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Leveraging Metacognitive Approaches to Improve Educational Performance

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ABSTRACT

Objective: The purpose of this study was to investigate the impact of metacognitive strategies on improving educational processes. The study focused on reviewing prior research to highlight the effectiveness of these strategies in enhancing students' learning and academic performance. Specifically, it emphasized the roles of teachers, learners, and curriculum in this context.

Method: The present study employed a systematic review methodology, following a narrative structure. The review process adhered to the four-stage model proposed by Okoli and Schabram (2015), with the second stage involving Silva's (2015) selection procedure for article inclusion. A total of 50 scholarly articles were systematically reviewed, sourced from international databases such as Google Scholar, ScienceDirect, JSTOR, Springer, ProQuest, and ERIC, as well as national databases, including IranDoc, Magiran, Noormags, and SID database.

Results: The findings of this study revealed several key results: 1) For learners, metacognitive strategies were found to significantly enhance academic performance, motivation, self-efficacy, reading comprehension, and problem-solving skills; 2) For teachers, metacognitive awareness contributed to more effective classroom management, reflective teaching practices, and the ability to adapt instruction to students' needs; 3) For curriculum design, the integration of metacognitive strategies into learning objectives, teaching methods, assessments, and content areas led to improved instructional quality and adaptability.

Conclusions: The study concluded that metacognitive strategies are essential not only for fostering self-regulated learners but also for improving instructional quality and promoting educational equity. The research recommends embedding explicit metacognitive training into teacher education programs and curriculum frameworks to support sustainable, student-centered learning environments.

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Introduction

In the contemporary system of educational psychology, teaching and learning continue to be central themes, constantly evolving with advancements in research and practice. Over the past few decades, a growing body of literature has emphasized the critical role of metacognitive processes in fostering effective learning outcomes. Metacognition, often defined as "thinking about thinking", refers to the ability to monitor, evaluate, and regulate one's cognitive processes. It encompasses self-awareness of one's knowledge, understanding of learning tasks, and the ability to employ effective strategies to navigate these tasks (Flavell, 1979; Schraw & Moshman, 2021).

The concept of metacognition, first introduced by Flavell (1979), has become increasingly integrated within educational contexts as its importance for academic success became evident. While metacognition was initially regarded as a peripheral concept in psychology, it has since gained prominence in modern educational theories. Recent research has emphasized that metacognitive knowledge is comprised of three key components: awareness of one's cognitive processes, understanding of task demands, and the ability to select appropriate strategies for tackling those tasks (McGuire, 2019; Pintrich & Zusho, 2020). This metacognitive awareness enables learners to adapt their strategies, thereby enhancing their learning efficiency and deepening their comprehension of the material.

Metacognitive strategies are typically categorized into three primary domains: planning, monitoring, and evaluation. Planning involves selecting strategies and resources that align with learning goals and task demands while monitoring refers to the continuous assessment of one's understanding and task progress. Evaluation involves the reflective review of cognitive strategies to determine their effectiveness (Dignath & Büttner, 2021; Schunk, 2021). These strategies are crucial in promoting autonomous learning, where students take ownership of their learning paths and engage in self-regulated processes that are essential for academic success (Zimmerman, 2021).

Recent studies have increasingly emphasized the importance of metacognitive strategies in academic achievement. These strategies not only improve students' ability to manage their learning effectively but also contribute significantly to their overall cognitive development. Research has demonstrated that learners equipped with skills to plan, monitor, and evaluate their learning are more likely to engage in deep, meaningful learning and adapt their strategies in response to challenges (Artz & Armour-Thomas, 2022; Veenman, 2020). Moreover, the integration of metacognitive training into classroom practices has shown positive effects on student outcomes across various subjects, including mathematics, science, and language arts (Schraw & Dennison, 2023). Therefore, promoting metacognitive awareness among students is a powerful approach not only to enhancing academic performance but also to fostering lifelong learning skills.

In addition to individual metacognitive strategies, the broader teaching-learning environment also significantly influences educational effectiveness. The teacher, curriculum, students, and physical environment are interrelated elements that either facilitate or constrain the learning process. Teachers, as central figures in the educational process, not only deliver knowledge but also guide and shape the learning experience. According to recent studies, teachers who incorporate metacognitive strategies into their pedagogy significantly enhance student engagement and academic performance (Kalyuga, 2020; Schraw & Dennison, 2023).

Thus, this study aims to explore the role of metacognitive strategies in enhancing educational processes, focusing on how planning, monitoring, and evaluation contribute to effective teaching and learning. By synthesizing recent theoretical and empirical studies, this paper seeks to provide a comprehensive understanding of metacognition's influence on education, with attention to the dynamic interplay between the teacher, learner, and curriculum in shaping successful pedagogical outcomes. Given the increasing emphasis on metacognitive practices in education, this research aims to fill the gaps in the literature by addressing the following research question:

- How do metacognitive strategies impact the academic achievement and learning processes of students, and what roles do teachers and curriculum design play in this context?

Materials and Methods

This study adopted a qualitative systematic review approach, designed to synthesize and interpret existing literature to explore the role of metacognitive strategies in educational processes. Unlike a narrative review, which primarily focuses on qualitative synthesis, the systematic review method used in this study involved a structured process of article selection, data extraction, and analysis. This review was based on the frameworks proposed by Okoly and Schabram (2015) and Silva (2015) including four stages: planning, article selection, data extraction, and implementation. The use of Okoly and Schabram's (2015) four-stage framework ensures a systematic and transparent process for synthesizing literature, while Silva's (2015) article selection model offers a robust method for ensuring relevance and methodological quality across studies. Both frameworks were chosen for their clear, structured approach, which is essential for maintaining rigor in a qualitative systematic review. The combination of these frameworks allows for a thorough exploration of how metacognitive strategies influence educational processes, with a focus on both theoretical insights and practical implications for educators. Below is a detailed description of each stage:

Stage 1 – Planning: The research objective was to systematically examine how metacognitive strategies—specifically planning, monitoring, and evaluation—contribute to various aspects of education, including student learning, teaching practices, and curriculum development. The review

aimed to uncover patterns and insights that can inform both theoretical and practical approaches to enhancing educational processes through metacognition.

Stage 2 – Article Selection: The article selection process was conducted according to the model developed by Silva (2015). Initially, articles were retrieved from international academic databases (Google Scholar, ScienceDirect, ERIC, ProQuest, JSTOR, Springer) and national databases (Magiran, Noormags, Irandoc, SID) using logical operators (OR, AND, NOT) and keywords such as: metacognition, metacognitive strategies, meta-comprehension, academic progress, academic performance, creativity, critical thinking, problem-solving, learning, teaching, instruction, studying, and motivation. This search initially yielded 4,316 articles. After removing duplicates, 894 articles were excluded, and 3,254 articles were discarded following title, abstract, and date range screening (limited to 2015–2025 in English and 1393–1403 in Persian). The remaining 168 articles were further screened based on their introduction and results, resulting in the exclusion of 118 articles for insufficient relevance.

Furthermore, inclusion criteria focused on the relevance of the articles to the role of metacognitive strategies in educational contexts, the methodological rigor of the studies, and the diversity of educational settings. The studies selected encompassed empirical research, theoretical papers, systematic reviews, and both qualitative and quantitative studies. After this additional screening, 50 articles (in both Persian and English) on the role of metacognitive strategies in enhancing educational processes were selected for review. The criteria for excluding studies were their lack of relevance to metacognitive strategies, insufficient methodological rigor, or a focus on unrelated educational domains. Figure 1 illustrates the full article screening and selection process following Silva's method.

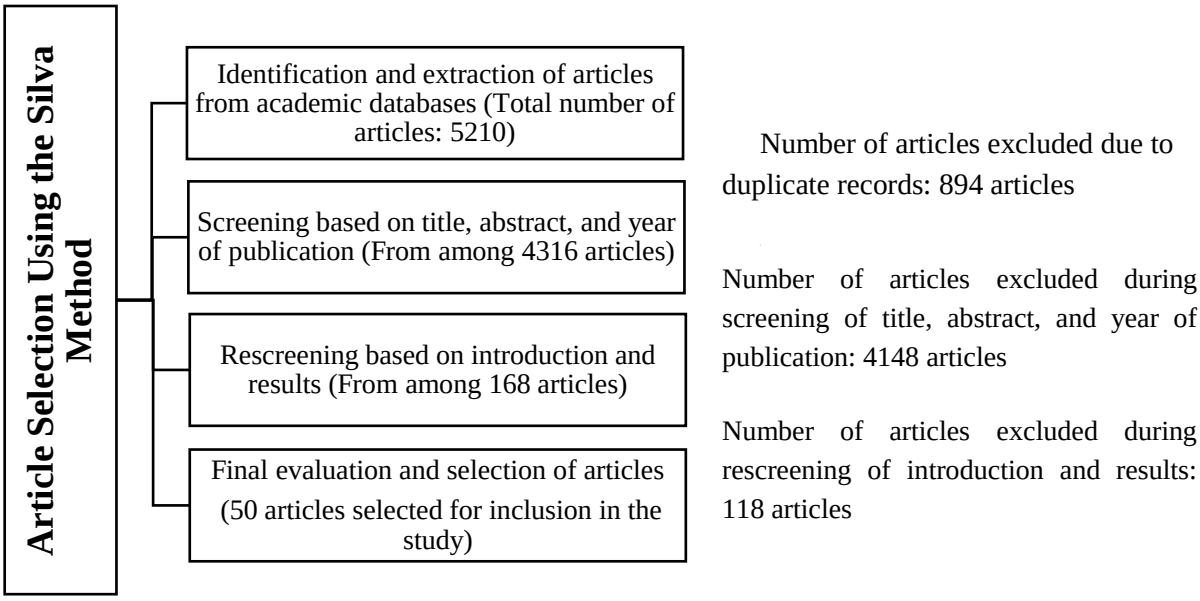

Figure 1. Article Selection

Stage 3 – Data Extraction: Key information was extracted from the 50 selected articles, including the research design, metacognitive strategies examined, and the outcomes related to educational processes. The data extracted from these articles were categorized into themes such as student engagement, teaching practices, and learning outcomes. These themes were then analyzed to explore how different metacognitive strategies, including planning, monitoring, and evaluation, influence these educational domains. Data analysis also involved assessing the quality of the studies and evaluating their methodological strengths and limitations.

Stage 4 – Implementation: In this final stage, the findings from the extracted data were analyzed and synthesized to evaluate how metacognitive strategies impact educational processes. The results of this analysis provided insights into the specific ways in which planning, monitoring, and evaluation strategies contribute to improving student learning, teaching effectiveness, and curriculum design. The implications of these findings are discussed in the next section, which outlines recommendations for integrating metacognitive strategies into educational practices.

Results

In this section, we present a summary of the key findings from the reviewed literature, which examines the role of metacognitive strategies in enhancing various aspects of education. The studies included a diverse range of educational contexts, from students' academic performance to the professional development of teachers. The table below provides an overview of the research domains, themes, and results from 50 studies, which collectively demonstrate the wide-reaching benefits of integrating metacognitive strategies in educational settings.

Table 1. An Overview of the Studies

	Author(s) & Year	Study Title	Results
1	Kadir (2023)	Students' Mathematical Achievement Based on Problem-Solving Skills	Direct relationship between metacognition and math performance
2	Chitiri et al. (2020)	Metacognitive Knowledge and Mathematical Intelligence	Positive relationship between metacognitive knowledge and academic success
3	Daradomis & Argudés (2020)	Enhancing Students' Reflective Learning via Emotional Feedback Tools	Emotional feedback tools improved reflective learning
4	Valencia Vallejo et al. (2019)	Effect of a Metacognitive Scaffolding on Self-Efficacy	Metacognitive scaffolding improved metacognitive abilities and outcomes
5	Zhao et al. (2019)	Path Model for Metacognition and Problem-Solving	General metacognition positively influences learning outcomes
6	Yilmaz & Baydas (2017)	Metacognitive Strategies in Flipped Classroom	Metacognitive strategies accounted for up to 80% of academic performance
7	Zepeda et al. (2015)	Direct Instruction of Metacognition	Metacognitive instruction increased motivation and performance
8	Santangelo et al. (2021)	Developing Metacognitive Skills with Active Learning	Active learning with metacognition improved skills
9	Akamatsu et al. (2019)	Metacognitive Strategies and Self-Regulated Learning	Planning strategies enhanced self-efficacy and learning outcomes
10	Silaj et al. (2021)	Test Anxiety and Metacognitive Performance	Metacognitive accuracy helped students perform under anxiety
11	Wang et al. (2021)	Test Anxiety and Metacognition in Students	Metacognition mediated test anxiety and reading/writing difficulties
12	Yardelndemar et al. (2015)	Pre-Service Teachers' Metacognitive Knowledge	Teachers' metacognitive knowledge improved instructional practices
13	Krikadias et al. (2020)	Teacher Behavior Impact on Metacognitive Skills	Teaching behaviors promoted metacognitive development in students
14	Jiang et al. (2016)	Teacher Metacognition Inventory	Measured teachers' metacognition and supported performance assessment
15	Hagues (2017)	Educational Complexity and Professional Development	Metacognitive awareness helped teachers manage instructional complexity
16	Bursali & Öz (2018)	Goal Setting in Foreign Language Learning	Goal setting improved metacognitive awareness and language success
17	Maor et al. (2023)	Metacognition, Creativity, and Critical Thinking	Metacognitive reflection improved creativity and critical thinking
18	Rivas et al. (2022)	Metacognitive Strategies in Higher Education	Metacognitive strategies enhanced critical thinking and outcomes
19	Hong et al. (2020)	Metacognitive Behaviors and Motivation	Motivational profiles impacted metacognition and academic success
20	Drayton (2016)	Use of Metacognitive Strategies in Adult Learning	Metacognitive strategies improved comprehension in adult learners
21	Rodríguez-Ortiz et al. (2025)	Metacomprehension in Deaf Students	No significant difference in metacognition between deaf and hearing students
22	Zabracki et al. (2015)	Metacomprehension Knowledge and Performance	Metacomprehension improved reading strategies and comprehension
23	Soto et al. (2019)	Metacognition and Inferential Skills	Poor metacognition led to weak inference-making abilities

	Author(s) & Year	Study Title	Results
24	Bui & Johnson (2024)	Self-Regulation in Flipped Classroom	Flipped classroom increased self-regulation and metacognitive strategies
25	Kuvas & Cook (2019)	Problem-Based Learning and Metacognitive Awareness	PBL improved metacognitive awareness and error-correction skills
26	Marra et al. (2022)	Metacognition in Engineering Curriculum	PBL supported metacognitive abilities and self-directed learning
27	Kubik et al. (2022)	Retrieval Practice and Metacognitive Monitoring	Retrieval practice increased confidence and metacognitive accuracy
28	Sigismond (2016)	Classroom-Based Learning Communities	Classroom learning communities enhanced student metacognition
29	Barenberg & Duke (2019)	Retrieval Practice Effects on Metacognitive Monitoring	Retrieval practice improved self-evaluation and learning strategies
30	Toppino et al. (2018)	Conditions Affecting Study Choices	Study conditions influenced test choice and metacognitive effectiveness
31	Shih & Huang (2019)	Metacognitive Strategy Use in EFL	Flipped classroom increased strategy use and language learning outcomes
32	Soodla et al. (2015)	Teachers' Metacognitive Knowledge and Reading Achievement	Teachers' metacognitive knowledge enhanced students' reading comprehension
33	Escolano-Pérez et al. (2019)	Preschool Metacognitive Skills Assessment	Early childhood metacognition supported learning and instructional practices
34	Niccolò-Carlo et al. (2018)	Metacognitive Skills and Reading Comprehension in Children	Metacognitive activities improved reading comprehension in children with learning disabilities
35	Wang et al. (2018)	Phonological Skills and Metacognition in Deaf Students	Metacognitive skills enhanced comprehension in deaf learners
36	Jumanto et al. (2024)	RADEC Model and Critical Thinking	Metacognitive materials enhanced critical and creative thinking
37	Perles et al. (2024)	Metacognitive Strategies in Online Learning	Metacognitive strategies improved critical thinking in virtual learning
38	Rubilos & Bastos (2022)	Metacognitive Listening Strategies	Listening strategies improved comprehension in college students
39	Teng et al. (2023)	Metacognitive Strategies in Remote Learning	Strategies improved engagement and achievement in remote learning
40	Gholamrezaei et al. (2017)	Metacognition and Critical Thinking	Metacognitive awareness supported critical thinking and academic success
41	Khatibi et al. (2022)	Metacognitive Beliefs and Academic Achievement	Metacognitive beliefs positively impacted academic achievement
42	Afshari et al. (2022)	Metacognitive Training and Learning Disorders	Metacognitive training increased task engagement and persistence in students with learning disabilities
43	Safaei Gheiri (2022)	Metacognitive Strategy and Emotional Intelligence	Metacognitive skills supported emotional regulation and academic success
44	Marzban (2018)	Metacognitive Beliefs and Test Anxiety	Metacognitive awareness improved learning strategies and reduced anxiety
45	Amir-Ardehjani (2022)	Group Teaching of Metacognitive Strategies	Group-based training increased students' flow and internal locus of control
46	Karimi Mehrab (2021)	Metacognition vs. Collaboration in Teaching	Metacognitive teaching was more effective than cooperative methods for all students
47	Komasi (2021)	Metacognitive Strategies and Academic Performance	Metacognitive training increased engagement and academic performance

	Author(s) & Year	Study Title	Results
48	Rahimi & Shojaei Zadeh (2018)	Metacognitive Skills and Problem-Solving	Metacognitive skills improved problem-solving and academic performance
49	Salimi (2018)	Metacognition and Reading Comprehension	Metacognitive strategies improved reading comprehension across gender and performance levels
50	Ghasemi-Gheshlaq et al. (2018)	Metacognitive Strategies in Math and Memory	Metacognitive training enhanced problem-solving and math self-efficacy

The findings of this study highlight the significant impact of metacognitive strategies across various domains of education, including students, teachers, and the curriculum. The synthesis of the selected studies reveals a wide range of positive outcomes associated with the use of metacognitive strategies. These outcomes include improvements in academic performance, motivation, self-esteem, and self-regulation for students, as well as enhanced teaching effectiveness, professional development, and self-efficacy for teachers. Moreover, the integration of metacognition within curriculum design has been shown to foster critical thinking, problem-solving, and creativity, while also enhancing learners' abilities to assess their own learning and progress. A summary of these findings is presented in the table below.

Table 2. Summary of the Findings

Research Domains	Research Themes	Research Findings and Results
Students	The impact of metacognition on learning and academic performance	Enhanced learning, academic achievement, and improved performance (Chitri et al., 2020; Samdani & Shangarfam, 2020; Zepeda et al., 201;)
	The effect of metacognitive strategies on student motivation	Increased intrinsic motivation through planning, regulation, and organization of learning (Al-Badarin et al., 2015; Amir-Ardejani, 202;)
	Influence on self-concept, self-efficacy, and self-esteem	Improved self-concept and increased self-esteem through self-monitoring and self-assessment (Garavand, 2023; Ghorbani, 2017)
	Reduction of test anxiety through metacognitive approaches	Reduction in anxiety through better planning and awareness of personal abilities (Abdoli, 2021; Marzban, 2018; Wang et al., 2021)
Teachers	The role of teachers' metacognitive knowledge	Metacognitive knowledge encompasses content knowledge, methodological knowledge, and knowledge of student learning (Yardleandmar et al., 2015)
	The influence of teachers' metacognition on teaching and student learning	Teachers with high levels of metacognition facilitate student learning more effectively (Nouri-Ardi, 2020; Sudla et al., 2016)
	The relationship between teachers' metacognition,	Increased teacher self-confidence and self-efficacy through performance monitoring (Jalalnia, 2018)

Research Domains	Research Themes	Research Findings and Results
	motivation, and teaching self-efficacy	
	The contribution of metacognition to teachers' professional development	Improved teaching capacity and better management of educational complexities (Hughes, 2017; Jiang et al., 2016)
Curriculum	The connection between educational objectives and metacognitive strategies	Students employing metacognitive strategies tend to focus more on mastery goals (Bursalı & Hoz, 2018)
	The role of metacognition in critical thinking, problem-solving, and creativity	Greater use of critical thinking, problem-solving, and creativity through metacognitive strategies (Rivas et al., 2022; Zhao et al., 2019)
	The relationship between metacognition and assessment as learning	Enhanced assessment as learning and self-evaluation resulting from improved metacognitive abilities (Earl, 2013)
	The application of metacognitive strategies across different content areas	Improved reading comprehension (metacomprehension) and mathematics performance through enhanced metacognition (Drayton, 2016; Schoenfeld, 2016; Zabracki et al., 2019)
	The association of metacognition with learner-centered and problem-based teaching methods	Students with stronger metacognitive strategies utilize problem-based and learner-centered instructional methods more effectively (Mara et al., 2022; Vahidi & Pooshneh, 2018)

Discussion

Based on existing research on metacognitive strategies and their effects on improving the educational process, these studies can be classified and analyzed in light of four fundamental pillars of education. These foundational elements—often called the "Teaching Square"—include the teacher, the student, the curriculum, and the learning environment. In the present study, emphasis is placed on the teacher, the student, and the curriculum, with each element examined independently.

A) Studies on Metacognitive Strategies in Relation to Students

A central question in metacognition is the age at which metacognitive skills first emerge. Earlier research, influenced by Piaget's theory, suggested that such skills develop in the final years of elementary school, assuming young children are incapable of monitoring their own thinking (Winnman et al., 2004). However, more recent studies indicate that early signs of metacognition can appear as early as preschool and continue developing throughout schooling (Chen & McDonough, 2022; Escolano-Pérez et al., 2019).

Research shows that metacognitive strategies influence both cognitive and psychological aspects of students. More than half of studies in this field have investigated how metacognitive instruction affects students' learning and academic performance. Many findings confirm

improvements in learning outcomes (Joviani, 2019; Samdani & Shangarfam, 2020; Santangelo et al., 2021; Stanton et al., 2021; Zepeda et al., 2015), academic achievement (Gholampour-Jajarm, 2018; Karimi Mehrab, 2021; Khatibi et al., 2022; Saeedzadeh et al., 2018; Marzban, 2018), and performance (Chitri et al., 2020; Damiri, 2020; Gheiri, 2022; Kamasi, 2021).

Various studies highlight that metacognition is among the most influential factors in student's learning (Chitri et al., 2020; Wang et al., 1993). The more students use metacognitive strategies, the more successful they tend to be academically. Pintrich (2000) explained that metacognition helps organize and retain information, manage time, choose study environments, regulate anxiety, and reduce procrastination—all contributing to better academic results.

In addition, metacognitive strategies are linked to increased intrinsic motivation. They encourage planning, regulation, and self-monitoring, fostering a sense of competence and internal locus of control (Amir-Ardejani, 2022). For example, Al-Badarin et al. (2015) found that higher metacognitive awareness was associated with greater academic motivation among university students in Jordan.

Metacognitive strategies also improve self-concept (Behroozrazagh, 2014; Ghorbani, 2017), self-efficacy (Akamatsu et al., 2019; Garavand, 2023), and self-esteem (Amin, 2019; Safari, 2016). They promote reflection, enable goal-setting tailored to personal strengths, and foster self-monitoring, helping students believe in their ability to achieve goals (Valencia-Vallejo, 2019). Moreover, they may reduce academic procrastination (Yahak, 2022).

Test anxiety is another frequent topic in metacognitive research. Studies show that metacognitive strategies help alleviate exam-related anxiety by enabling students to plan, assess, and set realistic expectations (Abdoli, 2021; Kazemi-Bahmanabad, 2022; Marzban, 2018; Silaj et al., 2021; Wang et al., 2021). Students with strong metacognitive skills understand their thoughts and feelings and know which strategies to use in challenging situations. Overall, research consistently shows that metacognitive strategies positively impact students' learning, motivation, self-perceptions, and emotional regulation. However, further research should explore cultural and contextual differences in how these strategies develop and function.

B) Studies on Metacognitive Strategies in Relation to Teachers

Research on teachers' metacognition has progressed significantly. It is often categorized into three subcomponents: content-related knowledge, methodological knowledge, and knowledge concerning students' understanding (Yardleandmar et al., 2015).

Teachers' metacognition influences both teaching practices and student learning. It not only supports student learning (Nouri-Ardi, 2020) but is also essential for helping students become metacognitive learners (Li et al., 2015; Sudla et al., 2016). To effectively teach metacognition, teachers themselves must be metacognitive and reflect this in their instructional practices, not just

in their beliefs or attitudes (Kyriakides et al., 2020). Jiang et al. (2016) developed a scale to measure teachers' metacognition, focusing on their ability to monitor and assess instructional effectiveness. While useful, the scale's high internal correlations suggest overlapping dimensions, raising concerns about conceptual clarity. Jalalnia (2018) studied 240 secondary school teachers and found significant links between teachers' metacognition, their motivation, and self-efficacy. Although causality was not clearly established, the findings imply that metacognitive strategies, through ongoing self-reflection and evaluation, foster teaching confidence and motivation.

Metacognition also contributes to teachers' professional development. Self-regulated learning is crucial for lifelong growth, and metacognitive teachers are better prepared to navigate complex educational demands (Hughes, 2017). Recent studies confirm that metacognitive interventions can improve teaching quality. Many teachers express a strong desire to integrate metacognition into their practice (Jiang et al., 2016). Therefore, it can be claimed that teachers' metacognition is central to effective teaching and professional growth. Yet, more research is needed to refine measurement tools and understand how metacognitive awareness translates into classroom practices across diverse educational contexts.

C) Metacognitive Strategies in Relation to Curriculum

The curriculum encompasses educational objectives, instructional content, teaching methods, and assessment strategies. Each relates differently to metacognitive strategies.

Educational goals shape learning experiences. Dweck's (1988) framework distinguishes mastery goals—focused on understanding—from performance goals—focused on outperforming others (Dweck & Leggett, 1988). Studies show that metacognitive instruction encourages mastery goals by helping students connect new knowledge to existing knowledge and manage their learning (Bursalı & Hoz, 2018; Nikpey et al., 2016).

Educational objectives can also be classified by Bloom's taxonomy into levels such as analysis, synthesis, and evaluation (Bloom, 1956). Metacognitive instruction is strongly linked to higher-order objectives, supporting critical thinking (Gholamrezaei et al., 2017; Soleimanifar et al., 2015), creativity (Jafari et al., 2022; Khorasani, 2016; Mauer et al., 2023), and problem-solving (Rahimi & Shojaeezadeh, 2018). However, some studies, like Rivas et al. (2022), conflate metacognition and critical thinking, leading to conceptual ambiguity. Though the two overlap, it is crucial to distinguish that metacognition is about managing one's cognitive processes, whereas critical thinking emphasizes evaluating and reasoning about information.

Considering ***Instructional Content***, many studies link metacognitive strategies to specific content areas, notably mathematics. Mathematical metacognition involves planning, monitoring, and evaluating one's thinking in math tasks (Schoenfeld, 2016). Learners with low mathematical metacognition often underperform despite high ability (Hong et al., 2020). A recent systematic

review by Thinga et al. (2024) analyzed 288 studies on mathematical metacognition but noted a lack of research in developing countries and minimal attention to cultural factors. In reading, metacomprehension helps students assess their understanding and adjust strategies accordingly (Drayton, 2016; Rodriguez-Ortiz, 2025; Salimi, 2018). Poor metacomprehension leads to ineffective study habits and lower academic success (Soto et al., 2019; Zabracki et al., 2015).

***Teaching Methods*:** Metacognitive strategies align closely with learner-centered methods such as flipped classrooms and problem-based learning (PBL). In flipped classrooms, students study material independently before class, freeing class time for higher-order activities (Shi & Huang, 2020; Yilmaz & Baydas, 2017). Effective participation in this model requires strong metacognitive skills (Bowie & Johnson, 2024).

Similarly, PBL encourages problem-solving and reflection, fostering metacognition. While small-sample studies (e.g., Mara et al., 2022) show benefits, larger studies are needed to confirm generalizability.

***Educational Assessment*:** Modern assessment is categorized into assessment of learning, for learning, and as learning. "Assessment as learning," introduced by Earl (2013), emphasizes self-assessment and metacognitive development. It places learners at the center, fostering skills such as self-monitoring and self-evaluation (Loeb et al., 2021; Siegismund, 2016). Retrieval practice, a metacognitive strategy, helps learners assess and strengthen memory. It can boost performance by 20–50% (Little-Libes, 2015; Carpenter et al., 2022). However, learners often misjudge their understanding, and retrieval practice helps close this gap, improving metacognitive accuracy. Generally, metacognitive strategies are deeply connected to curriculum components. They promote mastery goals, enhance engagement with complex content, and support modern teaching and assessment methods. However, future research should clarify conceptual overlaps and explore diverse educational contexts.While research highlights numerous benefits of metacognitive strategies for students, teachers, and curriculum, several issues remain. Some studies blur distinctions between metacognition and related constructs like critical thinking, leading to conceptual confusion. Furthermore, research often focuses on isolated findings rather than synthesizing insights into practical guidance for educational practice. Future work should integrate these findings and provide clear, context-sensitive applications for enhancing teaching and learning.

This study aimed to explore the role of metacognitive strategies in enhancing educational processes. The review of the literature revealed that metacognitive strategies significantly impact various aspects of education, including academic achievement, motivation, and teaching effectiveness.

The findings suggest that the use of metacognitive strategies improves students' academic performance by fostering better planning, monitoring, and evaluation of their learning processes. These strategies enhance students' motivation, self-efficacy, and self-esteem, which in turn contribute to more active engagement in their learning. Furthermore, metacognitive strategies are not only beneficial for students but also serve as a model for teachers to adopt, promoting metacognitive thinking within the classroom.

One of the key insights from the review is that metacognitive strategies are versatile and can be applied to a wide range of educational contexts. Whether in mathematics, reading comprehension, or other subject areas, these strategies are effective in diverse teaching approaches, including learner-centered and problem-based methods. Moreover, the adoption of these strategies supports the achievement of higher-order educational objectives, such as analysis, synthesis, and evaluation.

Finally, the importance of metacognitive strategies lies in their ability to transform educational practices. By integrating these strategies into both teaching and learning, educators can create more effective, reflective, and autonomous learning environments. The findings emphasize that metacognitive strategies are not only instrumental in improving academic outcomes but also contribute to the overall development of students' cognitive and emotional skills. Therefore, incorporating metacognitive approaches into educational practices is crucial for fostering deeper learning and preparing students for future challenges.

Despite the comprehensive scope of this narrative systematic review, there are several limitations that must be acknowledged. First, the study relied on the availability of articles in English and Persian, which may have excluded valuable research published in other languages. Second, while a wide range of databases were searched, there could still be relevant studies that were not captured due to variations in search terms or publication outlets. Additionally, the majority of the selected articles focus on specific educational settings which means the findings may not be fully generalizable across all contexts or educational systems. Furthermore, the reviewed studies predominantly emphasize the effects of metacognitive strategies on academic performance and motivation, with less focus on other potential outcomes such as long-term behavioral changes or the impact of cultural and contextual factors on metacognitive strategy use. These limitations suggest that future research should explore the broader applicability of metacognitive strategies across diverse educational environments and consider longitudinal studies to assess the lasting effects of these strategies.

Suggestions for Further Research

Future research should expand to include studies from diverse languages and cultures to better understand the effectiveness of metacognitive strategies across various educational systems. Longitudinal studies on the long-term impact of metacognitive training on academic and behavioral

outcomes are also needed. Additionally, exploring the role of metacognitive strategies in emotional regulation and the use of digital tools would be beneficial. Research should also examine the impact of these strategies across different age groups to develop age-appropriate educational interventions.

Metacognitive strategies should receive greater attention from teachers, policymakers, and curriculum designers. These strategies must be explicitly taught to students, either directly by teachers or through structured workshops, to enhance self-regulation, academic performance, and lifelong learning.

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Conflict of interest

There are no conflicts of interest.

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