

**Easily Learned, Easily “Forgotten”: Understanding Cognitive Biases in Self-Regulated
Learning**

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Abstract

Self-Regulated Learning (SRL) plays a crucial role in educational psychology, especially for adolescents who are going through significant cognitive and emotional development. This paper delves into the core components of SRL and examines cognitive biases, such as the misinterpretation of effort and foresight bias, that can have a negative impact on learning efficiency. Research shows that students who practice self-regulated learning (SRL) tend to achieve better academic results by effectively managing their study time and aligning their efforts with the difficulty of the task. However, biases such as the ease-of-processing heuristic often cause learners to give up on deep learning activities too soon, mistaking ease of processing for mastery. Decision Education (DE) plays a crucial role in helping students recognize and address cognitive biases, thereby improving their judgment and decision-making skills. Interventions for the classroom to enhance SRL, such as promoting a growth mindset, providing specific feedback, and using effective learning strategies like distributed practice and self-testing, can be used to bring DE to the classroom. By addressing these cognitive biases and integrating DE, educators can assist students in developing metacognitive awareness and more effective learning strategies, ultimately supporting lifelong learning and academic success.

***Easily Learned, Easily “Forgotten”*: Understanding Cognitive Biases in Self-Regulated Learning**

When learners face difficult learning experiences, it is common to assume that they are not making progress and that our approach is not effective. This can be discouraging and may hinder our ability to embrace strategies that require more effort, especially for students. As a result, they may not understand the value of strategies that require more effort. However, we can change this perspective by empowering students to take control of their learning journey. This is where Self-Regulated Learning (SRL) comes in. SRL is a crucial aspect of educational psychology that focuses on how learners manage and direct their own learning process. In this paper, I will explore the core components of SRL, identify the cognitive biases and heuristics that negatively affect SRL, and provide guidance on how to improve SRL in educational settings, especially for adolescents.

Research has shown that students who practice SRL strategies tend to achieve better academic outcomes. Research highlights that students who practice SRL not only manage their study time effectively (Dunlosky & Ariel, 2011) but also modulate their efforts based on the difficulty level of their tasks (Cleary & Chen, 2009). For instance, they devote more time and energy to challenging topics and less to simpler ones, aligning their study efforts with the demands of each task. However, students often misinterpret the effort required in deep learning activities (The Misinterpreted-Effort Model, Fraundorf et al., 2022). Many students perceive that if a task requires more effort, it must mean they are learning less efficiently. Consequently, they might focus disproportionately on easier topics that feel more rewarding in the short term, neglecting complex but important concepts that require more intensive study. This misinterpretation ties closely with the concept of foresight bias. During the study phase, when all

materials are accessible, students may feel overly confident about their understanding and retention. This confidence can be misleading, as it does not accurately reflect their future memory abilities during tests (Koriat & Bjork, 2005). Such biases lead to inefficient learning strategies.

Kahneman (2011) and Tversky and Kahneman (1974) highlight that much of our thinking occurs automatically and subconsciously, using heuristics as mental shortcuts. While these heuristics are useful, they can also lead to systematic errors or cognitive biases. It is especially crucial for high school students who are in a critical developmental stage of formal operational thinking (Piaget, 1972) to understand and address these cognitive biases. They are at an age where they can abstractly reason and critically analyze information, skills that are foundational for effective SRL (Zimmerman, 2002). By fostering SRL, educators can help students recognize their vulnerability to biases and help them with strategies to mitigate their impact. In this context, Decision Education (DE) is essential for nurturing skillful judgment and decision-making in students. It encompasses four learning domains designed to enhance decision-making skills, including recognizing and resisting cognitive biases. By integrating DE, students learn to manage and reflect on their decision-making processes, becoming better at identifying biases that can lead to biased judgments. This framework can be particularly influential in the context of SRL for high school students, as it complements SRL strategies by promoting critical thinking and effective decision-making, which are crucial for academic and personal success (Alliance for Decision Education, 2023).

Self-regulated learning and its relation to metacognition

SRL is a cyclical process whereby students a) evaluate and monitor their learning, b) set goals to improve their performances, and c) implement strategies to achieve newly set goals

(Zimmerman & Moylan, 2009). Therefore, SRL research mainly concentrates on how students utilize key metacognitive processes, including self-monitoring and strategy use (Winnie, 2017). Unfortunately, these metacognitive processes are vulnerable to various biases and heuristics because learners do not have objective or direct access to the potency of learning strategies. Instead, they use a variety of cues and heuristics to infer the effectiveness of learning strategies. Many learners appear to use the ease-of-processing heuristic, also known as processing fluency, to monitor their learning (Finn & Tauber, 2015; Kornell et al., 2011; Undorf & Erdfelder, 2011). This heuristic involves assuming that if information is easily learned, it will be easily remembered (Koriat, 2008). However, the ease of information processing can be misinterpreted as mastery, causing learners to prematurely cease their study efforts (Ackerman & Beller, 2017; Bjork et al., 2013).

Moreover, learning processes that require more effort, such as those associated with desirable difficulties (Bjork & Bjork, 1992), are often misinterpreted by learners as ineffective for learning. Studies show that learners' high mental effort ratings for a strategy after using that strategy to learn a set of materials were linked to lower levels of perceived learning (Fiedler et al., 2019; Undorf, 2020) and a lower likelihood of indicating that they would choose to use that strategy again for a similar task (Kirk-Johnson et al., 2019) It may lead learners to avoid beneficial strategies, such as spaced repetition or elaborative rehearsal, because these require more effort and are perceived as more challenging compared to less effective strategies like rereading or highlighting (Bjork et al., 2013).

Self-Regulated Learning in adolescents

In adolescence significant cognitive, emotional, and social development occurs. During this period, they develop the ability to engage in abstract thinking, hypothetical reasoning, and

complex problem-solving, which are characteristics of Piaget's formal operational stage (Piaget, 1972). As a result of this cognitive maturation, students become better equipped to engage in SRL, enabling them to plan, monitor, and evaluate their learning processes and strategies more effectively. Additionally, their development of identity and autonomy during this phase supports their SRL capacity as they start to take more responsibility for their educational outcomes and future aspirations (Steinberg, 2005).

As students grow more cognitively and emotionally mature, they tend to explore different study techniques to optimize their learning experience. There are several strategies that students use to improve their learning, including highlighting and underlining, summarizing, using imagery, re-reading, practice testing, and interleaved practice. However, not all of these strategies are equally effective. For instance, research suggests that self-testing and distributed practice are effective techniques, while re-reading and highlighting may not produce the same positive outcomes (Dunlosky et al., 2013).

The effective study methods for learning

The "distributed practice effect" refers to the fact that studying over multiple sessions enhances long-term retention more effectively than completing learning tasks in one study session (Benjamin & Tullis, 2010; Karpicke & Roediger, 2007). Previous research has shown that spaced practice, with a gap of either 1 day or 30 days, is more effective than massed practice with no gap and that this benefit is greater with longer time intervals of 30 days than shorter ones of 1 day (Bahrick, 1979). The benefit of distributed practice is thought to be because the processing of material during a second learning opportunity is hindered when it is too close to the original learning episode. Learners may also be misled into thinking they know the material better than they really do due to their foresight bias (e.g., Bahrick & Hall, 2005).

The practice effect is another effective learning strategy that is often seen as unwanted by many students due to the effort it requires. As a result, students tend to avoid taking tests to assess their own knowledge (Dunlosky et al., 2013). However, numerous studies have shown that self-testing improves learning and memory retention compared to restudying (Rawson & Dunlosky, 2011; Roediger & Butler, 2011; Roediger et al., 2011). For instance, Karpicke and Roediger (2008) presented undergraduate students with Swahili-English word pairs such as "mashua-boat" and "elimu-science" and asked them to learn the Swahili word. Results showed that students using *repeated testing* on the items performed significantly better (80%) in retention of the learned new word one week later than those who used *repeated studying* the items (36%). The testing effect has been proven to be a successful method for various types of learning, such as foreign language acquisition, vocabulary expansion, and mathematical understanding. This technique is highly effective and can enhance learning and retention.

Why is testing yourself effective? Learning that results from taking a test, such as practice testing, can enhance retention by triggering elaborative retrieval processes. This is because the retrieval process activates other related information and then encodes both the target information and the activated information. This creates a detailed memory trace, which helps us access the information later through multiple pathways (Carpenter, 2009, 2011). However, despite evidence that self-testing is beneficial, up to 72% of students still prefer to re-read notes instead of engaging in practice testing (Karpicke, 2009). This raises the question of why many students continue to use ineffective study techniques. In the following section, I will focus on the role of educational practices in this issue.

How can self-regulated learning (SRL) in adolescents be improved?

Effective training interventions should be comprehensive and include cognitive strategies (such as elaboration and organization), metacognitive strategies (such as planning, monitoring, and evaluation), and motivation. McDaniel and Einstein (2020) have developed the Knowledge, Belief, Commitment, and Planning (KBCP) framework for strategy training, which promotes effective self-regulation of learning strategies by students. The KBCP framework is based on the idea that training should include four vital components to enable long-term self-regulation of strategies: knowledge acquisition about strategies, belief in the effectiveness of the strategy, commitment to using the strategy, and planning of strategy implementation.

Knowledge. Studies have shown that learners who receive instruction on specific learning strategies can perform better than those who do not receive such instruction (McDaniel & Tillman, 1987). However, a key aspect of SRL is the ability to transfer these strategies to future tasks. Simply instructing students on specific strategies may not necessarily result in a successful transfer, especially among young teenagers (see Manalo et al., 2018). Besides, providing them with a broader understanding of the strategy would make its usefulness more effective. This also helps them to detect cognitive biases and heuristics, such as foresight bias and misinterpretation of effort, and recognize these when they occur during study. Providing more in-depth training about the strategy may be more effective in resisting those biases and promoting transfer.

Belief. McDaniel and Einstein (2020) suggest that belief has many benefits for transfer, such as more profound metacognitive knowledge of the strategy and how to use it and increased motivation through enhancing self-efficacy. However, merely explaining the benefits of a particular learning strategy and presenting evidence-based research results may not be enough to persuade many students. Nevertheless, direct experience may be a more effective way to

convince learners and encourage self-regulated use of learning strategies. This is consistent with studies that have shown that experiencing the effects of different strategies can improve metacognitive accuracy (Koriat & Bjork, 2006). Young adults are more likely to use a more effective learning strategy in the future after experiencing its benefits on a prior task (Brigham & Pressley, 1988).

Commitment. Students may understand a learning approach that works best for them, but they may not put in the necessary effort to use it. This could be due to a faulty belief about the amount of effort required and can lead to a lack of commitment (Fraundorf et al., 2022; Bjork et al., 2013; Fiedler et al., 2019; Undorf, 2020). In this part, utility-value interventions can play a crucial role in helping students understand the significance of using a particular strategy to make the most of their learning. For instance, if students realize that using a trained strategy can help them achieve good grades in their courses and subsequently increase their chances of getting accepted into their desired college, they are more likely to be motivated and engaged in their tasks (Priniski et al., 2019).

Planning. Planning for effective studying should focus on two main aspects. Firstly, students should be encouraged to create a study plan that applies the techniques they have learned to specific learning challenges and courses. Secondly, the study plan should be explicitly linked to the situations in which it will be used. One effective method for creating a practical plan to avoid getting distracted by other things is implementation intention (McDaniel & Einstein, 2020). For example, when college students were informed about the health benefits of vigorous exercise for the upcoming week, only 39% of them actually exercised after making a plan. However, 91% of those who created an implementation intention exercised the following week (Orbell & Sheeran, 2002). Therefore, implementation intentions can be very beneficial for

students to stick to their plans better, especially when there is some uncertainty (McDaniel & Einstein, 2020).

Classroom interventions

To consolidate all the points mentioned above, I suggest some basic classroom interventions that can enhance the learning outcome with simple steps.

To begin with, it is essential for educators to teach students about the advantages of using effective learning strategies. They can do this by explaining heuristics and cognitive biases such as foresight bias and misinterpretation of effort, which will help students understand these concepts. However, merely providing information is not sufficient; students also need practical experience to realize the efficacy of these strategies (McDaniel & Einstein, 2020). Therefore, teachers can incorporate learning strategies into their lesson plans. For instance, at the beginning of a new unit, a teacher could give students a practice test on the most important concepts covered in the previous unit. Moreover, educators can review the most important concepts and activities over several classes to demonstrate the concept of distributed practice (Dunlosky et al., 2013).

Secondly, educational practices should promote a growth mindset, where effort is seen as a path to mastery rather than a sign of inadequacy. A fixed mindset, where a student believes that they do not have the ability to learn a particular subject, can discourage them from putting effort into learning. On the other hand, a growth mindset motivates students to persist in their learning efforts and embrace challenging opportunities (Yeager et al., 2016). Encouraging students to embrace challenges and view difficulties as opportunities for growth can help align their self-

regulated learning strategies with more effective learning practices (Dunlosky et al., 2013; McDaniel & Einstein, 2020)

Lastly, providing timely and specific feedback is essential to help learners adjust their self-perceptions and learning approach, which can reduce the impact of biases. Feedback plays a crucial role in the SRL cycle by providing critical information for evaluating learning strategies and outcomes. According to Butler and Winne (1995), feedback at the task processing level is more effective in promoting deeper learning practices because it scrutinizes the techniques students use to detect errors. This provides valuable information that can lead to correcting faulty methods. Feedback can also help in setting goals (Erez, 1977), evaluating self-efficacy and task performance (Linnenbrink, 2005), and, most importantly, improving self-regulation (Chou & Zou, 2020).

Conclusion

In conclusion, understanding and addressing cognitive biases in SRL is pivotal for enhancing educational outcomes, particularly during the critical developmental stage of adolescence. As students navigate the complexities of formal operational thought, they encounter various cognitive biases that can disrupt their perception of effective learning strategies. The Misinterpreted-Effort Model and foresight bias exemplify how learners can misjudge the efficacy of their study techniques, often favoring less demanding methods that seem rewarding in the short term but are less beneficial for long-term retention and understanding.

Furthermore, Decision Education provides a robust scaffold for adolescents to enhance their decision-making capabilities. It complements SRL by enabling students to identify and counter cognitive biases, thereby making informed choices about their learning strategies. By

promoting metacognitive awareness and strategic learning, educators can guide students towards recognizing the nuanced relationship between effort and learning outcomes, mitigating biases like the ease-of-processing heuristic.

The ultimate goal is to develop learners who are not only aware of their cognitive processes but also capable of regulating their learning in a way that is effective and adaptable. By implementing interventions that cover knowledge, belief, commitment, and planning, students can be motivated to adopt more challenging and effective study techniques, such as distributed practice and self-testing. These methods have been scientifically proven to enhance learning and retention.

To promote effective SRL in educational settings, a multifaceted approach is required. This involves addressing cognitive biases, promoting metacognitive strategies, and emphasizing the importance of a growth mindset in the learning process. By equipping students with the skills to navigate their learning strategies, educators can help them develop a stronger academic foundation, leading to lifelong learning and success.

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