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A comparative analysis of academic literacy support models: Impacts on self-regulated learning (SRL) for an international student in Australia

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The advent of artificial intelligence (AI) has sparked significant debate regarding optimal implementation strategies, with many discussions relying on assumptions that have not been thoroughly tested. This study aims to move beyond speculation by critically examining the role of AI tools, specifically ChatGPT PDF, in supporting self-regulated learning (SRL) in the context of academic literacy. Situated within the process of composing a master's thesis in education in Australia, this investigation adopted a qualitative, self-reflective research design to compare the effectiveness of AI tools with traditional university-based academic support models. The findings suggest that while AI tools like ChatGPT PDF can enhance SRL through real-time feedback and increased accessibility, they also have limitations in providing deeper cognitive support. To optimise their effectiveness, AI tools should be integrated within a comprehensive framework that promotes self-efficacy, metacognitive reflection and a deeper understanding of academic literacy. This approach ensures that AI tools not only aid task completion but also foster transformative learning and independent thinking.

Implications for practice or policy:

- University academic support centres should revise their online literacy support guidelines to foster quality SRL. These revisions should be informed by pedagogically sophisticated frameworks, grounded in current intellectual thinking about effective academic support and how these insights can best be translated into online contexts.
- Universities have tended to depend heavily on outsourced literacy support, which is often costly and limited in scope. Policies should instead prioritise academically sophisticated, technology-enhanced online support that can systematise aspects of human intelligence within AI tools. Such an approach would not only extend access and efficiency but also strengthen students' capacity for SRL in a more coherent and sustainable way.

Keywords: self-regulated learning, postgraduate support, digital academic support, academic language support, academic literacy support, ChatGPT PDF AI, auto-ethnography

Introduction

As education enters the 21st century, policymakers and researchers increasingly emphasise the importance of integrating artificial intelligence (AI) tools into mainstream learning environments to prepare students for contemporary challenges. At the same time, debate continues over how these tools should be implemented, particularly in higher education, where critical literacy and self-regulated learning (SRL) are central goals. This study contributes to these discussions by examining the potential of AI-based academic support in relation to more traditional forms of guidance. Specifically, it compared three sources of literacy support available to postgraduate students: the online critical reading questions provided by a university's Language and Learning Centre, the affordances of ChatGPT PDF AI (https://chatgpt.com/g/g-dZyKGS17d-pdf-ai) and the structured guidance offered through a mentor's analytical steps. In doing so, it explored how different approaches to academic support foster or limit students' capacity for SRL.

Literature review

Since the early 1990s, the global increase in student populations has compelled universities to enhance their academic support services, with the goal of promoting equal opportunities for students from diverse cultural and linguistic backgrounds (Hornsby & Osman, 2014). This push towards inclusivity has necessitated the expansion of educational capacity, making it crucial to assess the effectiveness of these services in improving student outcomes. At the same time, the promotion of student-centred learning and SRL has become a central objective in education, not merely one of several pedagogical approaches. This emphasis is rooted in the theoretical underpinnings of self-efficacy (Bandura, 1977; Zimmerman, 1989), metacognition (Butler & Winne, 1995; Flavell, 1979) and mental accommodation (Piaget, 1943, Chapter 1), which collectively highlight the learner's active role in monitoring and shaping their own learning processes. Over time, these theories converged with broader educational movements that prioritised learner agency and higher-order thinking. SRL principles were subsequently foregrounded in global education policies such as the OECD's (2005) definition and selection of competencies framework and the OECD's (2019) learning compass 2030, all of which emphasise adaptability, reflection and student responsibility for learning (Bernacki et al., 2011; Kitsantas & Dabbagh, 2011). As Lian (2012) has argued, this orientation towards self-regulation reflects a long-term view of education that goes beyond immediate task completion to fostering enduring intellectual autonomy and the capacity for critical, higher-order thinking.

These theoretical frameworks help guide students in monitoring their own progress, reflecting on learning strategies and integrating new knowledge with their pre-existing schemas. Furthermore, SRL is supported by external instructional methods such as generic prompting, student-centred approaches and just-in-time learning, all of which have proven effective in fostering SRL behaviours and mindsets among learners. These frameworks inform the design of quality services that empower students to take ownership of their learning by setting goals, tracking progress and adapting strategies as needed:

- *Self-efficacy*: Self-efficacy, as introduced by Bandura (1977), refers to an individual's belief in their capacity to successfully execute tasks and achieve goals. In the context of SRL, high self-efficacy results in greater persistence when faced with challenging tasks, as learners with strong self-belief are more likely to engage in strategic planning and monitor their progress (Zimmerman, 1989). Research shows that students with higher self-efficacy tend to perform better academically, due to their confidence in overcoming obstacles and adapting their learning strategies (Schunk, 1984). This reciprocal relationship between self-efficacy and performance further enhances learners' motivation and autonomy, making self-efficacy a core component of SRL theory (Bandura, 1991). Observing experts or seeking help from various sources, as Bandura (2000) has suggested, demonstrates students' exercise of self-efficacy.
- *Metacognition*: Metacognition involves both metacognitive knowledge – awareness of one's cognitive abilities and task demands – and metacognitive regulation, which includes planning, monitoring and evaluating learning strategies (Butler & Winne, 1995; Schraw, 1998). Learners who develop strong metacognitive skills are better equipped to assess their understanding and adjust their strategies accordingly. For instance, they can recognise when a particular study approach is ineffective and modify their tactics, thereby improving task efficiency (Hacker et al., 2009; Roberts et al., 2019). Metacognition is a crucial element of SRL, as it enables learners to take deliberate control over their learning processes and outcomes.
- *Mental accommodation:* Based on Piaget's (1943) theory of cognitive development, mental accommodation refers to the process by which learners modify their existing knowledge structures (schemas) to incorporate new information. Although Piaget did not specify the exact mechanisms of accommodation, this principle is central to SRL, as it underscores the dynamic interaction between prior knowledge and new learning experiences (Fox & Riconscente, 2008). Learners with strong accommodation skills exhibit greater flexibility in thinking and are better prepared to tackle novel or complex tasks. For example, they actively adjust their mental frameworks to comprehend unfamiliar concepts, leading to deeper understanding and improved problem-solving abilities (Block, 1982).

- *Generic prompting strategy:* Ifenthaler (2012) has emphasised the effectiveness of generic prompting in fostering SRL, as it encourages learners to engage in independent, reflective problem-solving. Unlike direct instruction, which provides specific, step-by-step guidance, generic prompts consist of open-ended questions or suggestions that stimulate learners to draw on their existing knowledge and cognitive strategies to address challenges (Schraw & Dennison, 1994). This method promotes critical and creative thinking, allowing learners to tailor their learning processes. By fostering autonomy, generic prompting plays a pivotal role in building learners' confidence in their ability to self-regulate. However, Bandura (2000) has noted that adjusting task difficulty to align with students' capacities can also build confidence, although this approach shifts the focus towards teacher-directed learning rather than student-driven problem-solving.

- *Student-centredness and agency:* Matsuyama et al. (2019) has stressed the importance of student agency in SRL, highlighting the significance of learners envisioning their future selves and linking their learning to personal aspirations. When students view themselves as active participants in shaping their educational journey, they are more motivated to engage with their studies and take ownership of their learning outcomes (Lian, 2017). Lian (2017) has argued that learner-centred education benefits from intellectual risk-taking, as it encourages students to venture into uncertain, innovative approaches rather than adhering to traditional methods. By embracing unconventional strategies and empowering learners to decide what, when and how to learn, educators can cultivate deeper engagement and open pathways for transformative learning experiences.

- *Just-in-time learning:* Just-in-time learning (Killi & Morrison, 2015) provides learners with timely, relevant information that aligns with their immediate needs. This approach sustains motivation and autonomy, enabling learners to adjust their learning strategies based on real-time challenges. According to Lian (2017), as the amount of available information rapidly expands, learners are shifting from a just-in-case model – where knowledge is accumulated for potential future use – to a just-in-time approach, in which they seek out immediate, relevant information to meet current needs. This shift mirrors the growing preference for practical, need-based learning over formal education, resonating with SRL principles, which prioritise autonomy and adaptability in the learning process.

Taken together, these principles position SRL as a powerful framework for promoting autonomy, adaptability and higher-order thinking. Empirical studies have consistently shown that SRL enhances academic performance, particularly through the reinforcement of metacognitive reflection and self-efficacy (Kitsantas & Dabbagh, 2011; Winne, 2015). However, the efficacy of SRL is not uncontested. Critics point out that SRL frameworks often assume learners already possess the skills for self-monitoring and reflective judgement; when pedagogical preparation is weak, these assumptions can disadvantage students who have not been taught how to engage in such processes (Fox & Riconscente, 2008). These debates underscore the importance of situating SRL within supportive contexts – both technological and human – that deliberately cultivate learners' regulatory capacities rather than presuming their existence. It is within this contested and evolving landscape that the present study investigated how AI-based and traditional academic support tools contribute to or limit SRL in practice.

Research questions

To examine how different forms of support contribute to SRL, this study compared three distinct support tools used during the process of composing a master's thesis. These were selected because they represent the main sources of literacy support available to postgraduate students in practice: (a) university-developed resources, (b) AI-driven assistance and (c) personalised human mentoring. The first tool, the critical reading questions, is an online resource provided by the Language and Learning Centre at the university, designed to guide students' critical engagement with academic texts through a structured set of prompts. The second tool, ChatGPT PDF AI, is a digital platform that enables students to upload and interact with academic texts, offering summaries, clarifications and interactive questioning. The third tool, referred to here as the mentor's analytical steps, consisted of guidance provided by an academic mentor,

who developed a small set of probing questions intended to help the student identify the cohesion and argument structure within research articles. Although this last approach involved another human, the steps themselves were formalised into prompts that could in principle be generalised into a digital support tool.

The study was guided by the following research questions:

1. What were the user's experiences with each of the three academic text-analysis tools – university-provided critical reading questions, ChatGPT PDF AI and the mentor's analytical steps – in supporting academic text comprehension and analysis?
2. How did each of the three tools compare in fostering SRL for the user, particularly in relation to principles such as self-efficacy, metacognition and learner autonomy?
3. Based on the study findings, what theoretical frameworks were shown to better foster SRL and enhance academic literacy?

Methods

This study adopted a qualitative, self-study design situated within an auto-ethnographic and interpretive phenomenological tradition (Smith et al., 2022; Vanassche & Kelchtermans, 2015). Auto-ethnography emphasises the researcher's own lived experience as a site of inquiry, generating insights by systematically reflecting on personal engagement with a phenomenon. In this study, we occupied dual roles as researchers, with one of us also participating as the focal learner, a postgraduate student. The focal learner documented and analysed his own experience of engaging with academic research-support tools during the process of composing a master's thesis in education, while the other researcher contributed structured mentoring support in the form of an analytical framework guiding inquiry and reflection (referred to here as the academic mentor's analytical steps). This self-study design enabled a close, reflexive examination of how different forms of academic support, both human and digital, were encountered in practice.

Pedagogic setting and participants

Consistent with auto-ethnographic methodology, the research design reflected our dual positioning as researchers and, in one case, as participant. Data were generated through systematic reflection on the use of three text-analysis tools: the university's critical reading questions (please see the Appendix), ChatGPT PDF AI and the academic mentor's analytical steps.

The pedagogic setting was the process of writing a master's thesis in education at an Australian university. We structured the study around this thesis-writing process. One of us, a postgraduate student and non-native English speaker, engaged with the selected tools to support academic reading and analysis, while the other contributed mentoring and analytical oversight. Situating the study within this authentic academic environment allowed us to foreground the challenges faced by international postgraduate students in navigating academic literacy demands. By adopting this immersive approach, we aimed to generate empirical insights into the potential and limitations of AI-based and traditional forms of academic support, moving beyond speculation to a grounded evaluation based on lived experience (Rowland, 2023).

Design of the study

This study adopted a qualitative, self-reflective methodology, drawing on introspective techniques to collect and analyse data. Data were generated through structured reflective engagement with the three academic text-analysis tools during the thesis-writing process. Through qualitative reflection (Tenny et al., 2017), we examined the affordances of three academic research-support tools, namely the Language and Learning Centre's critical reading questions, the analytical capacities of digital tools such as ChatGPT PDF AI, and mentor guidance, with a focus on how each supports SRL.

Data collection and analysis

Data collection involved reflective note-taking, documentation of discussions between the postgraduate student (the focal learner) and the academic mentor, who also participated as a researcher, and analytic memos produced during tool use. The primary method of data analysis employed was qualitative description, a pragmatic approach that, as outlined by Sullivan-Bolyai and Bova (2021), captures authentic perspectives using clear and accessible language.

The data were analysed in two stages. First, a qualitative description was conducted using Christensen et al.'s (2010) job-to-be-done framework, which was originally developed in a business context to assess how well a product meets user needs. This framework addresses three key questions: (a) What is the fundamental job or problem the user is facing? (b) What experiences in use would perfectly address the job? (c) What product attributes, technologies or features are required to deliver these experiences? In this study, the framework was applied to assess user experience with each academic reading tool by comparing and contrasting the specific academic reading needs that emerged while using the three tools.

The second stage of analysis involved evaluating the experiences of the postgraduate student (the focal learner) with each of the research support tools against six SRL principles: (a) self-efficacy, (b) metacognition, (c) mental accommodation, (d) generic prompting, (e) student-centredness and agency and (f) just-in-time learning. This study employed an interpretive phenomenological tradition to document and evaluate the postgraduate student's (the focal learner's) subjective experiences of engaging with the research support tools during the thesis-writing process. The interpretive phenomenological tradition shaped the analysis by foregrounding the lived experience of the postgraduate student (the focal learner), focusing on how meaning was constructed through engagement with the research support tools during the thesis-writing process.

For the ChatGPT PDF AI tool, the phases of questions emerged directly from the system's interactive prompts when an uploaded text was queried. The AI generated a chain of questions organised broadly around the conventional sections of an academic paper (e.g., study problem and objectives, methods, findings and contributions). These questions were recorded during use and treated as the tool's analytical "framework". By contrast, the Language and Learning Centre's critical reading questions were pre-designed by the university's academic support unit, while the mentor's steps were formalised through consultation with an academic mentor, who developed a short sequence of guiding prompts for analysing cohesion and argumentation. To enable comparison, each tool was applied to the same set of academic texts, and the resulting analytical paths were documented side by side. This tracing of how each tool structured the analysis process formed the basis for Table 1 in the Findings section, which summarises their distinctive designs and affordances. Together, these three approaches represent institutional, AI-driven and human-guided models of support.

Ethical statement

This study did not involve human participants beyond the researchers. As such, no formal ethics approval was required. The research was conducted in accordance with institutional guidelines for self-study and reflective research.

Findings

Research question 1: What were the user's experiences with each of the three academic text-analysis tools – university-provided critical reading questions, ChatGPT PDF AI and the mentor's analytical steps – in supporting academic text comprehension and analysis?

This section presents an integrated analysis of the three academic text-analysis tools, combining the insights derived from Christensen et al.'s (2010) job-to-be-done framework. Rather than dividing the analysis into separate discussions for each question, the analysis offers a holistic reflection on the overall

effect of these tools on the user's experience. By examining how each tool addressed the core academic tasks, the experiences generated during use and the features required to support deeper engagement, this section provides a comprehensive evaluation of their collective impact on the user.

The three academic text analysis tools differed significantly in both design and their approach to engaging students with academic texts (Table 1), leading to varied user experiences. Although the Language and Learning Centre's critical reading questions and ChatGPT PDF AI primarily focused on extracting facts and probing surface-level content, they did not encourage the student to evaluate or critically assess the text, resulting in a straightforward and low-level analysis.

In contrast, the mentor's questions encouraged a deeper exploration of the cohesion between different stages of the academic report, making the analytical process feel more complex and unfamiliar, and therefore somewhat stressful. A significant challenge encountered with both the Language and Learning Centre's critical reading questions and other digital tools was the difficulty of achieving a coherent and insightful analysis that fostered critical engagement with the material. Both tools followed a circular process, engaging the reader in repetitive tasks that often led to superficial rather than deep analysis. For instance, with the critical reading questions, the analysis lacked clear structure, causing difficulty in focusing on the core argument of the text. This resulted in repetitive cycles of re-reading and answering similar questions across various sections, without encouraging intellectual or conceptual exploration. Additionally, the critical reading questions assumed a certain level of prior field knowledge, lacked explanations and did not provide feedback mechanisms to help establish logical connections between different stages of research reports. This often left teh particpant (the focal learner) feeling confused and unsupported.

Similarly, ChatGPT PDF AI produced overlapping questions across stages, with terms like *research context* and *purpose and objectives* being used interchangeably, which added to the confusion. Although it provided a high level of interactivity, allowing users to request explanations, summaries or rewritten feedback, it rarely prompted deeper analysis or challenged vague assumptions. Instead, it tended to align uncritically with the claims made in research papers and with the prompts and responses generated by one of us working as a postgraduate student, resulting in a less demanding and at times redundant analytical process. Ultimately, both tools lacked the necessary interactivity and feedback mechanisms to support a coherent and insightful examination of academic texts, limiting the potential for deeper learning and critical engagement.

Conversely, the mentor's analytical steps offered a more structured, coherent and cohesive approach, providing clear reasons for reading and focusing on identifying and scrutinising new perspectives to determine if they could effectively generate new insights. For example, when analysing the article investigating student feedback literacy (Teng & Ma, 2024), that is, the knowledge skills, and dispositions that students need to effectively engage with feedback in academic writing, the mentor's steps focused the analysis on the conceptual context in which the study was embedded. The study addressed the topic of feedback; however, the analysis showed it fell short of providing a comprehensive explanation or theoretical framework for the concept of feedback itself.

Different pedagogical approaches employ diverse concepts of feedback, ranging from drills and explanations to modeling, guidance and concept probing. Each method engages students in distinct ways, depending on its underlying principles. However, when working with the mentor's analytical steps, one of us, working in the capacity of a postgraduate student, relied heavily on ongoing interaction to make sense of the procedure, indicating a dependence on external guidance for interpreting and applying the steps. This reliance on the mentor's direct support highlighted both (a) an initial lack of understanding regarding the process of critical research analysis and (b) the need for additional online resources to reduce this dependence, offering guidance on how these analytical steps could serve as effective concept-probing prompts, particularly when integrated with tools like ChatGPT PDF AI.

To compare the three tools, we documented the sequence of prompts or steps each tool required when applied to the same set of academic articles. This produced three distinct "paths" of analysis: (a) the pre-determined sequence of the Language and Learning Centre's critical reading questions; (b) the dynamic, AI-generated chain of questions from ChatGPT PDF AI; and (c) the mentor's stepwise framework for identifying problems, perspectives and methods. Table 1 summarises these paths, illustrating how each tool structured the process of academic text analysis and the degree to which it supported SRL.

Table 1

The design of the three distinct tools for academic text comprehension and analysis

Self-regulation capacities		
Language and Learning Centre's critical reading questions	ChatGPT PDF AI's phases of questions	Mentor's analytical steps
The design of the tools for supporting academic text analysis		
A series of questions guiding students to assess the credibility of the source, the tone of argumentation, the relevance and currency of evidence provided and questions asking whether the text challenged their own biases.	A chain of questions was offered, believed to gradually increase an in-depth analysis of a text, starting with an overview of the text, focusing on the study problem and its objectives, methods and findings, discussion, limitations, biases and recommendations and contribution to the field.	A short series of steps, focusing the reader on the cohesion of the text being analysed: Identify the problem being addressed; Identify the new perspective through which the problem and its respective concepts were defined; Assess how this new perspective enhances the study's ability to provide more insights; Identify the methods used in the study; Evaluate the findings in relation to the relevance and impact of the new perspective; Determine how the new perspective helped to reframe the problem that the article sought to address.

Research question 2: How did each of the three tools compare in fostering SRL for the user, particularly in relation to principles such as self-efficacy, metacognition, and learner autonomy?

In this section, we examine how each text-analysis tool shaped the learning process of the postgraduate participant, particularly in relation to managing learning, reflecting on strategies and adapting to the demands of academic text analysis within an SRL framework. Table 2 summarises the findings.

Self-efficacy

The principle of self-efficacy focuses on learners' confidence in their knowledge and ability (Bandura, 1977). The Language and Learning Centre's critical reading questions and ChatGPT PDF AI negatively impacted self-efficacy. Both tools lacked a coherent structure for guiding the analysis, leading to confusion and reduced confidence. In particular, the unclear terminology and absence of feedback in the Language and Learning Centre's critical reading questions required the postgraduate student (the focal learner) to rely on assumptions, undermining confidence in his own responses. The interactivity feature of ChatGPT PDF AI was underutilised, as the feedback often simply agreed with the study participant, failing to provide guidance on how to approach the analysis or improve comprehension of the text. In contrast, the mentor's analytical steps provided clear, structured guidance, boosting confidence by foregrounding that reading involves more than simply deciphering the text. Instead, the steps encouraged focusing on inquiry skills, including evaluating how ideas flowed and connected within the text, as well as with concepts and ideas in other texts.

Both the Language and Learning Centre's critical reading questions and ChatGPT PDF AI negatively impacted self-efficacy, primarily because they lacked a coherent structure for guiding analysis and provided little useful feedback. In the case of the Language and Learning Centre tool, unclear terminology and the absence of explanatory feedback left the user relying on assumptions, which undermined confidence. Similarly, ChatGPT PDF AI's interactivity was limited, as its responses often echoed the prompts and input provided without offering direction on how to improve comprehension or analysis. In contrast, the mentor's analytical steps provided structured guidance that significantly boosted confidence by reframing reading as an inquiry process rather than a matter of simply decoding text. These steps encouraged a focus on inquiry skills, such as evaluating how ideas flow and connect within the text as well as how they relate to broader concepts and ideas from other sources.

Metacognition

This principle emphasises learners reflecting on, evaluating and adjusting their thinking to plan and execute strategies that optimise learning progress (Butler & Winne, 1995; Schraw, 1998). Both the Language and Learning Centre's critical reading questions and ChatGPT PDF AI posed challenges in fostering metacognitive skills, as the unclear terminology and lack of coherent instructions left the user feeling lost. This confusion made it difficult to effectively plan, monitor and evaluate the thought process – essential components of metacognitive learning. The absence of interactive feedback in the Language and Learning Centre model further constrained the focal learner's ability to self-assess and adjust strategies during analysis, reducing opportunities for deeper reflection. Similarly, ChatGPT PDF AI tended to focus more on surface-level content rather than guiding the focal learner through the process or problem-solving steps required for critical analysis.

In contrast, the mentor's analytical steps supported metacognitive development by providing a structured framework that encouraged the focal learner to think critically about how the text sought to influence, persuade or convey its message. Drawing on Teng and Ma's (2024) study, these steps prompted the focal learner to organise his thinking and approach to analysis through questions such as, "How did the text conceptualise feedback?", "What is the relationship between the pedagogical approach and the feedback concept it advocated?", "How did the Teng and Ma's study account for this relationship when investigating the correlation between factors related to student feedback literacy and academic writing performance?" and "Furthermore, how was this correlation reflected in the study's results and recommendations?". In sum, the clear guidance enabled the focal learner to monitor and evaluate their understanding more effectively by focusing on the logical flow of ideas within the text, identifying contradictions and gaps in their own knowledge, while also fostering deeper strategic thinking. Interactions with the mentor were crucial in guiding and refining metacognitive skills, helping the focal learner to assess how well the text's flow aligned with key principles of scientific inquiry.

Mental accommodation

This principle, based on Piaget's (1943) theory of cognitive development, highlights the importance of processes that help learners adjust their existing cognitive frameworks to integrate new information, reshaping their understanding to better align with novel concepts or experiences. The Language and Learning Centre's critical reading questions and ChatGPT PDF AI assumed substantial background knowledge without providing mechanisms for recalling and incorporating previous knowledge into new insights. The surface-level questions about sources of evidence, key points or ChatGPT PDF AI's descriptions of study objectives and findings offered no prompts to encourage the learner to relate what they read to their existing knowledge. There were no opportunities to explore what was missing in the texts, who or what was excluded or how new information could reshape and expand the learner's cognitive framework. In contrast, the mentor's steps actively promoted knowledge questioning and its recall, facilitating mental accommodation by encouraging the focal learner to connect existing knowledge with the perspectives presented in the text. This process also involved exploring overlooked frameworks and understanding why they may have been excluded, helping to assess the paper's relevance within the broader context of academic debates. However, fully leveraging the potential of this tool still required the mentor's guidance.

Generic prompts

Generic prompts refer to guidance through questions that encourage problem-solving, which in turn fosters both enhanced reflection and planning (Ifenthaler, 2012). The three academic reading tools varied significantly in their use of generic prompting and their ability to foster critical engagement and self-regulation during the analysis process. The Language and Learning Centre's critical reading questions primarily relied on close-ended questions that focused on specific factual details, such as the author's credentials, the key ideas and the recency of evidence. Prompts asking the user to reflect on how the text impacted his initial thinking functioned more as a summary exercise rather than feedback prompting reflection on one's inquiry process. ChatGPT PDF AI's questions, such as "What is the research context?" or "How does the author interpret the findings?", were designed to evoke broader analytical thinking. However, for a novice researcher, fully engaging with these system-generated prompts to explore deeper understandings of the studies proved challenging and required significant initiative from the study participant, a postgraduate student, rather than guidance from ChatGPT PDF. In contrast, the mentor's analytical steps encouraged reflection by prompting the identification, comparison and contrast of concepts, beliefs, values, policies and practices; establishing connections between them; and expanding one's own values, beliefs, and understanding. In the process, abstract reasoning skills were being engaged, alongside an assessment of the texts' impact within broader academic discourse, enabling more nuanced engagement with the material. Though initially challenging, these prompts eventually became effective tools for fostering autonomy.

Student agency and centredness

These principles concern themselves with the transformative aspect of education and learning 9Matsuyama et al., 2019). The analysis of the three tools revealed differing levels of support for student agency and engagement. The Language and Learning Centre's critical reading questions lacked interactive features that could have helped clarify key concepts and processes. As a result, the reading process and analysis often became frustrating and confusing, limiting meaningful engagement with the material. In contrast, ChatGPT PDF AI provided a more interactive platform, enabling the postgraduate participant to input responses, ask questions and receive real-time feedback with direct references to specific sections of the text under discussion. This interactivity fostered a more dynamic and learner-centred environment, by encouraging ongoing dialogue and, where possible, adapting to individual preferences. This facilitated greater engagement and supported increased ownership of the learning process. Additionally, ChatGPT PDF AI's text editing features and ability to operate across multiple languages enhanced the clarity of the thinking in English, while also smoothing interactions with the mentor and reducing language-related confusion. Its capacity to bridge Khmer and English further enriched the literacy learning experience.

The mentor's analytical steps, while offering a coherent and structured framework, lacked interactivity, requiring in-person consultations to address specific concerns. However, the mentor's approach extended beyond treating the postgraduate participant merely as a learner, instead positioning them as an active, critical participant in the field. This perspective foregrounded agency by encouraging inquiry, prompting the questioning of assumptions, the critique of perspectives, and the navigation of uncertainty. Such intellectual risk-taking facilitated a deeper engagement with the material, leading to a transformative learning experience in which greater ownership of their learning journey was assumed and active contribution to the development of the field became possible.

Just in time

This principle concerns itself with on-demand feedback (Killi & Morrison, 2015). Neither the Language and Learning Centre's critical reading questions nor the mentor's steps offered real-time feedback, leaving the the postgraduate participant without immediate support when facing challenges. In contrast, only ChatGPT PDF AI provided on-demand feedback, allowing to address questions promptly, though with the limitations discussed in previous SRL categories. One significant limitation of ChatGPT PDF AI is its frequent inaccuracies. This required careful attention when reviewing responses, especially when the system provided information about texts and theories beyond the specific text being analysed.

Table 2
Summary of the study findings

Stages 1 and 2	Language and Learning Centre's questions	ChatGPT PDF AI	Mentor's analytical steps
Student's experience	Lacked clarity, confusing categories, circular process of analysis	Interactive but resulting in repetitive and directionless analysis	Coherent, but additional assistance was needed
Reflexivity	Low	Low	High
Interactivity	Low	High	Low
Self-efficacy	✖	✖	✔
Metacognition	✖	✖	✔
Accommodation	✖	✖	✔
Generic prompting	✖	✖	✔
Agency	✖	✔	✖
Just in time	✖	✔	✖

Research question 3: Based on the study findings, what theoretical frameworks were shown to better foster SRL and enhance academic literacy?

The findings of this study suggest that fostering the transformative nature of learning, a core element of SRL principles, depends on ensuring that students retain their sense of self-efficacy and understand the impact of the learning process on their broader comprehension skill development. This requires creating a learning environment that allows students to feel in control and aware of how their efforts are contributing to their academic growth at each step of their reading and analysis. Among the tools examined, the mentor's analytical steps were most effective in achieving this, as they encouraged the postgraduate participant to move beyond simple factual responses to engage in more integrative, field-wide analysis. These steps mirrored the structure of academic inquiry, focusing the postgraduate participant on identifying new perspectives and their impact on the research. This approach provided both direction and clarity, fostering self-efficacy and metacognitive reflection by giving the student a purposeful sense of progress in the analysis.

ChatGPT PDF AI, while structured around conventional academic sections such as Introduction, Literature Review, and Methodology, fell short in promoting deeper problem-solving skills. For example, its guidance in the Literature Review section encouraged the postgraduate participant to assess the study's position within existing research but lacked the prompts needed to investigate the role of the literature review. This superficial approach led to confusion and diminished the postgraduate participant's self-efficacy, leaving limited support for integrating findings into a broader conceptual understanding. Despite its interactive capabilities, ChatGPT PDF AI had a limited impact on student-centred learning in this context.

The Language and Learning Centre's critical reading questions were organised in a seemingly progressive manner, from basic comprehension questions ("What is the author's approach and perspective?") to more complex critical thinking ("Who/what is left out of the text?", "Which parts of the argument do I agree with and why?"). However, the progressive structure lacked an apparent guiding theoretical framework to support the sequence, leaving the student without a coherent process for synthesising information. This absence of direction engaging in the learning process, including the cognitive processes of SRL, such as metacognition and self-efficacy, as the student was unable to engage deeply with the texts and struggled to integrate their analysis into a broader academic context.

Discussion

The present study was motivated by the question of whether AI can play a role in fostering SRL and enhancing academic literacy. Additionally, it sought to explore how AI might shift the role of educators

from managing students' learning to empowering them as independent learners. At the university level, these are critical questions, as policies aimed at building students' academic literacy ultimately seek to cultivate resilient professionals and citizens, equipped to become leaders capable of supporting and guiding others.

This study contributes to the debate in several key ways. First, the findings underscore that the cognitive goals of SRL – self-efficacy, metacognition and mental accommodation – cannot be supported in isolation from one another. The evidence from the study suggests that an integrated framework is required, in which self-efficacy is developed through a structured analytical process that promotes reflection alongside critical engagement with knowledge. The mentor's analytical steps were particularly effective in this regard, as they framed the inquiry in a way that stimulated planning, evaluation, and iterative learning, thereby reinforcing SRL processes.

Secondly, the study revealed the limitations of intuitive instructional design. The university-developed academic resource, Language and Learning Centre's critical reading questions, while well intentioned, relied on intuitive prompts that lacked coherence and clear direction. This resulted in a scattered and ineffective analysis process, making it difficult to evaluate new information in relation to prior knowledge. In the absence of a clear structural framework, meaningful engagement with the text and systematic evaluation of existing understanding were constrained. These findings underscore the importance of designing SRL tools that are both structurally coherent and theoretically grounded.

The study also highlighted the effectiveness of academic inquiry-based steps for analysis, as demonstrated by the mentor's framework. This structured approach facilitated deeper engagement with the material and helped the postgraduate participant connect new insights to broader academic concepts, promoting a more reflective and thorough analysis. By encouraging the integration of related readings and experiences, the mentor's approach fostered a more critical and insightful understanding of the text. The ability to link ideas beyond the immediate text emerged as central to the development of advanced comprehension and analytical reasoning, underscoring the value of reflective, inquiry-based frameworks for supporting SRL.

Furthermore, the study confirmed that positioning the student as an active participant within the academic field, rather than as a passive recipient of instruction, substantially enhanced motivation. Framing analytical engagement as directly relevant to professional development encouraged a more critical orientation towards research activity. This shift in perspective, facilitated by the mentor's guidance, helped cultivate a sense of professional agency, which in turn supported SRL by reinforcing active participation in academic discourse.

Finally, the study showed that just-in-time learning, while effective and highly desired, is only truly impactful when integrated with the supporting conditions outlined above. Although ChatGPT PDF AI provided just-in-time feedback, its lack of depth and direction undermined its effectiveness. The findings suggest that for just-in-time learning to effectively support SRL, it must be integrated into a structured, reflective process that prompts students to think critically and plan their learning strategies in alignment with broader academic objectives.

Conclusion and study limitations

This study highlights both the potential and limitations of AI tools like ChatGPT PDF in fostering SRL and enhancing academic literacy. ChatGPT's strengths, particularly in increasing accessibility, efficiency and the provision of real-time feedback, were evident in its dynamic platform, which facilitated immediate student interaction. These features align with existing literature that underscores ChatGPT PDF's role in streamlining certain academic tasks. However, the findings of this study, alongside previous research, suggest that while AI-powered applications are effective in these areas, ChatGPT PDF's feedback often lacks the depth needed to support critical engagement with academic content. This limitation was

particularly noticeable in its inability to promote higher-order thinking, critical analysis or reflective learning, all of which are essential for SRL.

In contrast, the mentor's analytical steps, though lacking interactivity, proved more effective in promoting transformative learning and supporting SRL. However, the analysis of the three tools for academic text analysis revealed that neither the mentor's analytical steps alone, with their structured yet non-interactive design, nor ChatGPT PDF AI, with its interactive capabilities but lack of structured guidance, can fully support SRL when used in isolation. More effective learning outcomes were observed when the strengths of both approaches were combined, leveraging ChatGPT PDF's accessibility alongside the mentor's deeper, reflective guidance.

Overall, this study reflects the broader consensus that, while AI has the capacity to enhance academic efficiency and accessibility, it is insufficient to fully support the development of critical, independent learners. A transformative educational experience requires the integration of reflective, human-centred intelligence that fosters deeper cognitive engagement and supports the core principles of SRL. This does not simply mean adding more human mentors but finding ways to model and automate aspects of human intelligence within AI systems. Universities can move beyond unsystematic uses of AI by developing structured, inquiry-based supports that mirror the intellectual guidance offered in face-to-face settings. In this way, AI can be harnessed not only for efficiency and accessibility, but also to extend the deeper analytical and reflective capacities that are central to advanced academic learning.

Despite involving only a single postgraduate participant, the study provided valuable insights and highlighted important considerations, offering meaningful contributions to understanding the use of AI tools in fostering SRL and enhancing academic literacy. Several limitations also present opportunities for future research. Beyond the limitation of being a self-study with only one student participant, other potential limitations include:

- *Limited generalisability:* As the study focused on the experiences of a single individual, the findings may not fully capture the diverse needs of a wider student population. Future studies could expand upon this by including more diverse participants across different academic settings, allowing for a broader understanding of AI's role in supporting SRL.
- *Expansion beyond text-based academic analysis:* The study's primary focus on different academic literacy support tools can be broadened in future research. Further data collection could explore the specific challenges participants encounter, how they interact with academic support tools, and what their reflections reveal about their developing ability to apply and enhance SRL processes. This expansion would offer a deeper understanding of how students engage with the tools and navigate the learning process
- *Limited scope of AI tools:* By focusing on ChatGPT PDF AI as a representative AI-driven tool, the study may have overlooked other AI applications that offer different or more advanced functionalities. Expanding the research to include various AI tools would provide a more comprehensive understanding of how different technologies foster SRL and academic literacy.
- *Lack of long-term assessment:* This study focused on the immediate experiences of the student without examining the long-term impact of AI tools on academic performance or SRL. Future studies could incorporate longitudinal assessments to determine whether the observed benefits have lasting effects on learners.
- *Potential biases in mentor guidance:* The mentor's framework, though valuable, was applied within a specific academic context. Further research is needed to examine its validity, usefulness and transferability across different educational settings and learner populations, and to compare its effectiveness with other approaches to supporting SRL.
- *Temporal context:* Finally, it is important to acknowledge that this study was conducted in early 2024, at a particular stage of AI development. The findings therefore reflect the capacities and limitations of AI tools available at that time, which may differ from more recent advancements.

These limitations suggest that further studies involving a more diverse range of students, tools and contexts are necessary to confirm the findings and their generalisability.

Author contributions

Mengly Ky: Data curation, Investigation, Formal analysis, Writing – original draft; **Ania Lian:** Conceptualisation, Formal analysis, Writing – review and editing.

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Appendix

Language and Learning Centre's critical reading questions
One of the key strategies you can use when reading critically is to ask yourself a series of questions. Begin by asking questions which relate to the text overall and then look at the author's argument and the evidence used to support it.

Examine the overall credibility of the text
The first level of reading critically
- Who is the author and when was this written?
- What is the author's approach and perspective?
- What is the author saying? (Try to sum up the argument in your own words)
- What are the main points of this text?
- Who/what is left out of the text?
- On first reading, does this seem a credible argument?

Examine the argument and the evidence
(These questions will help you to evaluate the validity of the argument and enable you to better understand how the argument has been developed and supported).
- What evidence has been presented to support the argument?
- What is the quality of the evidence? (Is the evidence anecdotal or supported by research and/or scientific study?)
- Is the evidence referenced? (or is the author relying solely on their own research?)
- Is the evidence recent and relevant?
- Is there a logical development of ideas?
- Which parts of the argument do I agree with and why?
- Which parts of the argument do I disagree with and why?
- What assumptions does the author make?

Analyse the style and tone of the argument
- Is the argument clearly expressed?
- Does the writer's language, tone, or choices of examples reveal any biases? If so do these ideas reduce the credibility of the argument?
- Does the author use emotive terms or examples to persuade the reader?
- Do these strategies enhance or detract from the argument?

Overall assessment of the writing
- Does the writing challenge your own biases, assumptions and beliefs?
- Are you capable of reviewing your beliefs/ assumptions in the light of the argument presented?
- What were the strengths of the argument?
- What were the weaknesses of the argument?
- How convincing was this piece of writing?
- What connections do you see between this text and other texts?