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Scaffold or shortcut? Postgraduate IT students' use of generative AI and self-regulated learning

Amara Atif[1] and Camille Dickson-Deane[1]

[1]Faculty of Engineering and Information Technology, University of Technology Sydney, Sydney, Australia

Generative artificial intelligence (GenAI) tools such as ChatGPT and Copilot are increasingly integrated into higher education, where students use them to summarise texts, solve problems, and generate code. While these tools are can reduce cognitive load and improve learning efficiency, they may also challenge students' ability to regulate their learning (i.e., self-regulated learning; SRL) by encouraging surface-level engagement and overdependence. This study investigates how GenAI shapes SRL behaviours within a postgraduate information technology (IT) subject/unit/course. A mixed-methods design was employed with 267 students, combining pre- and post-semester surveys with semi-structured interviews. The study examined how students engaged with GenAI and how this affected SRL components of goal setting, monitoring, and self-evaluation. Findings show varied patterns: some students used GenAI to clarify goals, check understanding, and reflect on progress, while others relied on it as a shortcut, outsourcing monitoring and evaluation. The study highlights GenAI's dual role as a scaffold and shortcut, offering insights for designing learning environments that foster productive use and sustain student agency and autonomy.

Keywords: cognitive offloading, generative AI, higher education, information technology education, metacognition, self-regulated learning

Corresponding author: Amara Atif, amara.atif@uts.edu.au

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Introduction

GenAI tools (e.g., ChatGPT, Copilot) are rapidly reshaping higher education. Students increasingly rely on these systems to condense readings, assist with analytical reasoning, and automate elements of coding or design tasks, positioning them as on-demand aids for academic work. Research shows that GenAI can enhance productivity and efficiency by reducing cognitive load (Gkintoni et al., 2025; Schulz et al., 2025; Tankelevitch et al., 2024) and providing personalised scaffolding (Binhammad et al., 2024; Yan et al., 2024). Yet their rapid uptake also raises concerns: reliance on AI-generated solutions may foster surface-level engagement (Kazemitabaar et al., 2025), weaken critical thinking (Gerlich, 2025; Zhou et al., 2024), and erode the development of SRL skills (Sardi et al., 2025). Recent empirical studies, including those in undergraduate contexts, similarly show that while GenAI can foster metacognitive engagement when used critically, it may also hinder self-monitoring and reflection when over-relied upon (Yan et al., 2025; Yang et al., 2025).

While questions of GenAI use and self-regulation are relevant across higher education, they are particularly acute in postgraduate (PG) programs. Unlike undergraduates, PG students are expected to show greater autonomy, critical reflection, and professional readiness, making SRL foundational to their success (Kember & Leung, 2005; Pintrich, 2004; Zimmerman, 2002). These cohorts are also diverse, often including international students and mid-career professionals (Tight, 2012) who typically know how and when they want to learn. For such

learners, GenAI tools can provide powerful opportunities for personalised support, efficiency, and creative exploration, enhancing reflection and self-direction. However, these same affordances can amplify risks: overreliance on AI feedback, erosion of critical judgement, or inequities in tool access. Recent research with STEM students also reports uneven AI literacy and ethical awareness (Atif et al., 2025). As PG learners frequently balance academic study with professional and personal responsibilities, these opportunities and risks intersect dynamically, shaping how students regulate their learning and adopt new technologies (Tobbell et al., 2010).

In technology-intensive disciplines such as IT and information systems (IS), where analytical reasoning, coding, and problem-solving are central, GenAI poses both pedagogical and governance challenges. Recent sector analyses show that universities are responding unevenly to AI-integrated assessment, reflecting diverse levels of strategic alignment and digital capacity (Atif et al., 2025). Some GenAI tools are particularly well suited to generating code, proposing design solutions, or summarising readings, yet these same affordances raise questions about whether students understand how they are using such outputs in relation to deeper learning, a core aspect of critical thinking in higher education (Alexander, 2003; Biggs et al. 2022). It is hypothesised that the usage either supports the learning process (i.e., a scaffold) or functions as a shortcut towards a more complex learning goal – the former actively engaging working memory, and the latter potentially leading to disengagement from learning altogether (Dickson-Deane, 2023; Rumelhart et al., 1972) with both representing choices that create specific learning outcomes.

Research on SRL highlights the importance of goal setting, monitoring, and self-evaluation (Pintrich, 2004; Zimmerman, 2002). Research on cognitive offloading shows that while tools can be used to manage routine tasks and free up mental space for deeper thinking, they can also encourage over-reliance and more superficial cognitive engagement (Hutchins, 2000; Risko & Gilbert, 2016; Sparrow et al., 2011; Ward, 2013). Despite this growing debate, little empirical evidence addresses how these dynamics unfold in everyday student use of GenAI, particularly in PG contexts where the stakes for SRL are highest, as learners often balance academic study with professional and personal commitments that shape how they confidentially self-regulate.

To address this gap, we examined *How PG IT students use GenAI* in a large Australian university. Using a mixed-methods design combining surveys and illustrative interviews, the sub-questions (SRQ) included:

SRQ1: How do postgraduate students use GenAI tools in a learning environment?

SRQ2: How does GenAI usage influence key SRL components (goal setting, monitoring, self-evaluation)?

SRQ3: Does GenAI act as a cognitive scaffold that enhances learning, or as a cognitive shortcut that reduces deeper engagement?

Through these questions, the study extends research on SRL and cognitive offloading to the context of GenAI and offers practical guidance for designing learning environments that not only sustain student agency and autonomy but also demonstrate how tools can and should be used to enhance learning outcomes.

Analytic framework: GenAI offloading and SRL

This study conceptualises students' interactions with GenAI as forms of cognitive offloading that can either scaffold or substitute key processes of SRL. We adopt standard SRL constructs such as goal setting, monitoring, and self-evaluation as the focal outcomes (Pintrich, 2004;

Zimmerman, 2002). Offloading is understood as delegating aspects of planning, execution, or evaluation to an external agent (Risko & Gilbert, 2016). Two functional modes of GenAI use are distinguished. In *scaffolded offloading*, students use GenAI to clarify goals, generate ideas, or obtain feedback that they then critique and adapt; agency and sense-making remain with the learner. In *substitutional offloading*, students accept outputs with minimal verification or modification, shifting control of task direction and evaluation to the tool. This distinction is conceptually grounded in cognitive offloading theory (Risko & Gilbert, 2016) and informed by research on metacognitive scaffolding and cognitive load in learning environments (Yan et al., 2025; Yang et al., 2025), adapted here to the context of GenAI-supported SRL. While mode shows how activities are operationalised, frequency can indicate levels of dependency, suggest intent, and shape how SRL is measured.

We acknowledge that both the mode and frequency of offloading, coupled with the choice of tool, may influence SRL. Our analysis therefore focuses on how students positioned GenAI along a continuum between scaffold and shortcut, rather than as a strict binary. Rather than testing formal hypotheses, we use this distinction as an interpretive lens for understanding students' self-regulatory responses. Surveys captured changes in students' skills and understandings (i.e., AI literacy, confidence, and SRL practices), while reflections and interviews revealed strategies for evaluating or outsourcing learning processes. This framework provides the basis for interpreting when and how GenAI functioned as a cognitive scaffold that supported SRL, a cognitive shortcut that displaced it, or both, depending on learners' goals, context, and metacognitive awareness. A summary of scaffolded and shortcut-oriented uses of GenAI in relation to SRL components is provided in Table 4 in Appendix A. This framing recognises that the same GenAI tool can simultaneously scaffold and shortcut learning, depending on how learners regulate its use.

Methodology

This study used a mixed-methods design to investigate the relationship between GenAI usage and SRL among PG students. Data were collected at three time points to minimise burden and capture developmental trends: a baseline survey (Week 1), a late-semester checkpoint survey following sustained engagement (Week 9), and a final open-ended reflection activity administered during the final tutorial (Week 10). This timing aligned with best practice in longitudinal course-based research and supported reliability and validity through triangulation (Creswell & Plano Clark, 2017). Combining surveys with qualitative reflections and interviews captured both breadth and depth of insight into how GenAI influenced SRL processes.

Participants and context

The study took place in a PG IT subject at a large Australian university, enrolling 267 students from diverse professional and academic backgrounds. GenAI tools (e.g., Copilot) were introduced as optional supports for authentic IT/IS learning tasks such as process modelling, problem-solving, and synthesising readings. Students were encouraged, but not required, to explore these tools as part of their learning, simulating AI-enriched professional environments and enabling them to experiment with integrating AI into their workflows.

Data collection

Data collection spanned twelve weeks and combined three custom-designed survey instruments (administered via the learning management system), aligned with SRL constructs (Pintrich, 2004; Zimmerman, 2002) and informed by principles of AI literacy and reflective practice. Surveys at Weeks 1 and 9 captured baseline and mid-to-late semester changes in GenAI literacy, confidence, and reflective strategy use. A final Week 10 reflection invited open-

ended commentary on how GenAI influenced students' learning practices across goal setting, monitoring, and evaluation. To enrich interpretation, two students were purposively selected for follow-up interviews to explore contrasting experiences of scaffolded versus shortcut GenAI use (Palinkas et al., 2015; Patton, 2014).

Table 5 (Appendix A) provides a consolidated overview of all data collection instruments, their timing, and the SRL-related constructs assessed, with full instrument wording included in Appendix B.

Data analysis

Data analysis to address the overarching research question *How PG IT students use GenAI* proceeded in three stages aligned with the sub-questions. Each sub-question drew on a distinct but overlapping set of data sources: SRQ1 used quantitative survey data (Weeks 1 and 9), SRQ2 combined survey indicators with qualitative reflections to examine SRL components, and SRQ3 drew on reflections and interview transcripts to explore the scaffold-shortcut tension. Descriptive statistics summarised changes in AI literacy, confidence, and use of reflective strategies based on structured survey items from Weeks 1 and 9. The Week 10 instrument consisted of an open-ended reflection prompt and was analysed qualitatively; it is therefore not included in quantitative results tables. Inferential testing was not applied, as the aim was to capture descriptive trends rather than test statistical significance.

Qualitative data were analysed thematically using Braun and Clarke's (2006) framework, with coding guided deductively by SRL dimensions and inductively by emergent themes of scaffolding, dependency, and ethical reflection. Interview data were analysed iteratively using the same framework, allowing for nuanced comparison between scaffolded and shortcut use. Emergent subthemes (e.g., critical evaluation, ethical concern, authenticity of learning) complemented reflection findings. This approach allowed for a convergent mixed-methods synthesis integrating quantitative and qualitative evidence to support cross-validation of how GenAI supported or constrained SRL.

Findings

Patterns of engagement with GenAI (SRQ1)

Engagement with GenAI was widespread although uneven. Most students reported prior exposure and moderate confidence that improved over time. Descriptive trends from the Week 1 and Week 9 surveys (Table 1) show baseline familiarity expanding into differentiated profiles, with some students becoming confident and regular users, while others remaining hesitant.

Table 1: Descriptive summary of GenAI engagement based on Week 1 and Week 9 survey responses, showing growth in confidence and variation in engagement trajectories.

Week	N	Prior Use	Confidence Level		Improvement in AI Literacy		Comfort Declaring Use		Key Trend
1	159	83%	beginner	40%	-		-		Broad exposure, low confidence
			intermediate	56%					
			advanced	4%					
9	228	-	↑ confidence		moderate	49%	comfortable	46%	Divergence between confident vs hesitant users
					significant	32%	very comfortable	29%	

Influence on SRL components (SRQ2)

GenAI influenced SRL processes positively for some students and disruptively for others. Students' reflections highlighted divergent approaches to goal setting, monitoring, and self-evaluation (Table 2).

Table 2: Influence of GenAI on SRL components (with indicative quotations from the data), illustrating how GenAI both supported and displaced SRL depending on student engagement.

SRL Process	Supportive Use (Scaffold)	Weakening Use (Shortcut)
Goal setting	Clarify intentions through reflective template *"Writing down what I expected to achieve each week and comparing with what I actually did made me more intentional with using AI."*	Treat as compliance task *"I just filled the boxes because it was required, not because it helped me think."*
Monitoring	Use AI to check understanding, test models *"I asked [GenAI tool] to explain my process model so I could see where I was wrong."*	Rely uncritically on AI outputs *"Once I got an answer from [GenAI tool], I usually just trusted it without much checking."*
Self-evaluation	Compare AI and personal outputs to refine work *"Comparing my answers with [GenAI tool] helped me see gaps in my thinking."*	Outsource judgement to AI *"I let the [GenAI tool] judge if my work was right instead of me double-checking."*

Scaffold vs shortcut tension (SRQ3)

Reflections and interviews revealed contrasting orientations toward GenAI. Of the two students interviewed, one viewed GenAI as a reflective scaffold that extended learning; the other as a shortcut that reduced authenticity and ownership (Table 3). These cases mirror survey trends, underscoring that outcomes were shaped more by learners' strategies than by the tool itself.

Table 3: Illustrative cases of scaffolded versus shortcut GenAI use, highlighting the dual role of GenAI in SRL.

Case	Orientation	Context	Key Insight
Student 1 - Scaffolded use	Integrative, reflective	Used GenAI for brainstorming and prototyping; relied on own expertise for evaluation	GenAI as collaborative scaffold enhancing reflection
Student 2 - Shortcut use	Cautious, avoidant	Avoided GenAI, seeing it as "a cheat shortcut"; documentation perceived as burden	GenAI seen as threat to authenticity and ownership

For most students, their confidence in using GenAI tools generally increased as the term progressed. Those who were confident in using the tool demonstrated key characteristics of agency and autonomy as illustrated in their reflective goal setting and monitoring. Those who

were less confident were more likely to view GenAI as a shortcut or form of academic misconduct, perceiving that it outsourced their autonomy and agency.

Discussion

This study examined how PG IT students engaged with GenAI tools in a technology-intensive learning environment and how these interactions influenced SRL. Students used GenAI as both a practical aid and a cognitive partner, integrating it into authentic learning tasks such as process modelling, problem-solving, and synthesising readings. While some employed GenAI strategically to support reflection and understanding, others relied on it for efficiency or verification, revealing that GenAI use among PG learners was widespread but differentiated, adaptive yet uneven, and simultaneously enabling and constraining.

Patterns of engagement reflected the diversity of postgraduate cohorts. Most students reported prior exposure to GenAI and indicated greater confidence and AI literacy by semester's end, although these gains cannot be directly attributed to the course, as tool use was optional. Adoption varied according to prior digital experience, domain knowledge, and confidence in integrating AI into learning practice. This heterogeneity highlights that PG students cannot be treated as a homogeneous "AI-literate" group. Their engagement with GenAI was mediated by professional identities and competing responsibilities, consistent with research showing that postgraduate diversity amplifies both the opportunities and challenges of technology adoption (Hutson, 2025; Selwyn & Gasevic, 2020).

Across these differentiated profiles, GenAI influenced SRL in both supportive and limiting ways, often within the same learning process. For many students, GenAI helped clarify goals, monitor progress, and compare outputs, functioning as a scaffold for reflection and self-evaluation. Yet, the same affordances could displace monitoring and evaluative effort when students relied too heavily on AI-generated responses. These intertwined dynamics align with theories of cognitive offloading (Risko & Gilbert, 2016; Sparrow et al., 2011), which posit that external tools can simultaneously extend and attenuate metacognitive control. Extending prior research on digital aids such as calculators and search engines, the generative and adaptive qualities of GenAI appear to intensify this duality, positioning it as both a cognitive scaffold and a potential shortcut within SRL processes.

Students' narratives further illuminated this tension. Some described GenAI as a "learning partner" that expanded their ability to brainstorm and critically refine ideas, while others referred to it as a "cheat shortcut" that undermined ownership and authenticity. These divergent accounts suggest that learning outcomes are shaped less by the technology itself than by how students integrate it into their workflows and regulate its use. Recent studies have observed similar patterns: critical engagement with GenAI promotes metacognitive awareness and reflective practice, whereas uncritical use diminishes self-monitoring and evaluative effort (Sardi et al., 2025; Yan et al., 2025; Yang et al., 2025; Zhou et al., 2024). For PG IT/IS students, whose success depends on autonomy, critical reflection, and readiness for AI-enriched workplaces (Alexander, 2003), the distinction between scaffolded and shortcut use is central to both academic development and professional preparedness.

These findings show that GenAI's role in learning is context- and learner-dependent, adding empirical evidence to a debate that has remained largely conceptual (Han et al., 2023; Kasneci et al., 2023). These mixed patterns align with recent undergraduate findings that GenAI can foster metacognitive engagement when critically used but hinder self-monitoring when relied upon unreflectively (Yan et al., 2025; Yang et al., 2025). Theoretically, it extends scholarship on SRL and cognitive offloading by showing how scaffolded and substitutional uses of GenAI operationalise key SRL processes—goal setting, monitoring, and self-evaluation—within

adaptive AI-supported environments. Practically, the findings point to design principles for AI-informed learning: embedding structured reflection, requiring justification or adaptation of AI outputs, and offering explicit guidance on productive tool use. These recommendations echo emerging design-science approaches that operationalise scaffolded GenAI literacy through sequenced guidance, application, and reflection within coursework (Atif et al. 2025), and align with pedagogical research emphasising scaffolded, iterative instruction as key to fostering ethical and critical engagement with GenAI in higher education (Jha & Atif, 2025). Similar to findings from learning design and analytics research showing that structured feedback and checkpoint mechanisms enhance learners' self-regulation and perceived support (Lim et al., 2023), these strategies call for an expanded view of AI literacy that goes beyond technical proficiency to encompass critical, strategic, and responsible engagement with GenAI.

Summary

This study examined how PG IT/IS students engaged with GenAI during a 12-week subject and how these interactions shaped SRL. Findings revealed GenAI's dual role: supporting goal setting, reflection, and feedback, yet at times displacing monitoring and self-evaluation when used uncritically. The study extends cognitive offloading theory by illustrating how scaffolded versus substitutional GenAI use influences SRL processes. Practically, it suggests the importance of embedding reflection and justification of AI-assisted work within learning design to promote intentional and critical tool use. Because, in this study, GenAI use was voluntary, reported improvements in AI literacy and confidence reflect self-perceived rather than instructional effects. While limited to one subject and reliant on self-reports and two interviews, the study highlights the need for longitudinal, cross-disciplinary research. Overall, the results emphasise GenAI's potential to enhance student autonomy and critical reflection when integrated thoughtfully into postgraduate education.

Disclosure of conflicts of interest

The authors report no potential conflict of interest.

Disclosure of the use of AI-assisted technologies during writing

No AI-assisted technologies were used during the writing process.

About the authors

Dr. Amara Atif is a Senior Lecturer in Computer Science at the University of Technology Sydney, specialising in educational technology and artificial intelligence in education. Her work focuses on designing technology-enhanced learning environments that support student engagement and self-regulated learning in higher education. Her research draws on empirical studies of diverse student cohorts to inform the design of interventions that support effective and responsible use of AI in learning. She has experience integrating emerging technologies, including GenAI, into both teaching practice and curriculum design to promote reflective and responsible learning. Her research combines learning analytics, human-computer interaction, and technology adoption to examine how students engage with digital tools and how these interactions shape learning outcomes. Dr Atif has published in leading journals and conferences and contributes to advancing pedagogical innovation in technology-intensive disciplines.

ORCID: https://orcid.org/0000-0003-0381-0343

Dr. Camille Dickson-Deane is an internationally recognised leader in education technology whose research drives methodological excellence, digital learning innovation, and the

equitable design of technology-enhanced learning. Her work spans digital learning, AI-enabled inquiry, and the complex interplay between technology, pedagogy, and individual differences, with over 80 traditional and non-traditional research outputs. She has served on three Q1 journal editorial boards and has a number of teaching and research awards from the Association for Educational Communications and Technology (AECT) with grants from Fulbright, AUSIndustry, CSIRO and most recently Trustworthy Digital Society.

ORCID: https://orcid.org/0000-0002-5504-7856

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Appendix A

Table 4: Scaffold vs. Shortcut uses of GenAI in relation to SRL

SRL Component	Scaffolded Use	Shortcut Use
Goal Setting	Students clarify goals with GenAI prompts, then refine them independently.	Students accept AI-suggested goals or tasks without adaptation.
Monitoring	Students use GenAI explanations/checks to evaluate understanding, compare, and revise.	Students rely on AI outputs without verification, reducing active monitoring.
Self-Evaluation	Students critically reflect on differences between their own and AI outputs.	Students outsource evaluation to GenAI ("if AI says it's right, it must be right").

Table 5: Overview of data collection instruments and SRL alignment

Instrument	Timing	Focus	Data Type	Purpose
Survey 1	Week 1	Prior exposure to GenAI; self-rated AI literacy	Quantitative	Establish baseline dispositions
Survey 2	Week 9	Perceived changes in AI literacy, confidence in using GenAI, and perceived usefulness of a reflective template	Quantitative	Assess goal setting and monitoring
Reflection activity	Week 10	Perceived impact of GenAI on academic work and learning practices (goal setting, monitoring, evaluation)	Qualitative	Elicit self-evaluation and insight
Assignment artefacts	Throughout	Appended GenAI prompts and outputs	Acknowledged, not analysed	Supplementary transparency
Follow-up interviews	Post-semester	Contrasting user experiences (scaffold vs shortcut)	Qualitative	Deepen interpretation; illustrative cases

Appendix B: Survey items used in the study

Week 1 – Baseline Survey: AI Literacy and Prior Experience

Have you ever used Generative-AI tools (e.g., ChatGPT, DALL-E, Copilot) before?

Yes / No

How would you rate your current AI (Artificial Intelligence) literacy level?

Beginner / Intermediate / Advanced

Week 9 – Mid-Semester Survey: Confidence and Reflection

How would you rate your current AI literacy level compared to the beginning of the semester?

Significantly improved / Moderately improved / Slightly improved / No improvement / Less confident than at the beginning of the semester

How comfortable do you feel using and declaring Generative AI tools in your academic work?

Very comfortable / Comfortable / Neutral / Uncomfortable / I prefer not to use Generative AI tools for my academic work

Having used the template each week since Week 2, how effective has it been in enhancing your AI literacy and in setting clear expectations for your learning?

Open-ended response box

Week 10 – End-of-Semester Reflection Activity

Reflecting on this semester, how has your experience with Generative AI tools (e.g., Copilot, ChatGPT, DALL-E) influenced your academic work and research practices? Please share any challenges you faced, positive experiences, practices that worked well for you, or other insights gained while using these tools.

Open-ended response box