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Editorial: Self-regulated learning in the age of generative AI: Finding the balance

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Self-regulated learning (SRL) underpins academic success and lifelong learning, yet remains a persistent challenge for many learners. With the increasing adoption of generative AI (GenAI) in higher education, learners, educators, and researchers find themselves walking a tightrope: how can they balance using GenAI to support human learning while preserving learner agency and epistemic responsibility? This special issue of Learning Letters explores this tension, offering timely insights into the impact of GenAI on SRL. The four featured articles examine how learners self-regulate their learning when using GenAI tools across different tasks and learning contexts, and how GenAI can be leveraged as a dynamic, context-aware SRL support. Together, the studies reveal a recurring tension between efficiency and depth. The editorial synthesises these contributions, identifying two key distinctions: distinguishing cognitive offloading as reduction versus substitution, and assessment for learning versus assessment of learning. Building on these distinctions, two directions for future research are advocated: designing tailored GenAI tools that scaffold SRL and prioritising teaching learners how to self-regulate effectively. Overall, this special issue highlights the core challenge for SRL research: finding the balance between GenAI-enabled support, and the imperative to develop critical, independent learning skills.

Keywords: cognitive offloading, generative AI, instructional design, learner characteristics, self-regulated learning

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Why does this issue matter?

Self-regulated learning (SRL), a proactive process in which learners activate and direct multiple aspects of learning, including cognition, metacognition, motivation, affect, and behaviour towards personal learning goals, is essential for academic success (Zimmerman, 2002). Yet effective SRL remains challenging for many learners, as they are often poor at monitoring their own learning (Dignath et al., 2023), rely on less optimal study strategies (Kornell & Bjork, 2007), and the cognitive demands of learning itself can leave insufficient resources available for self-regulatory processes (Seufert, 2018). The emergence of generative AI (GenAI) tools powered by large language models (LLMs), along with increasingly agentic AI systems capable of autonomously supporting learners' goals, adds a new dimension to these challenges, introducing both significant opportunities and substantial risks for SRL (Qi et al., 2025). While such tools can potentially scaffold SRL and free up

cognitive resources to support learning, over-reliance risks fostering dependency, as learners may accept direct solutions from GenAI, undermining deep engagement with learning materials and impeding the development of critical thinking (Fan et al., 2025). Understanding how SRL manifests in GenAI-mediated learning and how GenAI tools can be designed to support rather than undermine SRL are pressing questions that the field is only beginning to address.

GenAI and SRL: Opportunities, risks, and the reality of adoption

GenAI has been viewed as offering considerable opportunities to enhance education (Georgiou et al., 2026; Yan et al., 2024; Yigci et al., 2025): for teachers, to support curriculum development and enhance the student experience; and for students, to support personalised learning. Whether or not these tools are being used in ways that support SRL, their adoption in higher education is already well underway. Reports have emerged showing increasing adoption of LLM-powered technologies in learning and teaching (Chung et al., 2026; O'Dea, 2024). For example, in a recent large-scale survey of more than 8,000 students across four Australian universities, Chung et al. (2026) reported that more than 80% of respondents used these technologies for academic tasks, especially editing, idea generation, and summarising information. Importantly, students reported that their motivation for using GenAI was for productivity and workflow efficiency. Similarly, Morell-Mengual et al. (2025) found that almost 80% (of 580) Spanish higher education students used chatbots mainly to obtain information and generate ideas.

These adoption patterns raise concerns about students' engagement with GenAI tools. While many use them for efficiency and idea generation, their interactions may extend beyond basic help, hindering learning. Handa et al. (2025) found that students delegated higher-order tasks, such as creating and analysing, to Claude, suggesting that AI substitutes rather than supports the cognitive effort needed for effective learning. Recent findings from Liu et al. (2026) reinforced this, showing that AI assistance reduced independent performance and learning persistence when removed, especially for those relying on direct AI solutions. These findings reveal a gap between current and ideal use of GenAI to support SRL.

To conceptualise this gap, various analogies have been used to describe GenAI in learning: an “e-bike of the mind” that increases learners’ efficiency but significantly reduces the cognitive effort that comes with learning (Lodge, 2025); a “knife” that can be used constructively to spread butter or destructively to cause harm (Peloche, 2025); or a “drug” that induces laziness and increases reliance (Jin et al., 2025). These metaphors highlight a central concern surrounding GenAI in education and point to the central tension underlying this special issue: how can we find the balance between benefiting from GenAI support while maintaining the cognitive engagement and conditions necessary for self-regulation and effective learning? The four studies in this special issue address this question by investigating how learners self-regulate with GenAI tools and how these tools might support SRL.

Overview of the contributions

In “How do students regulate their learning with a GenAI chatbot”, Lim and Bannert employ process analysis and qualitative coding of students’ chatbot queries to examine SRL when reading and essay writing in a technology-enhanced learning environment with an integrated chatbot powered by ChatGPT. Results showed that students spent a small portion of their learning time engaging with the chatbot, primarily for information seeking. Furthermore, higher chatbot interaction frequency was associated with higher cognitive activities. However, students were engaging in superficial rather than deep processing, suggesting a focus on

completing the task efficiently. Students outsourced comprehension and synthesis activities, relying on the chatbot to make important regulatory decisions, such as evaluating the text's relevance. The findings highlight the need to support students' SRL skills to mitigate the outsourcing of critical processes when using GenAI tools. The authors suggest that GenAI interventions should embed SRL scaffolds that guide students to reflect on their learning process.

In "Efficiency vs. effectiveness: Self-regulated learning with LLM-mediated help-seeking", Viberg et al. investigate how university students employ help-seeking and task strategies when interacting with LLMs, grounded in Zimmerman's (2002) three-phase cyclical SRL model. Through a small interview study with university students in STEM programs, the authors identified a four-stage model of LLM-mediated help-seeking and found that students adopt a layered, context-dependent approach within a network of instructors, peers, and AI. Notably, their findings suggest that students seek efficiency rather than merely offloading cognition when using LLMs. The authors recommend revising current SRL measures to account for LLM-mediated help-seeking and emphasise the need for clear guidance for both students and instructors on leveraging LLMs to promote SRL in an increasingly AI-mediated higher education landscape.

In "Scaffold or shortcut? Postgraduate IT students' use of generative AI and self-regulated learning", Atif et al. examine how postgraduate students positioned GenAI along a continuum between scaffold and shortcut in a technology-intensive learning environment over a 10-week course. Survey results showed that although students started the course with prior GenAI exposure and low confidence, they progressed differently, as some became confident users while others remained hesitant. Findings indicate that GenAI can support or undermine SRL depending on use, such as whether students critically compare outputs with their own work or outsource evaluative judgement. Data from students' reflections further showed that learning outcomes are shaped less by the tool itself than by how students integrate GenAI into their workflows and regulate their use, highlighting its impact as context and learner-dependent. Accordingly, the authors recommend moving beyond technical proficiency to foster critical, strategic, and responsible GenAI use through structured reflection, justification and adaptation of GenAI outputs, and explicit guidance on productive tool use.

In "GenAI as a learning partner: Supporting self-regulated learning over time without replacing effort", Song et al. analyse first-year undergraduates' beginning, during, and end of semester SRL, motivation, and emotion to provide a proof-of-concept demonstration of how LLM can be used to generate tailored SRL support based on the longitudinal and contextual information. The pre- and post- semester survey results showed individual consistency and a decline in metacognitive knowledge and well-being. The week-by-week aggregated survey results showed that curriculum demands, such as a major project deadline, affected students' SRL, motivation, and emotional states. For the proof-of-concept, students' baseline and weekly SRL data, along with the academic context of the assessment in Week 8, were provided as input to an LLM, which was prompted to give three recommendations to support students' SRL in Week 9. The LLM's output was evaluated as appropriate and tailored to students' specific needs, suggesting the utility of GenAI in translating metrics into personalised, context-aware SRL support.

Implications and future directions

The four studies in this issue offer a multifaceted perspective on how students self-regulate their learning with GenAI. A common thread is the tension between efficiency and depth: Lim and Bannert reveal that students risk prioritising efficiency over deep processing, whereas Viberg et al. show that students engage in nuanced, context-dependent help-seeking when

using GenAI, making deliberate decisions about when to consult instructors, peers, or AI. Atif et al. further emphasise that students who use GenAI as a scaffold and critically evaluate its outputs are better positioned to maintain ownership of their learning. Together, the studies suggest that the central issue is not efficiency itself but rather the potential loss of cognitive processes necessary for learning.

Firstly, a distinction should be made between reduction and substitution with respect to cognitive offloading. Given that self-regulatory processes require cognitive resources, using GenAI to manage cognitive burden can be beneficial, such as by providing adaptive scaffolding and feedback (Martin et al., 2025). However, the risk arises when students use GenAI to substitute the effortful thinking that is required for learning. The substitution risk is closely related to a second distinction that should be made between performance and learning, which has profound implications for assessment design and whether we are assessing *for* learning or merely *of* learning. With these distinctions in mind, it is worth considering how GenAI can be leveraged as part of the learning process itself to provide a dynamic SRL support, as Song et al. demonstrate in this issue through their proof-of-concept for generating tailored, context-aware SRL recommendations.

Moving forward, the studies in this issue point to several promising directions for research. One concerns the design of GenAI tools that scaffold SRL. While tailored, context-aware tools show promise, questions remain about the feasibility in developing custom GenAI tools for different learning tasks, and whether students still self-regulate independently when such support is not available. The second direction concerns the learner. Teaching students how to self-regulate their learning more effectively remains as important as ever, perhaps even more so in GenAI-mediated environments where the temptation to offload and increase efficiency is high. This also has direct implications for educators. Teachers need to be equipped with the knowledge and skills to support the development of SRL in GenAI-mediated contexts. Ultimately, it is more than whether GenAI is an e-bike, a knife, or a drug; it is about ensuring that learners can still pedal when the battery runs out, have the skills to handle the tool constructively, and be willing to invest cognitive effort in order to learn independently. Striking the balance between the potential for GenAI to support learners and the importance of learners' development of critical independent learning skills is an important research area concerning SRL in the age of GenAI.

About the authors

Lisa-Angelique Lim is a Lecturer with the Connected Intelligence Centre at the University of Technology Sydney. Lisa holds a PhD in Education, specialising in learning analytics. Her research focuses on the human-centred co-design and implementation of learning analytics and AI tools that foster meaningful student experiences. Lisa works closely with educators in higher education with a mission to co-design learning analytics and AI interventions, recognising that learning analytics and AI are inherently socio-technical and must be embedded intentionally within institutional practice. Lisa has published her work in leading educational technology journals and the International Learning Analytics and Knowledge (LAK) conference. Currently, Lisa is exploring how generative AI can provide more nuanced, contextual feedback to learners while maintaining the human elements that make education meaningful. Her vision is a future where technology amplifies rather than replaces human teaching, creating educational experiences that are both highly personalised and deeply human.

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Jacqueline Wong is an Assistant Professor in the Department of Education at Utrecht University, the Netherlands. Her research focuses on how to support students' self-regulated learning in blended and online higher education. Bridging educational psychology, educational technology, and computer science, she examines how learning analytics can inform the design of adaptive and personalised instructional support that enhances self-regulated learning and academic achievement in digital learning environments. Her work addresses key challenges in measuring self-regulated learning and in scaling personalised support. She has published in leading international journals and conferences. In addition, she contributes to university-wide initiatives on assessment for learning and on examining the pedagogical implications of generative AI in higher education, supporting evidence-informed innovation in teaching and learning.

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