Empowering Learners: GenIA and Their Impact on Self-regulated learning

Yassine Safsouf[1*] and *Raja Mouachi*[1**]

[1]Laboratory LAMIGEP, EMSI Marrakech, Marrakech, Morocco.

Abstract. Self-regulated learning plays a crucial role in mitigating dropout rates and the risk of failure in the e-learning experience. However, when learners are left to their own devices, they can become frustrated and fatigued, often due to a lack of effective self-regulation techniques. The growing popularity of generative AI, its flexibility, and its accessibility through various free chat tools offer learners opportunities to interact and receive feedback on their learning processes. This article proposes a study on the diverse relationship between AI and self-regulated learning, exploring how AI can assist learners in managing their learning strategies, setting goals, monitoring progress, and regulating cognitive and affective processes.

Keywords. Self-regulated learning, generative AI, higher education, AI in education.

1 Introduction

E-learning environments offer numerous benefits to stakeholders. This learning mode provides increased accessibility to information, well-structured content, personalized instruction available on demand, and potentially fosters autonomy and interactivity. It offers great flexibility and independence in terms of time and location. However, learners may encounter periods of frustration and fatigue in their efforts to self-train and self-regulate. These experiences can be seen as challenges in self-regulation during the learning process, though they are a natural part of skill acquisition.

According to Bandura, schools can promote the development of self-efficacy in learners by emphasizing effective self-regulatory practices used by students and showcasing peers who demonstrate strong self-regulatory skills, encouraging them to share their experiences with others [1]. Studies further indicate that students who receive assistance in setting realistic and attainable goals experience an enhancement in self-efficacy [2].

The rapid progress of Artificial Intelligence (AI) technologies, alongside related techniques such as machine learning, deep learning, natural language processing, and computer vision, underscores the importance of exploring the multifaceted relationship between these AI techniques, specifically generative AI (GenAI), and the development of intelligent learning environments capable of adapting to individual learner needs. Section 2 provides an overview of self-regulated learning theory, focusing on the most widely used models. Section 3 reviews recent research on the application of GenAI in self-regulated learning. Section 4 concludes the article with suggestions for future research.

2 Self-regulated learning theory

Self-regulated learning theory (SRL) defines learning as a dynamic process in which individuals plan, monitor, and evaluate their learning, applying appropriate strategies to achieve goals [3]. It involves a proactive set of activities that individuals undertake independently [4]. An article published in 2017 presents a review of the six most popular models of self-regulated learning [5], Zimmerman's cyclical phases model of self-regulation [6], Boekaerts' dual-process model of self-regulation [7], Winne and Hadwin's model exploring self-regulation from a metacognitive perspective [8], Pintrich's model based on the role of motivation in self-regulation [9], Efklides' metacognitive and affective model of self-

* Yassine Safsouf : y.safsouf@emsi.ma
** *Raja Mouachi* : r.mouachi@emsi.ma

regulated learning [10], and Hadwin, Järvelä, and Miller's model of self-regulation in the context of collaborative learning [11]. The article concludes that most of these models consist of three essential phases: the forethought phase, the performance phase, and the reflection phase.

These three phases are presented in the model by Zimmerman and Campillo (authors of the phases and sub-processes of self-regulation), as illustrated in Figure 1. According to these authors, the phases are:

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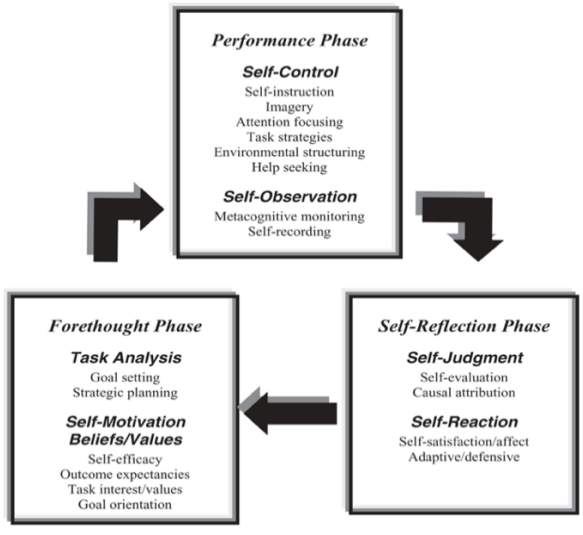

Figure 1. Phases and sub-processes of self-regulation [6].

- The **forethought phase** of self-regulated learning encompasses the processes through which learners initiate the formulation of plans to accomplish tasks, ultimately leading to goal achievement. This may involve setting short-term goals as proximal pathways to longer-term objectives, utilizing strategies to guide cognition, control affect, and direct actions.
- The **performance phase** delineates the processes that learners employ to execute a task, encompassing its actual performance while monitoring and controlling progress. This involves selecting specific strategies to accomplish the task, utilizing mental images, managing time and monitoring thought processes while working towards goal attainment.
- The final **self-reflection phase**, the learner evaluates oneself, reflects on progress toward the task or goal, and reacts and adapts for future performance. Learners can utilize these insights to make informed decisions about completing the current task or embarking on a new one.

Many researchers have recognized the importance of self-regulated learning as a predictor of academic success in online learning systems. [12] studied learner self-regulation to better understand learners' attitudes toward online learning. In their study, the authors proposed a conceptual model to investigate learner self-regulation in e-learning environments. The results indicated that perceived satisfaction, perceived usefulness, and interactive learning environments were identified as predictors of perceived self-regulation in the context of e-learning.

In another study on formal and informal learning using social media, [13] demonstrated that utilizing social media as a pedagogical tool encourages students to take control of their autonomy.

3 AI to improve self-regulation

In the field of education, automation of activities such as answering learners' questions is achievable. Artificial intelligence also facilitates personalized learning tailored to individual needs and assimilation capacities. In a recent study the authors explore the impact of generative AI (GenAI) on learners' self-regulated learning (SRL) skills in higher education [14]. The authors propose two studies. The first discusses the opportunities presented by GenAIs to support SRL, focusing on their role in enhancing understanding and assistance in the academic writing process. Specifically, they examine how generative AI chatbots, such as OpenAI's ChatGPT, can personalize the learning experience by serving as feedback systems, comparing their effectiveness to feedback provided by peers. The results of this study show that

learners found ChatGPT useful in supporting their SRL. However, it was perceived as providing less explainable responses and as being less "critical" and "analytical" than feedback from human peers.

In a study by Chang, Lin, Hajian, and Wang, researchers suggested that GenAI chatbots could enhance learners' reading and writing skills by promoting self-assessment through reciprocal questioning. This approach encourages students to analyze, reflect on, and improve their reading processes [15]. A recent study in the field of higher education aimed to harness the benefits of using GenAI chatbots to provide feedback on learners' learning processes while also exploring how learners incorporate these tools into their self-regulated learning practices [16]. In another study, the authors examined the impact of using GenAI hubs in technology courses within higher education. The study concluded that GenAI had a significant positive impact on personalized learning and student engagement [17].

A study based on the Technology Acceptance Model (TAM) aimed to explore the perceptions and usage of GenAI chatbots by teachers-in-training to enhance pedagogy and learner learning. The study revealed a strong acceptance of GenAI chatbots among trainee teachers as tools to support self-regulated learning (SRL) in teaching [18]. Other research has focused on the impact of GenAI chatbots on learning outcomes and teaching practices [19]. Authors investigated the effects of using the ChatGPT tool on enhancing the skills and motivation of foreign language students in academic writing. The study's results indicate that ChatGPT effectively improved students' writing performance. Additionally, the study concluded that students valued ChatGPT's personalized feedback and support, finding it beneficial for identifying errors and enhancing writing techniques.

A study underscores the significance of teachers accepting and integrating new AI techniques, including the use of GenAI chatbots, into the educational process of learners [20]. The authors emphasize that GenAI chatbots have revolutionized teachers' professional development and significantly enhanced pedagogy by offering personalized learning paths and automated feedback. A recent study focuses on the factors influencing undergraduate students' confidence in GenIA chabots, highlighting its critical role in the successful adoption of these tools in education. The study focuses on the relationship between their confidence levels and learning performance [21]. Another study reviewed a collection of research examining the impact of GenAI on self-regulated learning and learner motivation in foreign language classes, particularly focusing on English. The findings underscored the potential of AI to boost learning motivation in foreign language contexts [22].

4 Conclusion and future work

The studies reviewed reveal the promising potential of artificial intelligence chatbots (GenIA) in enhancing autonomous learning and learner motivation, especially in foreign language courses such as English. Integrating GenIA into education offers significant benefits such as personalized learning paths and automated feedback, thereby transforming the educational landscape.

These advancements indicate that teachers' acceptance and adaptation to new technologies, like GenIA chatbots, are crucial for optimizing learners' educational experiences. As research advances, it is essential to continue exploring how these tools can be effectively and ethically integrated to maximize their beneficial impact on education.

The integration and continuous advancement of GenIA chatbots in education are set to reshape learning experiences. Future initiatives will prioritize enhancing these chatbots' capabilities to bolster self-regulated learning and deliver advanced automated feedback.

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