

# ASCILITE 2025

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*Educating in an Era of Continuous Change*

### Design and evaluation of an LLM literature review assistant

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Writing a literature review is a challenging task for many students, particularly when it comes to locating relevant sources, synthesising findings, and citing accurately. This study presents the design and evaluation of a web-based tool that uses Retrieval-Augmented Generation (RAG) to support students in writing short literature reviews. The system allows students to upload academic papers, write drafts, and receive rubric-aligned feedback from a Large Language Model (LLM). A user study involving ten honours and postgraduate students examined how learners engaged with the tool during a two-hour session. User interaction logs, rubric-based scores, and survey responses were analysed to evaluate learning outcomes and user experience. All participants showed measurable improvements in their writing. Students reported that the tool helped improve their reviews, particularly in areas such as citation guidance, writing structure, and synthesis. They also suggested enhancements such as grammar checking, better interface design, concise feedback and improvement to the retrieval and citation validation. The findings suggest that LLM-powered feedback tools can effectively support academic writing when designed to encourage revision, reflection, and writing skill development.

*Keywords:* AI-assisted writing, Academic writing support, Citation literacy

#### Introduction

Writing a literature review is a fundamental yet challenging component of academic research, especially for undergraduate and postgraduate students. Common difficulties include retrieving relevant literature, synthesizing research findings, and maintaining academic writing standards (Fernandez, 2019; Zakharia et al., 2024). These issues are compounded by the ever-growing volume of scholarly publications, which can overwhelm students during the early stages of a research project (Walter & Stouck, 2020; Shao et al., 2024).

A well-structured literature review goes beyond summarizing articles, it requires formulating research questions, critically evaluating sources, and synthesizing evidence to establish scholarly context (Fernandez, 2019). For novice researchers, this process is often time-consuming and discouraging. Second-language students in particular face additional barriers related to grammar, vocabulary, and writing conventions, which further hinders their confidence as well as synthesis and writing productivity (Zakharia et al., 2024).

Although various AI-based tools and Large Language Models (LLMs) such as GPT-4 are able to support academic writing, most offer limited instructional value. LLMs are able to write full paragraphs and essays for the learner, even including citations, but fail to help students develop a deeper understanding of the writing process (Shao et al., 2024). To address this gap, we propose an LLM-assisted system that guides students step-by-step through the literature review process. The system offers keyword suggestions, allows students to upload papers and generate summaries on demand, and provides rubric-based feedback with citation validation and verification. Rather than automating the writing task, the tool encourages students to actively participate, reflect, and improve their academic writing practices after receiving AI generated feedback.

#### Related Work

Various tools have been designed to support student learning through feedback and structured assistance. For example, Litstudy enables literature mapping using natural language processing (NLP) (Wong & Li, 2023), and PEER provides rubric-based evaluation and guidance (Seßler et al., 2023). While these tools offer useful features such as citation checking, topic modelling, and scaffolded feedback, they typically lack interactivity

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and cannot adaptively support novice writers across the entire review-writing process.

Other tools like *CiteLearn* explore gamified environments to help students practice citation conventions (Knight et al., 2024). These tools place emphasis on learning and revision but tend to offer limited flexibility or depth.

Despite growing interest in using AI for literature-related tasks, current systems tend to either automate output without promoting understanding, or offer fragmented instructional support. This study builds on prior work by integrating LLM capabilities with structured pedagogical feedback, aiming to support, not replace, student agency in literature review writing.

A key innovation in the tool we propose is the use of Retrieval-Augmented Generation (RAG) (Lewis et al., 2023) to validate the accuracy of citations. By retrieving content from the papers uploaded by the student, the system can check whether the cited information is actually included in the referenced source. This allows for real-time verification of quotations, paraphrased content, and in-text references. In addition, LLMs are prompted to evaluate draft writing against an academic rubric, providing formative feedback on areas such as clarity, structure, citation formatting, and synthesis of research. Together, these features enable a more interactive and educationally grounded form of AI-assisted writing support, one that encourages revision, critical thinking, and the development of academic writing skills.

## Research Questions

This study was guided by the following research questions, which aim to explore both student interaction with the system and their perceptions of its educational value:

- RQ 1. Can an LLM-powered feedback tool that uses Retrieval-Augmented Generation (RAG) support measurable improvement in student citation and synthesis skills over a short session?  
This question can be answered using pre- and post-feedback scores from the LLM against the rubric, particularly focusing on dimensions related to citation accuracy and integration of sources.
- RQ 2. How do students perceive the usability and effectiveness of AI-generated feedback during the literature review writing process? This can be answered using Likert-style survey items related to overall satisfaction and improvements to quality.
- RQ 3. What additional features or improvements do students suggest to enhance the usefulness of an AI-assisted writing support tool? This question is directly addressed by the open-ended question on improvements to the tool collected from participants.

## Methodology

This study designed, developed and evaluated a web-based system that helps students write short literature reviews. The tool was designed to provide immediate, structured feedback aligned with a writing rubric, and to support citation validation using uploaded academic papers. The web interface allowed students to upload documents they had already sourced, draft their reviews, and request feedback. The system processes uploaded papers using keyword and semantic retrieval methods to support citation checking and relevance evaluation. Feedback was generated by a LLM using prompt templates that included an academic writing criteria rubric.

## Participant Profile

Ten (10) participants were recruited for the user study. This included one honours thesis student and nine postgraduate research students. Participants came from a range of technical disciplines, including cybersecurity, computer science, human-centred AI, and bioinformatics. Participants were asked to self-assess their academic writing experience. Two (2) students identified as beginners with eight (8) having intermediate-level writing experience. None of the participants reported being advanced writers. This mix aligned with the goal of supporting students at various points in their academic journey.

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### Study Procedure

Each participant completed a two-hour session. They were asked to write a one-page literature review on a given topic using the system. During the session, participants could upload papers, revise their drafts, and request feedback as often as needed. The feedback was aligned to a rubric that assessed writing structure, clarity, citation use, and integration of sources. The system generated numeric scores for each rubric criterion, which were recorded to track progress but were not shown to participants during the session. At the end of the session, participants completed a questionnaire that included both multiple-choice and open-ended questions. This captured their perceptions of the tool's usefulness, the value of the feedback, and areas for improvement. Ethics approval for the study was obtained at The University of Queensland Human Research Ethics Committee.

### Tool Design Guidelines and Implementation

The system was designed to provide an accessible, web-based environment to support students as they learn to write short literature reviews. A key design priority was ensuring that students could access the tool without installing any software. The interface was developed using Streamlit (shown in Figure 1), a lightweight web framework that allows for rapid development and deployment. This approach ensures that students can use the tool in any browser and on any device with internet access.

To support authentic academic practice, the system allows students to upload the academic papers they have already read or sourced themselves. These uploaded documents are automatically processed and indexed using both keyword-based and semantic retrieval techniques. The system combines BM25, a well-established method for ranking documents based on keyword relevance, with FAISS, a vector search technique that identifies semantically similar content using embeddings. This combined approach helps the system retrieve and interpret relevant information across a variety of documents.

Students are then able to draft a short literature review directly within the interface. Once a draft is submitted, the system uses a LLM to generate formative feedback. This feedback is aligned with a structured academic rubric and focuses on areas such as writing structure, clarity, citation use, and integration of research content. An important feature of the system is its use of RAG. RAG combines a language model with a document retrieval process. When a student cites a paper in their review, the system uses RAG to locate and verify the cited content within the uploaded documents. It also checks citation format and evaluates the review against rubric criteria. This allows the system to support both content accuracy and the development of academic writing skills. To support the evaluation of student engagement and writing improvement, the system also includes tracking features. Tracking data included feedback received, changes made between drafts, and improvements in writing scores over the course of a session.

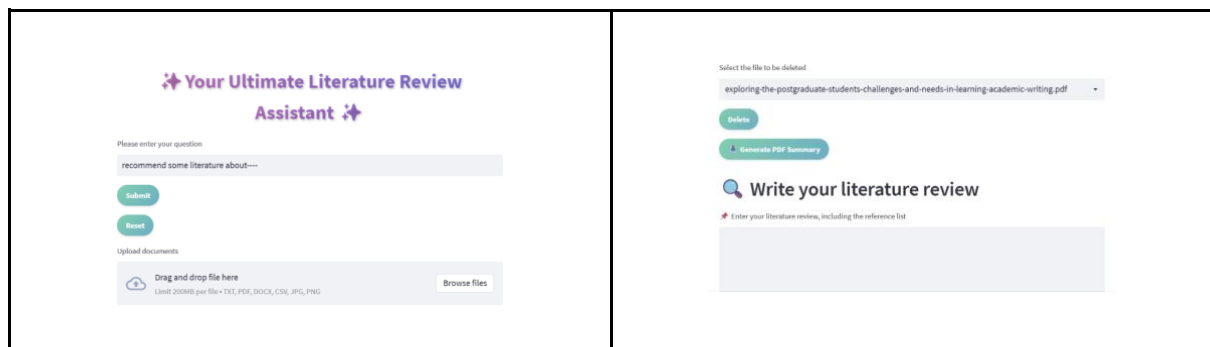


Figure 1. The Literature Review Assistant user interface

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### Analysis and Discussion

To understand how students engaged with the AI-assisted tool and what impact it had on their writing, we examined system usage data alongside feedback and survey responses. The discussion below addresses each research question and reflects on what the findings reveal about the potential of LLMs in writing support?

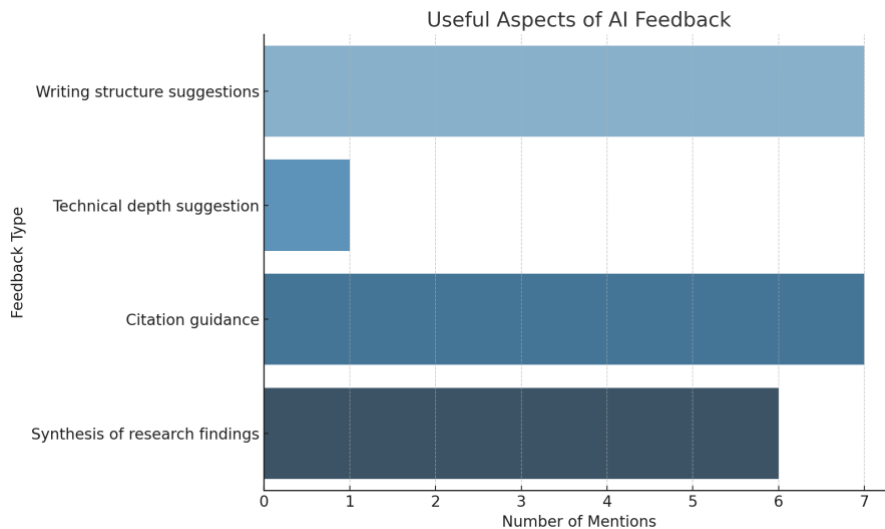


Figure 2. Aspects of AI literature review feedback learners found useful

- RQ 1. Can an LLM-powered feedback tool that uses RAG support measurable improvement in student citation and synthesis skills over a short session?  
The system's use of RAG allowed it to validate cited statements by retrieving relevant content from the student-uploaded documents. Through a custom prompt, the LLM assessed whether references were accurate, formatted correctly, and appropriately integrated into the writing. All ten (10) students showed an improvement in their rubric-based scores, with an average gain of 9.3 points (ranging from 4 to 17). This demonstrates that, even within a short session, the tool was effective in helping students improve their citation practices and integration of reliable sources. These findings suggest that the iterative revision process, supported by structured feedback from the system, contributed to improvements in students' final work.
- RQ 2. How do students perceive the usability and effectiveness of AI-generated feedback during the literature review writing process?  
Students reported a high level of satisfaction with the tool. All participants (100%) agreed that the AI-generated feedback helped improve the quality of their literature review, and 80% indicated they were very satisfied with the experience. The remaining 20% were somewhat satisfied, with no participants expressing dissatisfaction. Participants were able to specify the aspects of the AI-generated feedback that they found useful. The most frequently mentioned areas (See Figure 2) were citation guidance, writing structure suggestions, and synthesis of research. These responses indicate that learners found the tool both usable and educationally supportive across key elements of academic writing.
- RQ 3. What additional features or improvements do students suggest to enhance the usefulness of an AI-assisted writing support tool?  
Participants provided a range of suggestions to enhance the tool's usefulness. Common themes included the need for a grammar checker, more concise and clearer feedback, better UI design, transparency around LLM scoring, support for additional citation formats and improvement to the RAG functionality being used. Transparency around scoring referred to the fact that while the rubric criteria responses were given, the score from the LLM was tracked but not shown to students.

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The tool used intermediate RAG techniques but more advanced techniques are available (such as Graph RAG) and should be explored in the future. Several students also requested features such as concept maps, writing prompts, and tutorials to guide first-time users. These suggestions point to opportunities to improve usability and expand the tool's pedagogical support.

### Limitations

This study was conducted in a short, two-hour session, which may not reflect how students engage with writing tools over longer periods. The small sample of ten participants, all from technical disciplines, also limits the generalisability of the findings to other fields, where writing practices and citation styles may differ.

### Conclusion and Future Directions

This study explored the use of a RAG LLM tool to support students in writing short literature reviews. The system provided structured, rubric-aligned feedback that helped learners improve citation accuracy, integrate research more effectively, and revise their work within a single session. All participants showed measurable improvements in their writing, and survey responses indicated strong satisfaction with the tool's usability and ability to improve writing quality. Students particularly valued support with citation guidance, writing structure, and synthesis, and their suggestions for improvement offer clear directions for further development. These findings demonstrate the potential of LLM-powered feedback tools to support academic writing in higher education, not by replacing student effort and agency, but by guiding revision, reflection, and the development of foundational writing skills. Future work will explore how such tools can extend beyond short-term tasks to foster deeper reading, critical understanding, and synthesis skills, while supporting student agency.

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