

Self-Regulated Learning in Higher Education: Concept, Strategies and Challenges

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ABSTRACT: Self-regulated learning (SRL) is an important skill for students in higher education, which supports students to become active participants in their learning and to succeed academically. SRL refers to the learners' ability to structure, manage, control and assess their own learning through the effective use of cognitive, metacognitive, motivational and behavioural skills. The paper focuses on the relevance of self-regulated learning skills in higher education and their role in the formation of autonomous lifelong learners. Moreover, the analysis addresses the main factors affecting the development of SRL skills, such as motivation, self-efficacy, goal setting, reflection and learning contexts. This paper is qualitative in nature. This article explores ways to enhance SRL, including student-centred teaching, reflective practices, collaborative learning, and digital learning resources. The findings suggest that enhancing self-regulated learning skills can lead to greater student engagement, persistence, and academic success, and equip graduates for lifelong learning in workplaces that are rapidly changing. Future research should address the development of effective interventions and assessment approaches to support SRL in different contexts of higher education.

KEYWORDS: Self-regulated learning, Self-regulated learning strategies, Higher Education

I. INTRODUCTION

In the twenty-first century, human life has undergone significant changes, and the global system has evolved alongside it. We are now technologically far more advanced, with an impact clearly visible in our day-to-day lives. Our education system has not remained untouched by these changes either; indeed, the last twenty years have witnessed substantial transformations in the way we learn and teach. In an era of digital learning platforms, abundant knowledge, and increasing learner autonomy, academic success is more than just intelligence. Especially higher education students should actively regulate their learning processes, track their learning progress, control their motivation and change their methods when facing difficulties. These skills together are what educational scholars call self-regulated learning (SRL). SRL is the capacity of students to organise, monitor, regulate, and evaluate their motivation and thought processes to achieve academic goals (Zimmerman,2000). Rather than being passive recipients of instruction, self-regulated learners proactively assume control of their education and make strategic decisions regarding the when, how, and why of engaging in academic tasks.

Self-regulated learning is like a mechanisms of goal setting, self-monitoring, reflection, and learning strategies, is a dynamic process whereby an individual actively transforms their cognition into task-specific abilities (Nyman, 2024). The theory builds on social cognitive theory, which focuses on the interdependent subprocesses of goal-setting, performance, and self-reflection leading to competence. In addition to these key stages, learners must also successfully integrate cognitive strategies such as deep processing and memorisation with metacognitive monitoring to reflect on and regulate their motivational states and adapt to the specific demands of higher education environments (Cassidy, 2011; Jin et al., 2023).

In the last few decades, self-regulated learning (SRL) has become a central focus of education studies. Researchers have studied how learners set goals, carry out tasks, and report on their learning in increasingly complex learning contexts (Jin et al., 2023). The shift toward self-directed learning in higher education requires students to take greater responsibility for their own learning, making the development and enactment of SRL a critical factor in higher education success (Nyman, 2024). Many students struggle to use self-regulation when learning in a new academic context or when they have less support from the external structure of the activity, despite a general awareness of its importance (Nyman, 2024).

According to this logic self-regulated learning is the interplay of several learner domains that include cognition, metacognition, motivation, and behavior and is thus viewed as a process that is deliberately developed, rather than being a natural ability (Cassidy, 2011; Jin et al., 2023).

Elaboration and deep processing, along with metacognitive skills such as planning and corrective action, need to be coordinated, and motivational orientations and volitional control maintain engagement during long learning episode (Cassidy, 2011).

Problems in any of these areas can break the cycle of self-regulation, making it impossible for students to turn their intentions into significant learning.

The present study seeks to investigate the impact of self-regulated learning skills in higher education and to identify key processes that support and challenge effective self-regulation. The theoretical basis and modern research data are used in this research paper, which is intended to add to the deep and subtle knowledge of the ways of adequate preparation of students for various requirements of higher education, which can be achieved only through a well-planned formation of their self-regulatory skills.

II. BACKGROUND OF THE STUDY

Self-regulated learning (SRL) skills, including active student goal-setting, planning, monitoring and self-reflection, are generally believed to enhance learning in higher education. According to Pintrich's framework and Zimmerman's socio-emotional model, SRL is not a fixed trait, but a set of abilities students can acquire to improve their outcomes.

.Zheng conducted a meta-analysis of 29 trials (N=2648) to examine the effects of computer-generated self-regulated learning (SRL) interventions, and concluded that SRL support had a moderate positive effect on learning outcomes. However, the study was limited to controlled settings (2004-2015), thus limiting its applicability to more general idea work or non-digital settings. Purnamore's meta-review (15 research, 2017-2022) revealed that SRL intervention techniques had a "moderate" effect on learning outcomes in online/blended learning environments. They said that the general effectiveness of SL in a digital environment was demonstrated by the fact that the type of concept and the effect of SRL technology on the effect were not fixed.

"Even in online higher education, significant strategies for self-regulated learning (SRL) continue to predict success, often to a lesser degree than traditional approaches." Broadbent and Poon (2015) wrote in their extensive literature review. The strongest associations in online courses were metacognition, time management and effort control." In particular, methods that worked well in face-to-face teaching, such as detailed explanations and practice problems, had little impact online. They come to two conclusions: 1. SRL is important when learning online; 2. "other, currently unexplored factors" (technological, social, or motivational) may be even more influential. However, this review was limited by the heterogeneity of the research and its reliance on English language publications (2004–2014), although it was comprehensive (PRISM guided). Broadbent and Poon (2015) conducted a systematic review of the literature on online higher education and found that key strategies for self-regulated learning (SRL) still predicted success, but less frequently than in traditional approaches. Metacognition, time management and effort regulation were the strongest correlates of online courses. In particular, tactics like extensive explanations and activities (which work in face-to-face learning) have little effect online. Their conclusion has two parts. First, SRL is important in the online environment, but second, "other, as yet unexplored factors" (social, technological or motivational) may have an even greater influence on online learning. This review was comprehensive (PRISM-guided) but constrained by the heterogeneity of the research and the dependence on published English publications (2004–2014). This means that we still need to study in detail what SRL actions are the most helpful in different learning situations. Xu et al. (2022) carried out a large-scale investigation of SRL among 1,163 Chinese undergraduate students in an online university context (during COVID-19). They used self-report SRL measures and GPA data and found self-evaluation, cognitive self-regulation and effort control as positive predictors of academic improvement. What it means is that students who reflected on their learning and worked hard had a higher chance of earning higher grades. They also found a reverse effect, i.e. self-evaluation strengthened the impact of effort control on GPA. The study's strengths include a large sample size and real-world data on outcomes. Limitations It is limited by its cultural/contextual (a remote learning university in China) and cross-sectional design limiting causal claims. Nevertheless, these findings are in line with other research that emphasizes cognition and motivation as the key components of SRL. Cervin-Ellqvist et al. (2021) investigated the reasons for occasional inefficient strategy use in students. They surveyed 416 engineering students to find out the real tactics and

students' perceptions on them. They observed that many students engage in subpar methods not just out of ignorance ("metacognitive illusions") but also to manage their motivation or to adapt to the environment. For example, a student might re-read notes to feel more confident (ineffective method). 2. This study adds to this line of research by demonstrating that self-regulated learning (SRL) has an emotional component: The choice of strategy may be affected not only by cognitive processes but also by the control of emotions. It also highlights one of the shortcomings of much research on SRL: students tend to underestimate what methods are effective and so assessing usage alone may miss underlying motives.

In summary, Sarvin-Elqvist et al. demonstrated that teaching strategies used for SRL must be modified in order to teach students how to self-evaluate accurately.

The current research literature on this particular topic is in strong agreement that higher levels of self-regulated learning skills are linked to more positive outcomes, particularly in the cognitive and perseverative domains of the strategies. But its inconsistencies are worrying – for example, the effects of strategies are low in several areas, and the results are mixed for some sub-skills. Overall, the state of research is improving, but it is fragmented, and there is a need for research that directly links different aspects of self-regulated learning to academic success in different contexts. Our study will fill this gap by directly connecting outcomes with self-regulated learning skills, which can help in higher education, adding new dimensions to the theory and practice of how self-regulation contributes to academic success.

RESEARCH OBJECTIVES

- Discuss the concept of SRL in the context of higher education.
- Identify key self-regulated learning strategies.
- Explore the role of digital technology to SRL.
- Identify the obstacles that affect SRL.

RESEARCH QUESTION

1. How is self-regulated learning perceived in higher education?
2. What are the general methods of self-regulated learning applied?
3. How does technology help in self-regulated learning?
4. What are the challenges for SRL?

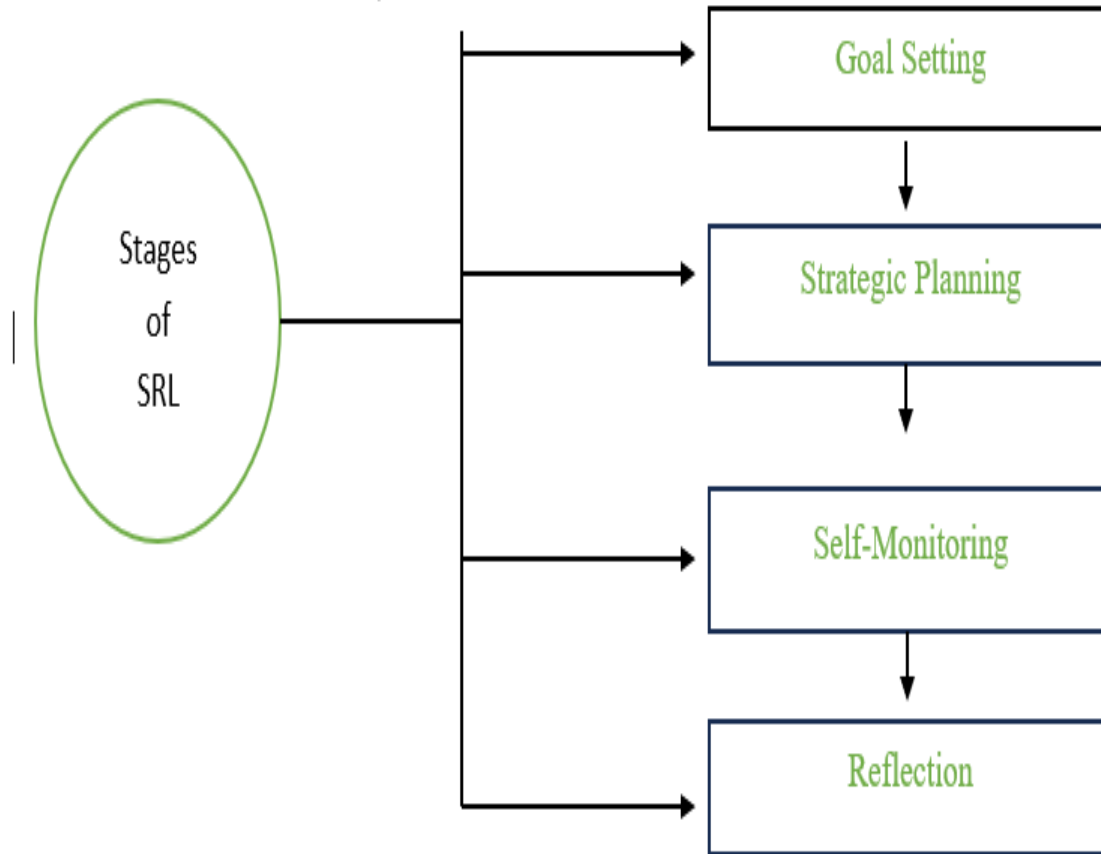
III. METHODOLOGY

This study was a qualitative review of self-regulated learning in higher education. We reviewed the literature extensively on learning and discussed the content, types and major outcomes found in prior studies. The current study sheds light on learning as a result of self-regulated learning by a deep reading of the available studies. Information was gathered from many studies, journals, and publications. The qualitative method has been used for data selection.

ANALYSIS AND DISCUSSION

RO I: Discuss the concept of SRL in the context of higher education.

SRL is typically defined as “an active, constructive process in which students set goals and regulate their perceptions, motivation, and behavior to achieve those goals” (Zimmerman,2000). It consists of the stages of goal setting, strategic planning, self-monitoring and reflection. In higher education, self-assessment and self-directed goal setting are important SRL skills for academic achievement and lifelong learning. In online and blended learning, individuals are increasingly expected to take responsibility for their own learning (e.g. sustain motivation in distance courses).



Models and Theories

There are theories models of self-regulated learning (SRL) used in higher education.

Cyclical Phase Model: An important cyclic model is Zimmerman’s (2002) cyclical stage model. Students experience a cycle of three stages: contemplation (planning/goals), performance (strategy implementation/monitoring), and self-reflection (evaluation/adaptation). Zimmerman's model, for instance, emphasizes the role of self-efficacy and goal orientation in the contemplation stage as elements that promote strategic learning behavior, which is in turn influenced by observation and reflection.

Pintrich’s (2000) model also distinguishes phases (orientation, planning, implementation, reflection) and highlights motivational, cognitive and environmental aspects. Pintrich (2000) states the use of self-regulated learning procedures as an influencing factor of goal orientation (competence vs. performance).

Cognitive Model : This is the model of Winn and Hadwin (1998), which also defines four steps (task set-up, goal setting/planning, strategy implementation, adaptability).

Layered Model: Boeckaerts’ (1999) hierarchical model adds depth in that it involves three regulatory levels, namely: self-regulation (goals/values), control of the learning process (cognitive planning/evaluation) and control of information processing (cognitive strategies).

Component Model: Lastly, Cassidy (2011) proposes a component model of higher education; he considers learning style (personal cognitive preferences), institutional control beliefs (e.g. locus of control, self-efficacy) and self-evaluation (peer and self-evaluation) as key concepts related to the process of self-regulated learning (SRL). Cassidy says these principles are in line with Zimmerman’s core themes of motivation, self-awareness and cognition (motivational factors, self-confidence, observation/evaluation).

SRL Models	Components
Zimmerman's cyclical model (2002)	<ul style="list-style-type: none"> i) Forethought (goal/task analysis, self-motivation) ii) Performance (strategy use, monitoring) iii) Self-Reflection (self-evaluation, adaptive reaction). Emphasises metacognition, self-efficacy and goal orientation.
Pintrich's model (2000)	Four stages: <ul style="list-style-type: none"> i) Orientation (task analysis, goal setting) ii) Planning (strategies selection) iii) Enactment/Monitoring iv) Reflection/Evaluation. Integrates cognitive, motivational and contextual regulation.
Winne & Hadwin's model (1998)	Four phases: <ul style="list-style-type: none"> i) Task Definition ii) Goal Specification & Planning iii) Learning Tactics iv) Adaptation (evaluation). Highlights how metacognitive judgments guide strategy adjustments during learning.
Boekaerts' layered model (1999)	Three levels of regulation: <ul style="list-style-type: none"> i) Self (motivation/values, goal-setting) ii) Learning Process (metacognitive planning) iii) Information Processing (cognitive strategy use) Emphasis on the interplay of cognitions and affect between levels.
Cassidy's component framework (2011)	Highlights on Learning Style (individual cognitive preferences), Academic Control Beliefs (self-efficacy/ownership), and Self-Evaluation (peer/self-assessment) as constructs underlying SRL processes. Each relates to Zimmerman's phases of motivation, self-reflection, and metacognition.

Research on SRL in higher education investigates the role of context in self-regulation.

Level of education: There is evidence that SRL skills increase as a function of experience. Panadero (2017) pointed out that the impact of SRL models may vary across different students depending on their developmental stage. For example, typically, first-year undergraduate students have less willpower and need more external persuasion, whereas graduate students usually show more autonomous SRL.

Students from different fields may stress different strategies (e.g. engineering students may heavily rely on problem-solving heuristics, humanities students on detailed explanations) but comparative research is scarce. In practice, SRL training is often embedded in discipline-specific courses (e.g., math study skills vs. writing centers).

Online and blended learning: The role of SRL is especially relevant in digital contexts. Blended learning demands a lot of self-regulation from students. Studies have shown that students who practice SRL by setting goals, monitoring progress, and seeking help are more likely to get higher grades and stay on track, while students who do not practice SRL are more likely to fall behind in online courses. For example, cognitive and motivational strategies are significant predictors of student engagement in MOOCs. However, students with lower self-directed learning skills tend to drop out of courses at higher rates (Azevedo et al., 2004). Therefore, online course designers intentionally embed self-directed learning supports (e.g., study plans, self-reflection guides, progress dashboards).

Cross-cultural studies show the effects of language and culture on self-directed learning reports: a recent study of the OSLQ indicated a somewhat different factor structure, and that many students overestimated their self-assessment proficiency. This points to the need to consider cultural differences in the expression of concepts of self-directed learning (e.g., asking for help or questioning authority).

In short, the level, content, teaching methods and cultural background of the student are important for self-directed learning in higher education. Educationalists need to contextualise the self-directed learning intervention: first-year seminars to develop planning skills, subject-specific strategy workshops and culturally sensitive SRL instruction.

RO2. Identify key self-regulated learning strategies.

1. Goal Setting:

Goals are central to SRL as they provide a means to organise thoughts, emotions, and actions to reach goals. These include leadership towards goals, planning and adapting behavior on the basis of feedback (Zimmerman & Schunk, 2011). Pintrich (1999) identified three goal orientations: mastery, completion and comparison. Mastery goals improve the SRL strategies and learning, while report and comparison goals can have negative effects. Effective goal setting involves specificity, measurability, time frames, evaluation, and feedback (Kay et al., 2022).

2. cognitive and non-cognitive processes:

In SLR cognitive and non-cognitive processes are important since the ability to control and change the cognitive power. Cognition involves higher-order processes, such as monitoring and evaluating one's own cognitive behavior (Yeh et al., 2019). Full explanation, structure and empowering thinking are important to organise and implement the cognitive learning process (Kay et al., 2022).

3. Time Management:

SRL success refers to the management of study time, the monitoring of progress, and the maintenance of motivation, especially in online environments (Jivet et al.2022). Effective time management involves goal setting, efficient time allocation, and progress and planning. Time-based interventions reduce anxiety and improve assessment fluency (Apridayani et al., 2023).

4. Monitoring:

In SRL, monitoring is defined as the constant recording of progress and evaluation of tactics and adjustment as needed to meet learning goals. Moreover, portfolio assessments are also beneficial for autonomous monitoring and improvement of academic achievement, thereby encouraging learner autonomy (Ismail et al., 2023). For example, technological tools such as OLMs allow monitoring by providing mastery levels and performance data (Kay et al., 2022).

Task management:

Task management is a part of SRL, which is related to planning and organising tasks to realise learning goals with the help of cognitive and metacognitive strategies (Funa et al., 2023). Effective task strategies predict personal course goals and learning gains, and perceived autonomy promotes task management and problem-solving skills (Hidayatullah & Csikos, 2023).

RO3: Explore the contributions of digital technology to SRL.

Digital Technology	Contibution
Artificial Intelligent	Artificial intelligence (AI) can improve self-regulated learning (SRL) by providing personalised learning paths and real-time assistance (Ingvavara et al., 2022). Personalised support, feedback and support structures are provided by AI tools to improve learner engagement and confidence. These tools can be particularly useful in encouraging goal setting, time management and help-seeking behaviors through dynamic feedback and assessment.
Learning Management Systems (LMS)	Learning Management Systems (LMS) provide the collection of course materials, communication with classmates and instructors, and management of learning activities (Abduvakhidov et al., 2021). These systems are instrumental in promoting self-regulated learning (SRL) by structuring instructional materials, monitoring student advancement
MOOCS	MOOCs offer flexible and broad access to educational resources, but they have high drop-out rates that could be addressed by stronger engagement tactics (Mehrabi et al., 2020; White et al., 2020). Learning analytics dashboards (LADs) in MOOC provide useful feedback on study habits and progress, improving SRL by supporting learners in adapting their tactics as needed (Fleur et al., 2023).
Mobile learning	Mobile learning (m-learning) enhances self-regulated learning (SRL) by providing accessible and interactive learning materials through mobile applications. Mobile devices have been proven to enhance self-regulation and learning outcomes.
Digital resources & repositories	Digital resources and repositories are helpful for self-regulated learning (SRL) because they provide a large and readily available pool of materials that facilitate personalized learning and autonomy.

RO4: Identify the obstacles that affect SRL.

There are advantages of SRL but there are also a number of problems that are precluding effective adoption of SRL. One of the main challenges identified in the literature is the uneven access to digital technologies and reliable internet connectivity. Faza and Lestari (2025) stated that the lack of technology infrastructure would restrict students in engaging in online learning environments and self-regulated learning activities.

Another issue is the irregularity of students' preparedness for self-regulation. Not all learners have the metacognitive skills, motivation, or self-efficacy to be successful self-regulators. Moreover, the students' low level of digital literacy might prevent them from using the educational tools properly.

Clear instructional design for self-regulated learning (SRL) with goals, suitable approaches and adaptive learning (Ekavar et al., 2022). In fact, teachers provide practical advice and effective solutions that will help them set realistic goals and ensure personalized learning. There might be difficulties in self-regulation during online situations without adequate guidance (Ekavar et al., 2022).

Teacher guidance and personal feedback, which significantly improves learning by self-reflection and self-assessment. Timely and specific feedback can help individuals adjust their learning processes and increase self-regulation. However, in many cases the feedback is either late or generic, which diminishes its usefulness (Yazalp & Bahachivan, 2021).

Time challenges in distance learning want to make effective use of their online resources (Ayinisamy Mukherjee, 2021).

Without the real classroom environment that is able to influence learning, deadlines may cause procrastination and lack of focus. These restrictions, self-monitoring and adaptive discussion are strategies of self-regulated learning (SRL) that can help to strengthen conversation time and control mechanisms (Omar et al., 2023).

These limitations imply that successful SRL implementation requires institutional support, as well as intentional instructional activities that aim to improve learners' self-regulatory capacities.

IV. CONCLUSION

This study enriches the theoretical framework of self-regulated learning (SRL) by integrating techniques with modern technology, focusing on planning, collaboration and communication. It provides a full understanding of how to improve SRL with digital tools. It's key for lifelong learning. The study highlights the change in educational paradigms with technological advancement and the significance of excellent SRL skills in online learning. The study provides educators with insights into the use of SRL techniques with IT resources that can contribute to developing practices that foster accountability, planning, collaboration and communication. Policymakers can contribute to creating inclusive environments by promoting digital literacy and SRL training in school programs to address barriers such as technology access and digital skills. The results highlight the importance of supporting students to develop strong SRL skills to sustain their reduced dropout, especially in the online learning context. Overall, the results indicate that SRL is an important predictor of academic achievement in higher education. The reviewed studies show the importance of cognitive, metacognitive, motivational and behavioural processes that support effective learning. Digital technologies and AI have great capability to scale SRL, through personalised, adaptive learning experiences. However, technological barriers, differences in learner readiness and infrastructure constraints are serious challenges. Therefore, higher education institutions should emphasise the development of SRL skills by providing explicit training, conducive learning settings and effective integration of digital technology

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