI literacy development and reflective writing agency in higher education.

METHOD

This study employed a qualitative research design supported by the RTA method to explore how undergraduate language students utilise AI tools in their thesis writing. The qualitative approach was most appropriate as it allows for a rich, in-depth understanding of individuals' experiences, perceptions, and strategies in engaging with AI tools within authentic academic contexts. The study adopted a RTA protocol to examine students' decision-making and reflective processes after completing their thesis writing. RTA is a branch of the Think Aloud Protocol (TAP) (Charters, 2003) method. The most common of TAP is the Concurrent Think Aloud (CTA) which requires participants to recall and verbalise their cognitive processes after the task is completed. It was selected because thesis writing is an extended activity completed over several months, making concurrent verbalisations (as in standard TAP) impractical. RTA thus allowed participants to reflect meaningfully on their use of AI tools across the different stages of the thesis process.

Population, Sampling Techniques, and Samples

Eight final-year undergraduate students – three females and five males – enrolled in Arabic and English language studies at a public university in the central region of Malaysia participated in the study. All had completed their undergraduate theses in the preceding semester and voluntarily agreed to participate. Purposive sampling was employed to select participants who had prior experience in using AI tools for academic work and had completed their research projects independently. This sampling strategy ensured that participants could offer relevant and reflective accounts consistent with the study's purpose.

Although the sample size is small, it aligns with qualitative research principles that prioritise depth over breadth (Creswell & Poth, 2018). The number of participants enabled detailed exploration of individual experiences while maintaining manageable data for in-depth analysis. Data saturation was reached by the sixth interview; however, two additional participants were included to confirm the recurrence of key patterns and ensure analytical comprehensiveness.

Research Instrument

The instrument used in this study was the RTA protocol. It was developed following the objectives of the study – the areas in the thesis in which students utilised AI tools, the tools they employed, and the strategies students used in utilising AI for thesis writing. The questions were open-ended and probes were employed to gather rich details which provide further understanding of the actions taken.

Data Collection Procedures

Data collection was conducted online via Microsoft Teams. Each participant shared a soft copy of their thesis and was asked to recount, chapter by chapter, how they had used AI tools during its development. During the RTA sessions, participants verbalised their thoughts and actions retrospectively while referring to specific thesis sections. Prompts such as, “In which part(s) of your thesis writing do you use AI tools?” and “How do you verify the accuracy or relevance of AI-generated suggestions?” were used to stimulate reflection. Participants were allowed to respond in English or Malay.

Each session lasted between 20 minutes and 40 minutes and was audio-recorded with participants’ consent. Recordings were then transcribed verbatim. Segments originally in Malay were translated into English to maintain consistency. Transcripts were anonymised using pseudonyms (e.g., Didi, Fina, Umi, Don) to ensure confidentiality. The data collection process adhered to ethical standards, including voluntary participation, informed consent, and participants’ right to withdraw at any stage.

Data Analysis

The data were analysed using thematic analysis, following Braun and Clarke’s (2006) six-phase procedure. This approach was selected because it allows identification of recurring patterns and interpretation of meaning across participants’ narratives while remaining flexible enough to accommodate exploratory qualitative data from RTA sessions. Transcripts were transferred to ATLAS.ti software to help manage the data analysis process. The data analysis procedures are:

1. Familiarisation: All transcripts were read repeatedly to gain a broad understanding of how students described their interactions with AI tools.
2. Initial Coding: Meaningful segments were assigned descriptive codes that captured participants’ actions and reflections, mainly focussing on the functions of AI when utilised for or during thesis writing. Coding was conducted manually and reviewed iteratively. During this process, the research questions became the main guiding parameter.

3. **Theme Development:** Codes were grouped inductively into broader categories representing strategies of AI utilisation and participant attitudes. The AI Literacy Framework (OECD, 2025) and the PAIRR model (Sperber et al., 2025) provided interpretive scaffolding for refining the thematic structure. For instance, segments reflecting critical assessment and autonomy were aligned with Managing and Engaging with AI, while those describing reflective comparison of AI feedback corresponded with PAIRR's Review–Reflection stages.
4. **Reviewing Themes:** Preliminary themes were examined for coherence and consistency across participants. Overlapping or ambiguous codes were consolidated to strengthen analytical validity. Another consideration was to align the themes as answers to the research questions.
5. **Defining and Naming Themes:** In line with the generated research questions, four overarching themes were finalised: AI as Assistive Tool, AI as Intelligent System, AI as Cognitive–Affective Partner, and Delegated Autonomy. Each is defined by taking into account the extant literature and also the main findings.
6. **Writing and Interpretation:** Final themes were supported with verbatim excerpts to preserve participants' voices while linking interpretations to the underpinning frameworks and existing literature. Since the excerpts are verbatim, they can be erroneous in grammar and structure.

FINDINGS

This section puts forth the findings which are answers to the research questions through a compilation of related excerpts. These excerpts are verbatim and taken from the interviews conducted with the eight participants. They become the evidence that provide insights into the explicit or implicit process of utilising AI in completing their thesis writing. Once the answers have been established, the next section will present the discussion where they are linked to the extant literature and theories.

Utilisation of AI Tools in All Chapters

The first part of the results presents the data relating to the first research question – What are the areas in the thesis in which students utilise AI tools, and what AI tools do they employ? The qualitative findings of this study reveal a comprehensive and strategic pattern in the use of AI tools among students throughout the various chapters of their thesis. Students reported leveraging AI from Chapter 1 through Chapter 5, as one participant (Fina) mentioned, “I use it like everywhere, from the beginning until the very end.” Fina also stated, “For each chapter, I had a structure... I must have the outline first.” This shows that students utilised AI not only as an assistive writing tool but also as an intelligent system that guided them in constructing the overall framework of their final year project. This indicates AI's extensive role across all stages of academic writing and research development.

In Chapter 1, which typically encompasses the proposal and background of the study, AI was primarily used to refine research ideas, clarify problem statements, and generate preliminary outlines. This is shown when students mentioned, “I use ChatGPT a lot to get the outline for my topic... they give the outline and I just elaborate from there” (Faroq), and “Yes, because for Chapter One and Chapter Two, we need to write a lot... so by getting lots of information from different AI, I can keep updating the chapters” (Umi).

In Chapter 2, students utilised AI to conduct literature searches and organise related works systematically. AI tools were instrumental in helping them synthesise themes and construct coherent arguments based on existing literature. For example, students noted, “Elicit is used mainly for literature review because we can compare between the research articles... it’s easier to compare the details we want” (Faroq), and “For literature review... we got a lot from different papers, so I need help in repair. I use AI for that” (Amri).

Chapter 3, focussing on research methodology, saw students using AI to draft methodological frameworks and to assist in developing research instruments such as questionnaires. Students shared, “I’m using AI to create questions... I think from my ideas it’s not really deep, so I will ask ChatGPT to give suggestions” (Don), and “If I want something for research methodology, I just mention how I want it, the method, the topic, and so on” (Faroq).

In Chapter 4, which presents the findings, students employed AI to support the organisation and interpretation of data. Although the core analysis remained the students’ responsibility, AI served as a supplementary tool for visualising and summarising data trends. This is proven by two students when they said, “For data analysis I used visual text analysis first and then I wrote everything. This part is when I used a lot of ChatGPT” (Fina), and “(using AI) just for the findings section, for organising and explaining the results” (Dolly).

In Chapter 5, students used AI to structure their discussions, refine their conclusions, and ensure coherence with previous chapters. Faroq described,

I use it only for doing the outlines and framework so it can guide me into the right direction,” and Amri emphasised, “Before I start writing, I always check first with ChatGPT or QuillBot... to make sure everything is in order.

Among the AI tools students mentioned they used in their thesis writing were Mendeley, ChatGPT, Grammarly, Gemini, Blackbox, Copilot, QuillBot, BingAI and Jenni. These tools provided students with a range of functionalities – managing references and citations in Mendeley; generating content, refining language, and ensuring grammatical accuracy through ChatGPT, Grammarly, and QuillBot; enhancing students’ ability to organise ideas, improve writing flow, and assist in drafting and editing sections of their work using Gemini, Blackbox, Copilot, and Jenni. By utilising these tools, students were able to

streamline their writing process and refine the quality of their work, while maintaining control over the critical academic processes.

Strategies in Utilising AI for Thesis Writing

The next part of the results relates to the second research question – What strategies do the students use in utilising AI for thesis writing? The data revealed that there are four pertinent strategies employed in utilising AI. The first three are termed as assistive tools, intelligent systems, and cognitive and affective partners. These AI-based strategies are governed by a human-related strategy termed as delegated autonomy. Figure 2 shows how the strategies are linked.

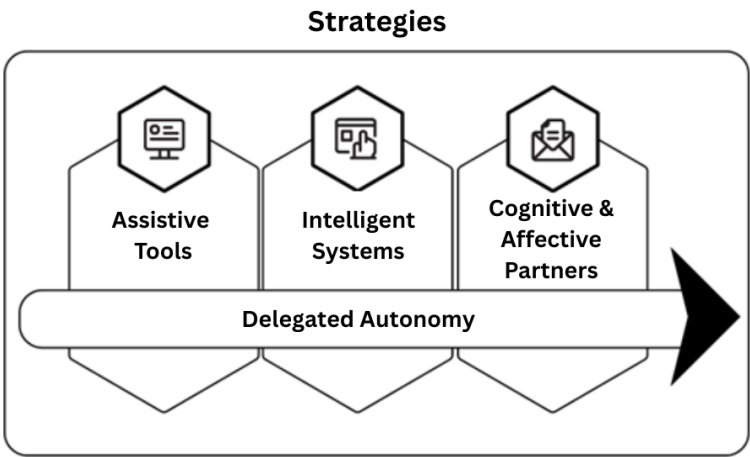


Figure 2. Strategies for AI use in thesis writing

AI tools as assistive tools

This strategy represents the foundational stage of AI engagement in which students utilise AI primarily for mechanical and linguistic support, such as grammar checking, paraphrasing, and vocabulary refinement. Tools like Grammarly, QuillBot, and ChatGPT were used to polish sentences, enhance coherence, and ensure compliance with academic writing conventions. Students reported utilising a variety of AI systems to aid them at different stages of their thesis writing process – to streamline tasks, refine ideas and improve the overall quality of their work. For example, one participant mentioned using Gemini primarily for generating chapter structures, stating, “For Gemini, I use it only for prompting the structure for each and every chapter” (Fina). This indicates how AI was used to guide the organisation of their thesis, so that students had a clear framework to follow. Fina further elaborated, “For ChatGPT, I use it a lot in terms of developing my

ideas actually, I use it to summarise things for me in terms of reading, proofreading because of my anxiety I did that.” This shows how AI helped alleviate some of the mental load associated with writing, by offering both summaries of reading material and aiding in the proofreading process. By using these tools, students could ensure that their writing was clear, concise and accurate without getting overwhelmed.

AI tools were also used for enhancing language and improving vocabulary. A few participants highlighted how they relied on Grammarly, QuillBot, and even Microsoft Word’s synonym feature to refine sentence structures. Arif shared, “I just read, read, read, but then every time I’m going to paste something or put any words into my final, Grammarly, QuillBot... check the spelling and we can search the synonym of the word in the Microsoft Word.” These tools served not only to fix grammatical issues but also to enhance vocabulary and sentence structure, to ensure that the writing aligned with academic standards.

For Jenni, another AI tool mentioned, students found it particularly useful for generating human-like responses, to enhance their writing style. Faroq explained, “I sometimes use Jenni because Jenni is really dependable. The word they use is really like a human, like human-like and I think suits my style.” This suggests that students preferred Jenni for its natural language generation capabilities, which helped them express their ideas more effectively.

Students also used Consensus AI for research purposes, as it provided access to research papers directly related to their topics. Umi noted, “I think for research is Consensus AI because they can give directly the research paper that has been covering the topic before.” This tool helped students quickly locate relevant literature, reducing the time spent searching for academic sources. For the literature review, Elicit was employed as it allowed students to compare various research articles and align them with their own findings, simplifying the process of synthesising information.

Lastly, Mendeley was frequently mentioned as an essential tool for managing citations and references. Umi explained, “Mendeley, I used to use for citation, I do quanti but then to explain the graph... I use AI *lah*.” This indicates that students relied on Mendeley not only for referencing but also to explain data visualisations like graphs and charts, with AI helping to clarify and interpret the results.

Overall, these AI tools provided significant assistance throughout the early and mid-stages of thesis writing, particularly for brainstorming, developing outlines, refining research questions, and enhancing academic writing. These tools allowed students to focus on higher-level thinking and content development while leaving the repetitive or technical aspects of writing and research to AI.

AI tools as intelligent systems

The strategy where participants predominantly employed AI tools as intelligent systems refers to how it facilitated multiple dimensions of academic inquiry, including idea generation, outline creation, and information retrieval. This utilisation pattern reveals a systematic integration of AI technology across various stages of the academic writing process, with participants leveraging these tools to enhance both efficiency and comprehension in their scholarly endeavours. Conceptually distinguishing this category from ‘assistive tools’, AI as an intelligent system represents a shift from mechanical support to analytical and structural scaffolding. Here, students are not merely correcting what they have written but are using AI to navigate complex informational landscapes and construct the architecture of their arguments, which reflects higher-order cognitive engagement.

Participants identified AI tools as particularly valuable resources during the initial conceptualisation phase of academic writing. These tools served as catalysts for brainstorming and provided foundational structures that guided subsequent research efforts. A participant exemplified this approach, describing how AI tools facilitated the initiation of his thesis writing. He said, “when I just search about the things I would like to find out, and then it will come up few, few topics and few ideas and I will check it on another website” (Don). This process demonstrates a strategic use of AI as a starting point for broader inquiry, with participants subsequently validating and expanding upon AI-generated suggestions through additional research.

Another participant articulated a more sophisticated multi-platform approach, utilising different AI tools for complementary purposes in the planning stage. He explained, “I will use Jenni AI to get a bigger picture, just to get the whole picture. I use my title as a prompt in Jenni AI and it will give me an outline of my topic. Then I use Chat GPT” (Amri). This is echoed by Fatin, “Because there’s no idea. I have it first, but I don’t know how to narrow down... I ask it to help me. So that’s why that’s how I got there,” illustrating how the AI tools assisted her in generating initial ideas and subsequently structuring her research ideas. This step shows how participants developed strategic workflows that maximise the distinct capabilities of various AI platforms, employing specialised tools for comprehensive topic mapping before proceeding to more detailed exploration. These findings correlate with OECD AI literacy framework – Engaging with AI – where students are expected to deliberately use AI to produce content and able to critically assess the AI output. Don’s practice of verifying AI-generated topic suggestions on external platforms, and Amri’s deliberate sequencing of Jenni AI for structural mapping followed by ChatGPT for deeper exploration, are indicative of this domain in action. Instead of accepting the output of AI totally, participants treated AI as assistive tools, in which they used AI as a starting point for broader academic process.

Another significant finding is that most participants use AI tools for literature search, a critical component of academic inquiry. Participants recognised AI tools as effective solutions for streamlining the literature review process, particularly in addressing the

temporal constraints faced by advanced undergraduate students managing multiple academic responsibilities. An example is mentioned by Faroq, “I use Elicit, to find materials...to speed up the process because if I spend too much time on it on my own, it will make my work take more time,” demonstrating the efficiency of AI-assisted literature discovery, which shows practical value participants derived from AI tools in managing academic workload pressures. This point exemplifies the Managing with AI in OECD AI Literacy Framework, in which Faroq utilised AI to accelerate literature retrieval and manage the workload of the academic process. This finding also corresponds with PAIRR model that states students work as active agents.

The evidence suggests that participants viewed AI tools not as isolated utilities but as integrated components of a comprehensive academic writing system. The seamless incorporation of AI assistance across multiple stages – from initial conceptualisation through literature review – indicates a sophisticated understanding of how these technologies can enhance traditional academic practices while preserving scholarly rigour and critical thinking processes. This reflects a form of distributed cognition, in which the AI system acts as an external hard drive for processing large volumes of literature. This enables students to preserve their cognitive resources for critical synthesis and the actual writing of the thesis.

AI tools as cognitive and affective partners

Beyond their conventional application as intelligent systems for information retrieval and paper structuring, the data shows that participants employed AI tools in a more sophisticated capacity, as cognitive and affective partners in academic writing tasks. The boundary that separates this category from “intelligent systems” is relational and socio emotional. Intelligent systems are utilised for structural output, whereas cognitive and affective partners support psychological safety and dialogic interaction. This multifaceted engagement demonstrates a fundamental shift in how students conceptualise AI technology, treating these tools not merely as functional resources but as collaborative entities with human-like qualities.

Firstly, data shows that there is evidence of personification of AI technology. Participants consistently characterised AI tools through human-like language, conceptualising them as conversational partners rather than mechanical systems. Fina explicitly articulated this perspective, stating, “Well, we are talking about Chat GPT, it is a person. In a way that you have conversation with.” This personification extended beyond simple interaction patterns to encompass preferred engagement strategies. Dolly described her deliberate approach to AI interaction, explaining, “As usual, I will talk to ChatGPT first. Only then, I will key in the prompts. It is like a request; can you give me ideas regarding this topic.” These accounts suggest that participants developed communication practices that reflect human interactions. From a theoretical standpoint, this personification and reliance on AI for affective support functions to lower the students’ “affective filter” (Krashen, 1982). By providing a non-judgemental space for academic inquiry, AI tools reduce the imposter

syndrome and writing anxiety often experienced by undergraduate students. The AI becomes a simulated peer that fosters metacognitive dialogue, which allows students to test and refine their ideas in a low-stakes environment before committing them to the formal thesis draft. The dialogic interaction with AI that Dolly and Fina had, indicates active engagement rather than passive output retrieval, reflecting the collaborative, reflective disposition that is required by the Creating with AI domain (OECD, 2025).

Secondly, data shows that AI tools are not considered merely as responsive systems but as entities possessing empathy, maturity, and genuine understanding of their academic needs. The data indicates that participants utilised AI tools to fulfil dual functions within their academic practice – information retrieval and affective support – through these interactions. Fina described her AI interactions as conversations with “a very very intellectually mature person,” elaborating that “I like that person, that person somehow sort of like really understands you.” This characterisation indicates that the participant viewed AI tools as non-judgemental partners that alleviates academic anxiety and fosters a safe learning environment. Fina articulated, “with Chat GPT, you don’t feel stupid. I don’t have that sense of fear if a person thinks I ask stupid questions,” which shows that the interaction with AI tools enabled participants to engage in exploratory questioning without the social risks associated with human consultation, thereby reducing stress related to academic performance. Umi corroborated this finding, reporting that AI tool usage helped her “overcome the stress related to the academic exercise.” This affective dimension relates to PAIRR model (Sperber et al., 2025) as it foregrounds students’ metacognitive engagement as central to the feedback and revision process, specifically their capacity to evaluate, reconcile, and adapt AI-generated feedback in relation to peer and supervisory input. The data reveals that the psychological safety afforded by AI – its non-judgemental, patient, and available character – functioned as an affective enabler of this metacognitive process. Fina’s sense of freedom from fear of judgement, and Umi’s reported reduction in academic stress, suggest that AI created the internal conditions necessary for students to engage in the open-ended, exploratory thinking that the “Reflect” stage of PAIRR requires.

This dual functionality suggests that AI tools serve as comprehensive academic support systems, addressing both cognitive and affective dimensions of the learning process.

Delegated autonomy in AI use

The prior three strategies are linked to the fourth strategy, delegated autonomy, which focuses on the human factor that governs the use of AI. Delegated autonomy shows that although the students embraced their autonomy in completing their thesis by using their own judgement, data also revealed that they trusted their supervisors and friends to consult after getting input from AI. With the high functions of AI tools replacing and easing the tasks of humans in producing a write up, the participants in this study revealed that they did not place their trust fully in its usage. In other words, AI does not hinder students’ autonomy in completing their thesis writing. With the autonomy given to them, the

majority of the participants have allowed only 50% or even less in the use of AI in their thesis completion. Don expressed it clearly when he said, “I think it’s about 50-50. Fifty is for.. to just spark the ideas and the other 50 and the process itself I am writing it,” and so did Umi, “I think 50 at least it can be up to 50.” Ramli, on the other hand, gave lower “... to write maybe 20%.”

However, the reasons given for having the trust in AI vary. In connection to the percentage given, they justified what AI was used for in completing their thesis. Umi used it for “proofreading and editing,” Don utilised it for “generating ideas,” and Amri made “writing better.” Interestingly, Fina expressed her distrust because she experienced ChatGPT’s admission to making mistakes “when asked is it really true, he [ChatGPT] said like oh, I’m sorry, it was a mistake...so that’s when I come to realise that I can’t 100% rely on it.” This echoes in Umi’s sharing about ChatGPT being not human. She said, “but to write something argumentative and critical thinking, it’s really not ethical using AI because they are... they are still AI, you know, not human.” Participants’ concern about the ethics in utilising AI reflects the “Managing with AI” domain, as they are able to sustain their critical ownership after getting contribution from AI tools. Delegated autonomy represents a metacognitive strategy where participants plan when, how, and to what extent to involve AI in their cognitive workflow.

This strategy can further be elaborated into three sub-dimensions: Own Judgement, Further Checking to Filter Information, and Point of Reference.

Own judgement

The first aspect of delegated autonomy is participants’ own judgement when using AI in their thesis writing. This is demonstrated when they actively use AI to evaluate, adapt, and integrate AI outputs to align with their specific research objectives and thesis writing standards rather than passively accepting them. One participant stated that while AI can provide suggestions, he is engaged in a process of selecting points that can be expanded. This is shown when Don mentioned, “I mean there’s no idea about the points given by this GPT, but still I will select which part of the points I think could be expendable and then I will use it, the point and still I will search.” Don further mentioned, “I need to read one by one because some of the points is similar from paragraph one and last paragraph of the suggestion,” showing his careful review for redundancies or inaccuracies from AI output. This approach of own judgement and engagement in verifying information ensures the quality and originality of their work.

In making their own judgement, participants go through a process of critical evaluation when engaging with AI outputs. They acknowledge that AI-generated text may provide a different interpretation of what was prompted, requiring them to restructure the information to suit their intended focus. Ramli mentioned:

There is a little bit of a meaning gap. So, we need to use human thinking to together get the right information. If we take it directly from what AI gives us, it may give us the wrong information...So that we can restructure it back so that it can tally with what we have in our chapter. Otherwise, sometimes it will be out of context, right? If we just follow what it gives, then it will make us see the difference with what we want and what is given by AI which does not really fit into our needs.

These excerpts indicate a positive stand in ensuring contextual coherence and accuracy, showcasing their judgement over the AI's suggestions. Meanwhile, Amri "compare answers or responses from AI tools", and "try to mix the answer and I come up with my own summaries," illustrating an active intellectual process of combining and refining information rather than mere adoption. This shows that students were critical in evaluating the information provided by the AI tools, especially the ones which do not meet their expectations.

Other than being critical in making their own judgement, students personalise and strategically integrate AI assistance into their writing style and research focus. They do not simply copy and paste from original sentences from any sources but revise them to ensure that it suits their intention. Dolly mentioned, "I took back the original sentence and changed it a little bit" and "I didn't just put it here but I took the whole thing and pasted it, copy paste it and change it a little bit, modify it a little bit," showing that she amended the sentence to ensure the language and flow align with her thoughts. Another participant accepted AI-generated points by evaluating whether it suits her research questions. She mentioned:

Does it answer my research question? So if it doesn't so if I put it, it wouldn't make sense to be there. (Fina)

This demonstrates a thoughtful and goal-oriented approach, where AI suggestions are carefully filtered through the lens of their research focus. Another aspect of autonomy is when participants use AI for idea generation or as a starting point when they lack ideas, but they evaluate the ideas provided and refocus or edit their prompt to get information that is more directed to what they want. This was mentioned by Amri:

I just use it to help me... for example, when I'm blur (unsure), I'll use it to make sentences. I'll read it, then I'll tell it, it will generate a new one. Then I'll edit the outcome.

Meanwhile, Farok stated "I still make some changes based to what I think suits my style." Both evidences show that students refine and strategically integrate the output provided by AI and their personal focus to ensure that the final outcomes reflect their own voice. Overall, this active engagement provides a clear understanding that while AI is a valuable

resource, the intellectual responsibility and direction of the thesis remain firmly in students' hands.

Further checking to filter information

The next aspect of autonomy seen among undergraduate language students with their use of AI tools for thesis writing is their practice of further checking to filter information. The data shows that rather than passively accepting AI outputs, students actively filter information by validating the accuracy, relevance, and scholarly integrity of the outputs. This thorough step taken by students shows their understanding that while AI is a powerful assistant, they take responsibility in ensuring their thesis has their voice. Ramli mentioned that he is responsible for analysing the AI outputs, as he "reads, analyses, observes and arranges the outputs carefully." This indicates that careful reading, analysis, and arrangement of information are essential, regardless of AI assistance. Filtering is also done by participants when they cross-checked the suggestions provided by AI tools with external sources. For example, Amri illustrated his acceptance to AI outputs is based on checking on "another website such as... past papers," and determining the availability of "relatable past studies." This shows his autonomous filtering and selecting of ideas that are academically feasible and well-supported. Meanwhile, Umi mentioned that she uses AI to "get the link to the Google Scholar articles and then check" and "after all I need to read it again and have a double check fact that be given by AI," which shows her approach in using AI as a search helper, and by following up on checking the related academic works.

The participants also filtered information by further checking the sources provided by AI and evaluating their validity by searching if the sources exist. Faroq mentioned:

Let's say the ChatGPT give the answer for me. Before I take any of their point, I will just go their sources...I will ask them for the source. If they give me the source, I will get the source, is valid or not.

Faroq also mentioned, "because the parts of ChatGPT, some of the citation does not even exist in the website, but Cite AI most... I will search up also," showing that he will check for the citations or sources provided by AI tools. Similarly, Umi stated that she checked all sources suggested by AI using other reliable online platforms as she mentioned that "... find the paper, maybe from ResearchGate or Google Scholar and one more the website library." These points reflect a systematic strategy for confirming information provided by AI.

Filtering is also done when participants further check the quality of the AI outputs. Don highlights the need to read AI-generated content "one by one" to identify repetitive or contextually unrelated points, even if they initially appear suitable. This internal review ensures the coherence and academic appropriateness of the content. Amri elaborated that when he interacted with AI, he continually explains and refines his prompts until he gets

a “satisfying answer,” followed by reading and “looking at the reference” to “come out with the final own idea.” The students’ self-control over the frequent process of inquiry and content generation reflects their thoroughness in accepting AI outputs. Overall, through this strategic move, students played an active role of crosschecking the reliability and validity of the sources and their contents rather than merely receiving provided information. This critical engagement builds students’ ethical and academic responsibility and cultivates essential research skills that students can apply in their future work life.

Point of reference

The theme delegated autonomy can also be viewed as how the students have assigned other entities (supervisors and peers) to help them navigate the use of AI like checking the validity of information obtained from AI. Many of the participants highlighted their supervisors to be the ones they talk to regarding the information given by AI. Don admitted using AI for some parts but referred to his supervisor for others, as he stated:

I think few of the topics I also use it but some of them. Because still I need to ask about ask my supervisor about this. Is it correct? Is it suitable with my topics, but still I am using it to generate.

He then gave a specific scenario when he had to talk to his supervisor due to the contradiction he had between his ideas and AI. He said;

Sometimes I am having my own opinions because the GPT some sometimes is not really. The idea of Chat GPT is not same with me, with mine. So still I’m using this ChatGPT first, but then I will ask my supervisor.

Similarly, Fina expressed her reliance on her supervisor to give the green light, as she mentioned, “rely on my supervisor because everything and then when she said okay, everything is suitable.” This aptly summarises the other few instances like Ramli who elaborated, “ChatGPT. Still I need to consult my supervisor,” and Don who expressed,

I mean there’s no idea about the points given by this GPT, but still I will select which part of the points I think could be expendable and then I will use it, the point and still I will search, I will ask my supervisor. Is it correct or not?

Besides supervisors, two of the participants also reported talking to their peers about the information gathered from AI. Don chose to talk to his friends who are employing similar research approach when using AI to write his analysis. He shared:

I think I will refer to my friends that use ... same method with my research. For example, my research is using quantitative. So I will ask my friends those who

are using quantitative also to make sure I am on the same path with them...so I think I still refer my friends even I am using the AI.

In sum, undergraduate language students exhibit strong autonomy in their use of AI for thesis writing. Their consistent exercise of critical evaluation and adaptation, personalisation and strategic integration, and informed decision-making transforms AI from a potential aid into a helpful tool that supports their intellectual thinking. It embodies the synthesis of cognitive independence and technological collaboration, marking a shift from using AI to Managing AI ethically. This degree of engagement shows a generation of students who are harnessing technology while firmly maintaining control over their academic output.

DISCUSSION

The findings of the study have provided rich insights into how undergraduate language students engage AI tools through four interconnected strategies – AI as Assistive Tools, AI as Intelligent System, AI as Cognitive and Affective Partner, and Delegated Autonomy. This reflects a clear understanding regarding the balance between student involvement and AI support. The results strongly connect with the theoretical underpinnings discussed in the literature review, particularly concerning AI literacy, the OECD AI Literacy Framework, and the emerging PAIRR model.

AI Utilisation Across Thesis Stages

In relation to RQ1, AI tools are found to be utilised across thesis chapters, demonstrating the pervasive and strategic integration of AI from the initial conceptualisation (Chapter One) through to the concluding remarks (Chapter Five). Students leveraged AI for diverse purposes, including refining research ideas, generating outlines, assisting with literature searches, drafting methodologies, organising data, and structuring discussions. Tools such as ChatGPT, Grammarly, QuillBot, Mendeley, Gemini, Blackbox, Copilot, and Jenni were employed, confirming AI's role not merely as a grammar checker but as a multi-functional assistive technology (Roe et al., 2023). This comprehensive application of AI across the thesis development highlights its potential to streamline workflows and enhance efficiency, aligning with previous observations that AI can help overcome common writing challenges and enhance the overall writing experience (Fathi & Rahimi, 2026). Mapped to the PAIRR model, this extensive cross-chapter utilisation aligns with the “AI Tool Selection” and “Interaction” phases. The data reveals that students do not use a generalised approach, instead, they evaluate which specific tool best addresses the unique ‘Problem Formulation’ of each respective chapter. Overall, students’ varied use of AI tools across chapters suggests a clear understanding of each tool’s specific affordances, indicative of a purposeful form of AI literacy in practice.

Strategies for AI Use

The main findings in relation to the focus of this study is related to RQ2, focusing on four strategies for AI utilisation – AI as an assistive tool, an intelligent system, a cognitive and affective partner, and the human-related strategy of delegated autonomy.

AI is used as an assistive tool for basic tasks like spelling and grammar checks, relating to the foundational aspect of thesis writing skills, where AI provides immediate feedback to enhance linguistic precision and academic style (Barasa, 2024). This aligns with the “Engaging with AI” domain of the OECD AI Literacy Framework, where learners use AI to access information and tools to support their work (OECD, 2025). Similarly, AI functions as an intelligent system for organising ideas and refining arguments, reflecting AI’s capacity to assist with higher-order writing skills such as argumentation and structure, which are crucial for producing well-structured and coherent thesis papers (Jonathans et al., 2025). This also connects to the “Managing with AI” domain, emphasising students’ ability to delegate structured tasks while retaining human control. The conceptualisation of AI as an extended cognitive partner highlights a personal level of interaction, where students view AI as a collaborator in enhancing their cognitive processes. This aligns with the “Creating with AI” domain of the OECD framework, which encourages collaboration with AI to generate and refine ideas and solve problems (OECD, 2025). By mapping this to the framework, it becomes evident that students operating at this level understand the deterministic nature of AI outputs. In this domain, delegating surface-level revisions to AI allows students to enact the “Review” component of the PAIRR model at a syntactical level, by assessing whether the AI’s grammatical suggestions maintain or distort their original scholarly voice. This finding extends previous discussions by suggesting that, for several participants, AI was integrated into their metacognitive strategies in meaningful ways, fostering critical thinking and self-regulation as they interact with AI (Jonathans et al., 2025), though the depth of this integration varied across individuals.

A significant strategy employed by students in understanding how they navigate AI use responsibly is delegated autonomy. This concept directly responds to the need for students to balance their own involvement with AI support (Eleftheriou et al., 2025). Delegated autonomy signifies that students consciously and actively choose when, how much, and in what capacity to entrust tasks to AI, while critically retaining the ultimate judgement and responsibility for the final output. This finding strongly supports the tenets of AI literacy articulated in the literature review, in relation to critical evaluation and ethical engagement (Long & Cope, 2021; Ng et al., 2021). The students’ conscious decision-making exemplifies the OECD AI Literacy Framework’s emphasis on understanding AI’s capabilities and limitations and engaging with it thoughtfully and responsibly (OECD, 2025). Their ability to “Manage AI” and ensure its outputs are suitable for the student’s thesis topic demonstrates a practical application of AI literacy in a high-stakes academic context. Besides managing, the participants were also seen to have embraced the first two domains – Engaging and Creating. In the former, participants could develop their critical thinking skills by assessing the accuracy and relevance of AI outputs. This is evident when

the participants first checked the information and references given by AI before including them in their thesis. Whereas in the latter, it was observed that the participants reflect on ethical issues as they openly admitted not putting 100% trust in AI.

Furthermore, delegated autonomy provides empirical validation for the practical relevance of the PAIRR model (Sperber et al., 2025). The students' strategies of utilising AI as assistive tools, intelligent systems, and cognitive partners naturally feed into the "Problem Formulation," "AI Tool Selection," and "Interaction" stages of PAIRR. Most importantly, the core of delegated autonomy – the students' conscious decision to verify, adapt, and critically oversee AI output – directly embodies PAIRR's "Review" and "Reflection" stages. Participants in this study demonstrated the critical assessment of AI-generated content that PAIRR advocates, ensuring that AI suggestions are not passively accepted but rigorously evaluated for accuracy, relevance, and alignment with their academic goals. Participants' active "further checking" validates PAIRR's human-centred approach to the writing process when decision-making and critical engagement with AI feedback (Sperber et al., 2025; Lee & Kim, 2023; Johnson et al., 2023) are involved. It signifies that students are not avoiding control, but selectively delegating specific cognitive burdens to AI, while maintaining oversight to protect themselves in terms of academic integrity and intellectual ownership – although the degree of this oversight varied among participants, with some demonstrating more systematic verification practices than others.

Together, these frameworks enable a dual-level analysis of students' AI use – the AI Literacy Framework identifies the skills and knowledge dimensions evident in students' strategies, while the PAIRR model illuminates the reflective and evaluative processes mediating their interaction with AI feedback. The compiled excerpts are proof for these processes. Their integration ensures that this study goes beyond a descriptive account of AI tools used to analyse how students exercise critical awareness, maintain autonomy, and develop writing agency through their engagement with AI. These conceptual underpinnings directly inform both the research design and the interpretation of findings presented.

By combining AI Literacy and PAIRR, this study adopts a human-centred approach to investigating AI-assisted thesis writing. The AI Literacy Framework informs the conceptualisation of skills and strategies – from prompt formulation to evaluation of generated outputs – while the PAIRR model interprets how those skills are enacted reflectively in real writing contexts. Their integration supports a layered analysis:

1. At the cognitive level, identifying how students engage, manage, and create with AI tools.
2. At the reflective level, understanding how they assess, compare, and revise based on AI feedback.
3. At the ethical level, examining how autonomy and academic integrity are maintained.

CONCLUSION

This study provides empirical insights into how undergraduate language students strategically employ AI throughout thesis writing. Findings reveal that students utilise AI as assistive aids and cognitive partners, with the central strategy of delegated autonomy emerging as key. This highlights a conscious choice to entrust specific tasks to AI while maintaining ultimate authorial responsibility. These results validate AI literacy constructs and provide practical support for the PAIRR model. Ultimately, students' commitment to critical evaluation and 'further checking' underscores a human-centred approach, proving that technological integration enhances intellectual scholarly work.

This study makes three pivotal contributions to AI-assisted academic writing. First, it offers an integrated view of AI literacy, shifting the focus from static skills to a dynamic, process-oriented mapping of how students engage, create, manage, and design. Second, it provides empirical validation of the PAIRR model, demonstrating how its cyclical phases – Problem Identification, Interaction, Review, and Reflection – naturally enhance iterative learning. Finally, it introduces “Delegated Autonomy,” a construct reframing autonomy as the strategic management of interdependence with AI. By distributing cognitive tasks while maintaining authorial control, participants who are particularly those exercising more deliberate forms of delegated autonomy demonstrate a meaningful blend of metacognition and academic integrity.

These findings offer critical pedagogical implications for higher education. First, universities must move beyond basic tool instruction to integrate explicit AI literacy into curricula, prioritising critical thinking and “Delegated autonomy.” Educators should design assignments that utilise the PAIRR framework, encouraging students to reflect on AI interactions to enhance, rather than replace, core research skills (Smith et al., 2024; Zhou et al., 2024). Furthermore, institutions must establish clear guidelines that recognise AI as a valid assistive tool while mandating student responsibility for originality and ethical review. By reframing AI as a sophisticated enabler of learning guided by ethical frameworks, higher education can cultivate a new generation of autonomous, ethically aware, and highly skilled academic writers.

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