

## Harnessing AI To Support Self-Regulated Learning in Educational Settings

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### Abstract

The paper discusses the role of Artificial Intelligence (AI) in the facilitation of Self-Regulated Learning (SRL) in teaching. The concept of SRL enables students to plan, monitor, and evaluate what they are learning, an aspect that is becoming increasingly essential in online and hybrid learning systems. Artificial intelligence enables self-regulated learning by providing learners with autonomy and suggesting learning assistance to support them throughout the learning process. The paper relies on empirical research and policy reports to note successful adoption in language learning and general institutional practices. Other issues mentioned in it are over-reliance, ethical issues, and digital equity. Some of the recommendations are related to human-centred design of AI, teacher training, and policy change. In conclusion, the paper is of the opinion that in its exclusively applied form, AI can become a potent supporter of SRL and lifelong learning.

**Keywords:** Artificial Intelligence (AI), Self-Regulated Learning (SRL), Personalised Education, Learning Analytics, AI in Education, Digital Equity

### Introduction

Self-Regulated Learning (SRL) is a concept that illustrates one of the transformative impacts of AI in education. SRL deals with learners' abilities to plan, monitor, and evaluate their learning processes through cognitive, metacognitive, behavioural, and motivational tasks (Faza & Lestari, 2025). In the post-pandemic era, as students participate in digitally mediated learning that includes online or hybrid learning platforms, self-directed learning has become increasingly important. Often, traditional educational frameworks do not support students with the SRL features they need; this deficiency, in turn, encouraged researchers and institutions to explore AI tools as commonly scalable and personalized solutions (Lan & Zhou, 2025).

Accordingly, AI systems give personalized feedback, predicting learning pathways while tracking progress along the way to enhance autonomy among learners. The paper addresses the discussion on role of AI in supporting SRL across different educational contexts, the state of different AI applications in effectiveness and implementation challenges, and strategic recommendations for future adoption. The discussion based on systematic reviews, empirical studies, and government perspectives provides a well-rounded view of how AI will transform the way SRL is conducted in a digital age.

### The Concept of Self-Regulated Learning in Education

Self-regulated learning is considered to be far more important for academic achievement, especially in learner-centred and technology-mediated environments. It has three cyclical phases: forethought, performance, and self-reflection. Each phase describes the learners' characterisations of different tasks imposed by goal setting, strategy selection, time management, self-monitoring, and performance evaluation (Faza & Lestari, 2025). However, many students are challenged with regulating themselves well during the learning process, especially with an online learning environment where the learner might not have a lot of supervision from his/her instructor. This has triggered the search for new and innovative interventions and thus the emergence of AI as a promising enabler. AI tools help scaffold learners' SRL processes by providing personalised guidance, analysing engagement patterns, and prompting reflective actions through automation. Lan and Zhou (2025) pointed out that AI-enhanced environments can simulate a few human tutoring functions by adapting to individual needs, and enhancement of motivation, both of which are critical in effective SRL.

### The Role of AI in Supporting SRL

**AI Capabilities Enhancing SRL:** The functions exhibited by AI systems facilitating Self-Regulated Learning in educational settings include Intelligent Tutoring, Natural Language Processing (NLP), Learning Analytics, and Recommender Algorithms. All these tools allow for changing the content-complexity dynamically, providing real-time feedback to the learners, and detecting learners'

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disaffection (Lan & Zhou, 2025). The student is directed to work on recognising gaps in their performance and making strategic improvements with guidance from ITS (Information Technology Services) after processing the student's performance data and recommending exercises accordingly. AI is employed to foster metacognitive regulation by serving prompts for students to assess their goals and progress in a systematic review (Faza and Lestari, 2025). AI chatbots are being utilised more often in online platforms to enhance students' cognitive engagement through clarifying instructions. The review further emphasised that the integration of AI with dashboards and visualisation tools allows students to set and adjust their learning goals, one of the fundamental requirements for SRL development. Case Evidence from Language Learning Contexts One of the most important uses of AI-supported SRL is in the education of English as a Foreign Language (EFL). According to Fitriati and Williyani (2025), an empirical study was conducted among EFL learners using simulated tools enhanced by AI in the skills of presentations. Learners found self-assessment tools and real-time feedback, as important applications of AI in specifying areas for improvement. AI tools provided goal-setting behaviours and self-reflection, which would otherwise be absent in traditional classrooms. Instead, the AI environment promoted student autonomy and created an environment for self-awareness. According to the participants, the capacity to receive immediate and individualised feedback was essential to revise their learning strategies. This is an indication that AI has a role to play in bridging the barriers between external learning and internal regulation, as noted in skill-based contexts.

Institutional and Policy-Level Insights:

**Government Perspectives on AI in Education:** The U.S. Department of Education (2023) published a landmark report titled *Artificial Intelligence and the Future of Teaching and Learning*, highlighting AI's potential to support self-regulated learning at scale. It emphasises the promise of AI in fostering self-regulated learning at scale. The report highlights that while AI personalises learning, ethical guidelines are needed before implementation, especially regarding student data privacy, fairness, and transparency. Some recommendations focus on integrating key SRL-supportive components in educational AI tools through interactive dashboards, formative feedback mechanisms, and nudges to learning. SRL also covers other important areas, for instance, lifelong learning competencies essential for an effective workforce in an economy that is being taken over by AI (U.S. Department of Education, 2023).

**Educational Equity and AI Integration:** One of the challenges of AI in SRL support is the digital divide. Students from under-resourced communities may lack access to high-quality AI tools or internet connectivity, limiting the reach of such innovations. Fitriati and Williyani (2025) warn that although AI can help in individualising instruction, there is a propensity that it may not be so successful if systemic inequities are ignored. On policy frameworks, therefore, the inclusion of all people must be prioritised in deploying AI with open-source platforms and public-private partnerships geared towards scaling AI tools in public education systems. The teacher-training approach is also key to enabling successful integration. Educators need to understand how to interpret AI feedback and guide students in using AI tools to regulate their learning (U.S. Department of Education, 2023).

**Benefits of AI-Supported SRL**

**Personalised and Scalable Learning:** One of the most prominent benefits of AI in SRL is its ability to deliver personalised learning experiences at scale. In a conventional classroom setting, it is really difficult to cater to diverse types of learners. AI can read a learner's learning pattern and instruct accordingly while providing real-time interventions (Lan & Zhou, 2025). AI can support learners to augment self-efficacy from then on, according to the individualized early successes they get through appropriately challenging levels. Learners would usually find it overwhelming to carry on with an activity or even become disinterested when a task is too far from their current capabilities, according to a fundamental SRL principle (Faza & Lestari, 2025).

**Increased Learner Autonomy:** Smart study planners, progress dashboards, and self-assessment quizzes, and all other AI tools, hold students responsible for their learning. These tools visualise progress as well as goal performance comparisons, allowing adjustment in real-time. Fitriati and Williyani (2025) revealed that students working with AI-enhanced systems felt more confident in independently managing their learning processes, especially while performing preparatory practices for oral presentations or writing assignments. Autonomy in learning enhances the outcome of learning while cultivating an environment for students to build other important skills, such as critical thinking and decision-making abilities of self-regulated learners of the 21st century (Seema, 2024).

**Challenges and Limitations:**

**Over-reliance and Cognitive Offloading**

Even though AI supports self-regulated learning, it often leads to an individual's cognitive offloading. Cognitive offloading refers to the use of technology or other external tools for planning and decision-making, thereby diminishing one's mental efforts and self-regulatory skills. Faza and Lestari (2025) caution that, in absence of careful design, AI systems would turn learners into passive

recipients instead of active participants in their education. AI tools should instead be constructed to cue metacognitive reflection instead of giving the right answers. Features such as "reflection prompts" or "strategy suggestions" would urge learners to inquire why a solution works, as much as what it is.

### **Data Privacy and Ethical Concerns**

The use of AI in SRL can challenge issues like data collection, spying, and algorithmic bias. Protecting student data and promoting fairness in algorithms are the main factors for responsible AI integration, according to the U.S. Department of Education (2023). Any SRL-supportive device gathering personal behavioural information would be required to state clearly how data usage is shared with learners and guardians, as well as provide opt-in opportunities. Besides, ethical AI systems shall be built with inclusivity in mind, avoiding assumptions or predictive models that might have adverse impacts on marginalised groups of learners. Developers and educators should come together to test the tools against a diversity of contexts so they can be assured of equitable outcomes (Generative Artificial Intelligence, 2025).

### **Strategic Recommendations**

#### 1. Designing AI for Human-Centred SRL

To optimise the benefits of AI in supporting SRL, developers and educators must adopt a human-centred design approach. AI tools should:

- Encourage goal-setting and self-reflection
- Provide formative, timely feedback
- Promote self-assessment and revision (Lan & Zhou, 2025)

Embedding these features ensures that learners remain actively engaged in their educational journey, rather than outsourcing control to the system.

### **Teacher Professional Development**

Teachers are central to the success of AI-enhanced SRL. Institutions should invest in professional development programs that train educators to:

Interpret AI-generated learner analytics

- Integrate AI tools into pedagogical strategies
- Facilitate use of AI among students for independent learning (U.S. Department of Education, 2023)

Educators should be positioned not as mere users of AI tools, but as collaborators in refining their design and implementation.

### **Policy and Infrastructure Support**

Governments and educational bodies must establish clear policy frameworks to govern the ethical and equitable use of AI in education. These frameworks should include:

- Guidelines for data privacy and transparency
- Funding for equitable access to AI tools
- Incentives for research-practice partnerships (U.S. Department of Education, 2023)

Investing in shared infrastructure such as National Learning Analytics and other similar platforms can further democratize access to AI-driven SRL support.

### **Conclusion**

The use of AI in Self-Regulated Learning represents a massive step in the personalisation, equity, and effectiveness of education. When adaptive features of AI are aligned with the cognitive and metacognitive strategies of self-regulated learning by educational institutions, the latter promotes learner independence, motivation, and skills for lifelong learning. Success will depend on far-sighted design considerations, teacher training, and ethical considerations. As shown in recent empirical and policy-based studies on this subject, AI is not a substitute for human guidance, but acts as a strong external support structure that can enhance student agency and engagement, if well utilised. The future of self-regulated learning is entwined with intelligent systems; however, the impact will depend on the mindfulness of their design and development.

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