

The Curriculum Content of a Metacognition-Based Program for Reducing Learning Disorders Among Elementary School Students

Esmat. Nabipoor¹, Maryam. Baratali^{2*}, Jahanbakhsh. Rahmani²

¹ PhD Student, Department of Educational Sciences, Isf.C., Islamic Azad University, Isfahan, Iran

² Department of Educational Sciences, Isf.C., Islamic Azad University, Isfahan, Iran

* Corresponding author email address: maryambaratali@iau.ac.ir

Article Info

Article type:

Original Research

How to cite this article:

Nabipoor, E., Baratali, M., & Rahmani, J. (2026). The Curriculum Content of a Metacognition-Based Program for Reducing Learning Disorders Among Elementary School Students. *Psychological Research in Individuals with Exceptional Needs*, 4(3), 1-14.
<https://doi.org/10.61838/kman.prien.5723>



© 2026 the authors. Published by KMAN Publication Inc. (KMANPUB), Ontario, Canada. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

ABSTRACT

Learning disorders during elementary school are among the important issues in the educational system, as they can negatively affect students' academic performance, self-confidence, and social adjustment. In recent years, metacognition-based approaches have attracted attention as an effective strategy for reducing these disorders because of their emphasis on self-awareness, self-regulation, and control of the learning process. However, designing a coherent and purposeful metacognition-based curriculum for reducing learning disorders among elementary school students remains one of the essential needs in the field of elementary education. The purpose of the present study was to identify the curriculum content of a metacognition-based program for reducing learning disorders among elementary school students. This study was conducted using a qualitative approach and thematic analysis with an exploratory inductive approach. Data were collected through the study of documents, scientific texts, and relevant research literature. The research domain included documents available in reputable databases and websites from 2007 to 2025 in the field of learning disorders and metacognition, as well as English-language documents published between 1991 and 2025. The data collection technique was an exploratory inductive approach, the data collection tool was note-taking, and the data analysis method was three-stage coding. The findings showed that, in the curriculum content dimension, the curriculum had an integrative and multilevel nature, and the implementation methods emphasized direct instruction, active strategies, multisensory approaches, metacognition-oriented strategies, and collaborative methods. The conclusion of the study indicated that curriculum content should be organized in accordance with the developmental characteristics and individual differences of elementary school students and should include practical and play-based activities, short and gradual exercises, feasible home assignments, and formative assessment tools so that it can sustainably reduce learning difficulties, increase learners' self-awareness, and improve academic performance.

Keywords: curriculum content, learning disorders, metacognition, elementary school.

1. Introduction

Learning disorders during elementary education constitute one of the most consequential challenges in

educational psychology, special education, and curriculum studies because they emerge at a developmental stage in which foundational academic, cognitive, emotional, and social competencies are being formed. Elementary school is

not merely a period of acquiring literacy and numeracy skills; rather, it is the stage in which children learn how to attend to information, organize knowledge, monitor their own performance, regulate effort, respond to feedback, and gradually internalize strategies for independent learning. When students experience persistent difficulties in reading, writing, spelling, mathematics, or broader academic processing, these difficulties may disrupt the normal trajectory of academic growth and produce secondary consequences such as low academic self-concept, reduced motivation, avoidance of school tasks, emotional distress, and weakened social adjustment. Specific learning disorders are therefore not limited to deficits in isolated academic skills; they are multidimensional conditions involving cognitive, metacognitive, motivational, affective, neuropsychological, and contextual dimensions that must be addressed through systematic educational planning (Mostafaei & Samavati, 2023; Seif Naraghi, 2022; Tabrizi et al., 2024; Yahyanejad et al., 2024).

The importance of addressing learning disorders in elementary school becomes clearer when the developmental vulnerability of this period is considered. Children with learning disorders often encounter repeated experiences of academic failure at precisely the time when their beliefs about competence, school belonging, and learning capability are being shaped. These experiences may gradually lead to learned helplessness, low persistence, decreased academic vitality, and dependence on external support. Families may also experience confusion, anxiety, and uncertainty regarding the nature of the child's difficulties and the most appropriate forms of educational and psychological support. Phenomenological evidence regarding the experiences of parents of students with learning disorders indicates that learning problems affect not only the child's academic performance but also the family's emotional climate, expectations, and interaction with school systems (Mohammadi Armandi & Mottaghi, 2022). In addition, studies have shown that academic mediators, cognitive-metacognitive strategies, and motivational beliefs are interrelated among children with specific learning disorders, suggesting that academic outcomes are shaped by a network of cognitive and motivational variables rather than by instructional exposure alone (Ashrafzadeh et al., 2021). Accordingly, intervention for learning disorders must extend beyond remediation of reading or mathematical skills and must also strengthen self-awareness, motivation, engagement, and adaptive participation in school life

(Koukabi Rahman et al., 2022; Nasiri Garmeh Cheshmeh et al., 2023).

Among contemporary educational and psychological approaches, metacognition has gained particular significance as a theoretical and practical framework for supporting students with learning disorders. Metacognition generally refers to individuals' awareness, knowledge, monitoring, and regulation of their own cognitive processes. In educational contexts, metacognition includes students' ability to understand what they know, recognize what they do not know, select appropriate learning strategies, monitor comprehension, detect errors, evaluate performance, and revise strategies when previous approaches are ineffective. Metacognitive instruction is therefore closely connected with self-regulated learning, cognitive flexibility, executive control, academic decision-making, and adaptive learning behavior. Contemporary accounts of teaching and learning emphasize that metacognition should not be treated as an abstract psychological construct separate from classroom instruction; rather, it must be translated into concrete curricular activities, teacher guidance, explicit strategy instruction, reflective questioning, and structured opportunities for planning, monitoring, and evaluation (Aghazadeh, 2022; Sharifi Asadi, 2023). Observational and interview-based findings in mathematics classrooms also show that teachers can promote self-regulated learning both directly and indirectly, although such promotion requires intentional instructional design rather than incidental classroom practice (Dignath & Buttner, 2018). More recent theoretical work further highlights the social and affective nature of regulation, emphasizing that metacognition interacts with motivation, emotion, and socially shared learning processes (Singh & Muis, 2024). Empirical evidence also indicates that metacognitive-based learning strategies can enhance decision-making and reduce cognitive dissonance, suggesting that metacognition supports not only academic performance but also adaptive judgment and cognitive control (Abadi et al., 2025).

The relevance of metacognition is especially strong in the field of learning disorders because many students with such difficulties do not merely lack academic knowledge; they often lack awareness of how to approach tasks, how to choose strategies, how to evaluate errors, and how to shift from ineffective to effective procedures. Students with learning disorders may continue using inefficient strategies even when these strategies repeatedly fail, may have difficulty identifying the source of their errors, and may struggle to transfer learned strategies across tasks. In this

regard, metacognition provides a mechanism for improving the quality of learning by helping students become active agents in their own learning process. Instead of viewing the learner as a passive recipient of remediation, metacognitive approaches position the learner as a participant who can learn to plan, monitor, correct, and evaluate cognitive activity. This perspective is consistent with findings showing differences in the use of metacognitive knowledge and regulation strategies between students with and without special learning difficulties (Mastrothanais et al., 2018). Systematic review evidence also supports the significance of metacognitive functioning in students with learning disabilities or learning difficulties and emphasizes the need to better understand how metacognitive processes operate in this population (Noureddine et al., 2024).

A growing body of research has examined the effectiveness of metacognitive approaches in specific academic domains, particularly reading and mathematics. In the domain of reading, metacomprehension strategies have been found to improve the reading functioning of students with specific learning disorder by enabling them to monitor meaning, identify comprehension breakdowns, and apply corrective strategies (Fahami et al., 2023). Teachers' use of metacognitive strategies has also been examined in relation to supporting reading comprehension skills among children with learning disabilities, showing that teacher-mediated strategy instruction can play an important role in guiding students' comprehension processes (Lacin & Cetin, 2022). Reciprocal teaching, which includes prediction, questioning, clarification, and summarization, has similarly been supported as a reading comprehension intervention because it combines cognitive and metacognitive engagement in a structured instructional format (Dew et al., 2021). Moreover, the application of metacognitive-based problem-solving approaches among primary students with dyslexia in algebraic word problems demonstrates that metacognition can support students beyond conventional reading remediation by helping them analyze problem structure, monitor solution steps, and regulate comprehension during complex academic tasks (Abdullah, 2023).

In mathematics, metacognitive instruction has also shown considerable relevance. Mathematics learning disorders often include difficulties in conceptual understanding, procedural fluency, mathematical reasoning, working memory, anxiety management, and transfer of learning to new problem situations. Research has shown that metacognitive training can reduce mathematics problems in students with reading, writing, and mathematics learning

disorders, indicating that metacognitive intervention may have cross-domain value when students' difficulties overlap across academic areas (Afshari et al., 2022). Studies comparing metacognition and working-memory training have further highlighted the importance of both regulatory and cognitive-capacity components in improving mathematics performance and reducing mathematics anxiety among students with mathematics learning disorder (Saeed et al., 2024). Reviews focusing on metacognition programs for elementary-school students with mathematics learning disorders have also underscored the value of systematic strategy instruction, self-monitoring, and structured practice in mathematical learning (Hekmatnia et al., 2024). In addition, didactic designs that use metacognitive approaches to overcome geometry learning difficulties show that metacognition can support creative thinking, representation, and problem-solving in mathematics education (Fauzi et al., 2024).

Beyond domain-specific academic skills, the literature emphasizes the importance of neuropsychological and cognitive-processing components in learning disorders. Students with learning disorders may show weaknesses in attention, working memory, processing speed, inhibitory control, cognitive flexibility, and executive functioning. These processes are essential for reading fluency, written expression, mathematical calculation, comprehension, and classroom participation. Evidence regarding Jager's metacognitive knowledge and skills program indicates that metacognitive interventions can affect neuropsychological skills among students with reading learning disorder, suggesting that metacognition may operate in connection with underlying cognitive processes rather than only with surface-level academic behaviors (Moradi & Mirbad, 2020). Similarly, metacognitive-strategy training has been reported to reduce attention-deficit symptoms and learning-disorder symptoms, highlighting the link between metacognitive regulation and attentional control (Ghadiri Alamdari et al., 2021). Research on metacognition and errors in children with specific learning disabilities also demonstrates that self-regulatory training can influence how children identify, interpret, and respond to errors, which is a central mechanism in durable learning (Lucangeli et al., 2019). Therefore, curriculum content for reducing learning disorders should not focus only on presenting academic material but should also include cognitive exercises, error-monitoring activities, working-memory support, and opportunities for students to reflect on their learning processes.

Motivational and emotional variables are also central to any curriculum designed for students with learning disorders. Academic failure often undermines students' self-efficacy, academic motivation, school engagement, and sense of competence. Accordingly, metacognitive curriculum content must be sensitive to students' beliefs about learning and must provide opportunities for mastery experiences, verbal encouragement, gradual success, and realistic self-evaluation. The effectiveness of metacognitive strategies on self-efficacy and motivational beliefs among students with learning disorders confirms that metacognition can contribute to motivational reconstruction when students learn how to understand tasks and regulate their performance more effectively (Afzalkhani & Ghadousi, 2022). Metacognitive-strategy training has also been shown to improve cognitive self-awareness and self-regulation among students with learning disorders, reinforcing the idea that students must develop awareness of both their cognitive processes and their capacity to control those processes (Ghorbani et al., 2022). Furthermore, metacognition-based strategies have been found to improve academic self-concept among students with spelling learning disorder, indicating that strategic competence may gradually transform students' self-perceptions as learners (Rostami et al., 2019). Research on school well-being models also shows that school bonding and academic self-regulation are important targets for students with learning disorders, emphasizing that intervention should support the student's emotional connection to school as well as cognitive regulation (Yahyanejad et al., 2024).

Despite the growing body of evidence supporting metacognitive intervention, an important gap remains in the design of coherent curriculum content for elementary students with learning disorders. Many existing studies focus on specific skills, isolated interventions, or limited instructional strategies, whereas curriculum design requires an integrated organization of goals, content, learning activities, implementation methods, and evaluation procedures. A curriculum for reducing learning disorders should clarify what kinds of knowledge, academic skills, cognitive-processing skills, planning and self-monitoring skills, life skills, attitudinal-value orientations, and socioemotional competencies need to be included. It should also determine how these components can be adapted to the developmental characteristics of elementary students, the heterogeneity of learning disorders, and the realities of classroom instruction. The role of learning disorders in elementary students' use of cognitive and metacognitive

strategies further indicates that students' difficulties influence their ability to independently apply strategies, making curricular scaffolding essential (Dashtbani & Dashtbani, 2024). Metacognitive instruction for students with special needs has similarly been introduced as a strategy that must be systematically embedded in educational practice rather than treated as a supplementary activity (Denis, 2023). Therefore, curriculum content should be designed in a structured, developmental, and inclusive manner.

The need for such a curriculum is also supported by the diversity of learning disorders and the heterogeneity of students' needs. Some students primarily struggle with reading accuracy and comprehension; others experience spelling, writing, mathematical reasoning, nonverbal learning problems, attentional weaknesses, or difficulties in executive functioning. Modeling nonverbal learning disorders based on neuropsychological skills and learning problems among students aged 8 to 12 years demonstrates that learning disorders may involve complex interactions between cognitive profiles and educational difficulties (Mostafaei & Samavati, 2023). This diversity requires curriculum content that is modular, flexible, and responsive to individual differences. A metacognition-based curriculum can provide such flexibility because metacognitive skills are applicable across academic domains and can help students transfer strategies from one task to another. However, transfer does not occur automatically; it must be taught through repeated practice, explicit modeling, guided reflection, and real academic tasks. This is why modern teaching approaches based on brain-based learning, constructivism, cooperative learning, and metacognitive research emphasize active learning environments in which students participate, reflect, collaborate, and gradually assume responsibility for learning (Aghazadeh, 2022).

In this regard, curriculum content for reducing learning disorders should be conceptualized as a multidimensional structure rather than a collection of remedial exercises. Knowledge content is needed to help students understand learning processes, task demands, strategies, and errors. Academic content is needed to strengthen reading, writing, spelling, comprehension, and mathematical skills. Processing content is required to support attention, working memory, cognitive flexibility, and neuropsychological functioning. Planning and self-monitoring content is necessary to develop goal-setting, sequencing, monitoring, checking, and evaluation. Skill and lifestyle content can help students transfer learning strategies to daily life and real

academic contexts. Attitudinal-value content can strengthen self-efficacy, persistence, adaptive beliefs, and openness to strategy change. Socioemotional content can support communication, emotional regulation, family involvement, school bonding, and respectful interaction with the child. Such a curriculum would be consistent with evidence that metacognition, cognitive strategies, motivational beliefs, and academic adjustment are deeply interconnected in students with learning disorders (Ashrafzadeh et al., 2021; Koukabi Rahman et al., 2022; Nasiri Garmeh Cheshmeh et al., 2023).

Accordingly, the aim of the present study was to identify the curriculum content of a metacognition-based program for reducing learning disorders among elementary school students.

2. Methods and Materials

This study was conducted using a qualitative approach and thematic analysis with an exploratory inductive approach. Data were collected through the study of documents, scientific texts, and relevant research literature. The research domain in the analysis of texts related to metacognition-based learning disorders among elementary school students consisted of all articles available in reputable databases and websites. In addition, authoritative books in

the field of metacognition-based learning disorders were used for analysis. It should be noted that 43 Persian-language documents published between 2007 and 2025 and 30 English-language documents published between 1991 and 2025 and indexed in reputable databases were examined. The data collection technique was an exploratory inductive approach, the data collection tool was note-taking, and the data analysis method was three-stage coding. Regarding ethical considerations, it should be stated that the qualitative study was conducted in accordance with the principles of research ethics. Before the beginning of data collection, the purpose of the study, the procedure for conducting interviews/observations, the duration of participation, and the way in which the information would be used were explained to the participants, and informed consent—and, where necessary, consent from the legal guardian—was obtained. It was also emphasized that participation in the study was voluntary and that individuals were allowed to withdraw at any time without any negative consequences.

3. Findings and Results

Table 1 presents the basic and organizing themes related to the overarching theme of content, that is, the content dimension.

Table 1

Basic and Organizing Themes Related to the Overarching Theme of Content (Content Dimension) in the Metacognition-Based Curriculum Model for Reducing Learning Disorders Among Elementary School Students

Basic Themes	Organizing Themes	Overarching Theme
Cognitive strategies for reducing deficits	Knowledge content	Content
Changes in curricular and instructional materials	Knowledge content	Content
Ability to reorganize knowledge in different situations	Knowledge content	Content
Applying organized knowledge to respond to changing situations	Knowledge content	Content
Role of working memory and executive functions in learning	Knowledge content	Content
Diversity of mathematical difficulties: concepts, operations, and application	Knowledge content	Content
Metacognitive deficits in students with learning disorders	Knowledge content	Content
Role of metacognition in selecting learning strategies	Knowledge content	Content
Progress in understanding academic concepts	Knowledge content	Content
Neuroplasticity or brain flexibility approach	Knowledge content	Content
Cognitive and neuropsychological theories	Knowledge content	Content
Making meaning of new information	Knowledge content	Content
Genetic theories	Knowledge content	Content
Biological theories	Knowledge content	Content
Developmental and maturational theories	Knowledge content	Content
Behavioral theories	Knowledge content	Content
Educational theories	Knowledge content	Content
Content reinforcement	Knowledge content	Content

Structuring lessons in a module-based format: memory module, attention module, and strategy module	Knowledge content	Content
Better representations of texts and problems	Knowledge content	Content
Knowledge and cognitive regulation	Knowledge content	Content
Effects on the psychological processes of learning, speaking, and writing	Academic content	Content
Verbal reasoning	Academic content	Content
Key skills for students	Academic content	Content
Importance of reading skills in academic success	Academic content	Content
Reading disorder as the most common learning disorder	Academic content	Content
Engagement and development of working memory	Processing content	Content
Relationship between working memory and planning	Processing content	Content
Strengthening accuracy and attention	Processing content	Content
Strengthening working memory	Processing content	Content
Neuropsychological rehabilitation	Processing content	Content
Brain plasticity	Processing content	Content
Cognitive exercises and repetition	Processing content	Content
Planning and sequencing	Planning and self-monitoring content	Content
Planning	Planning and self-monitoring content	Content
Training in self-monitoring skills	Planning and self-monitoring content	Content
Training in process-control skills	Planning and self-monitoring content	Content
Practicing attention regulation and inhibitory control skills	Planning and self-monitoring content	Content
Combining neurocognitive exercises with strategy instruction	Planning and self-monitoring content	Content
Facilitating problem-solving and everyday decision-making	Skill and lifestyle content	Content
Skills resulting from experience, instruction, and learning	Skill and lifestyle content	Content
Automatic performance of skills	Skill and lifestyle content	Content
Cognitive skills for adapting to new situations	Skill and lifestyle content	Content
An active lifestyle that improves flexibility	Skill and lifestyle content	Content
Vicarious experience	Skill and lifestyle content	Content
Emphasis on transferring skills to real academic tasks	Skill and lifestyle content	Content
Matching performance to task difficulty	Skill and lifestyle content	Content
Replacing weaknesses with new skills	Skill and lifestyle content	Content
Need for special education	Attitudinal-value content	Content
Academic adjustment of students with special needs	Attitudinal-value content	Content
Specific characteristics of teachers in special-needs schools	Attitudinal-value content	Content
Inflexibility and difficulty in changing viewpoints	Attitudinal-value content	Content
Representation of situations and problems	Attitudinal-value content	Content
Resistance to interference	Attitudinal-value content	Content
Identifying and using adaptive strategies	Attitudinal-value content	Content
Ability to adapt to changing tasks	Attitudinal-value content	Content
Flexibility as the opposite of avoidance	Attitudinal-value content	Content
Ability to abandon a dysfunctional strategy and replace it with an appropriate strategy	Attitudinal-value content	Content
Focus on changing the content of thoughts	Attitudinal-value content	Content
Exposure to a wide range of thoughts and emotions	Attitudinal-value content	Content
Challenge of the educational system in responding to special needs	Attitudinal-value content	Content
Curriculum flexibility	Attitudinal-value content	Content
Cognitive and metacognitive processing	Attitudinal-value content	Content
Durability of educational interventions	Attitudinal-value content	Content
Genetic and developmental nature of individuals	Attitudinal-value content	Content
Belief in capability	Attitudinal-value content	Content
Increasing self-efficacy	Attitudinal-value content	Content
Verbal persuasion	Attitudinal-value content	Content
Hierarchical design	Attitudinal-value content	Content
Role of the family as a key element	Socioemotional content	Content
Establishing children's natural and normal relationships	Socioemotional content	Content

Strengthening social skills	Socioemotional content	Content
Strengthening emotional skills	Socioemotional content	Content
Strengthening adaptive behaviors	Socioemotional content	Content
Creating emotional communication	Socioemotional content	Content
Child leadership	Socioemotional content	Content
Emphasis on respect for the child	Socioemotional content	Content

The qualitative analysis of the data organized the curriculum content required for reducing metacognition-based learning disorders into seven main categories: knowledge content, academic content, processing content, planning and self-monitoring content, skill and lifestyle content, attitudinal-value content, and socioemotional content. Each of these groups represents essential content dimensions that can be used in designing a specialized curriculum for elementary school students with learning disorders. Table 1 presents the basic and organizing themes related to the overarching theme of content, that is, the content dimension.

1. **Knowledge Content:** The data analysis showed that part of the content should focus on basic knowledge related to the learning process and cognitive mechanisms. The themes in this section indicate the necessity of familiarizing students with fundamental concepts such as cognitive strategies effective in reducing deficits, changes in instructional materials and educational content to adapt to individual needs, the ability to reorganize knowledge in diverse situations, the role of working memory, cognitive flexibility, and executive functions in learning, metacognitive deficits and their role in academic decline, the necessity of appropriately representing concepts, texts, and problems, and the use of cognitive, biological, genetic, developmental, and behavioral theories. The findings in this section show that content should be rooted in the scientific principles of cognition and learning and should provide students with the possibility of making meaning from new information.
2. **Academic Content:** The second category of themes represents content that is directly related to basic academic skills. The extracted items in this section include verbal reasoning, key skills necessary for academic success, reading, writing, and comprehension skills, the importance of reading disorder as the most common learning disorder, and strengthening working memory as the foundation of academic skills. These findings

emphasize that content should be designed in a structured manner based on task analysis and should target the foundational skills of reading, writing, and mathematics.

3. **Processing Content:** In this section, the findings show that the content should include a type of cognitive-processing intervention. The most important components include strengthening accuracy and attention, strengthening working memory, neuropsychological rehabilitation, repeated and purposeful cognitive exercises, and attention to brain plasticity and the concept of neuroplasticity. These themes indicate the necessity of designing content that strengthens not only students' knowledge but also their ability to process and retain information.
4. **Planning and Self-Monitoring Content:** This section indicates the importance of providing content that strengthens cognitive control, learning monitoring, and academic self-regulation in students. The most important components include planning and goal-setting, dividing goals into smaller parts, coordinating and implementing sequences of activities, training in self-monitoring skills, controlling cognitive processes, practicing attention regulation and inhibitory control skills, and combining strategy instruction with neurocognitive exercises. These findings show that part of the content should be directly devoted to strengthening metacognition and learning regulation skills.
5. **Skill and Lifestyle Content:** The analyses revealed that part of the content needs to strengthen skills that empower students in everyday life, problem-solving, and adaptation to new conditions. The themes in this category include life skills and cognitive skills, automatic performance of skills, adaptation to new situations, an active lifestyle for strengthening flexibility, vicarious experience, transfer of skills to real academic tasks, and replacing weaknesses with new skills. The findings show that educational content should go beyond the

academic domain and enhance students' general preparedness for life.

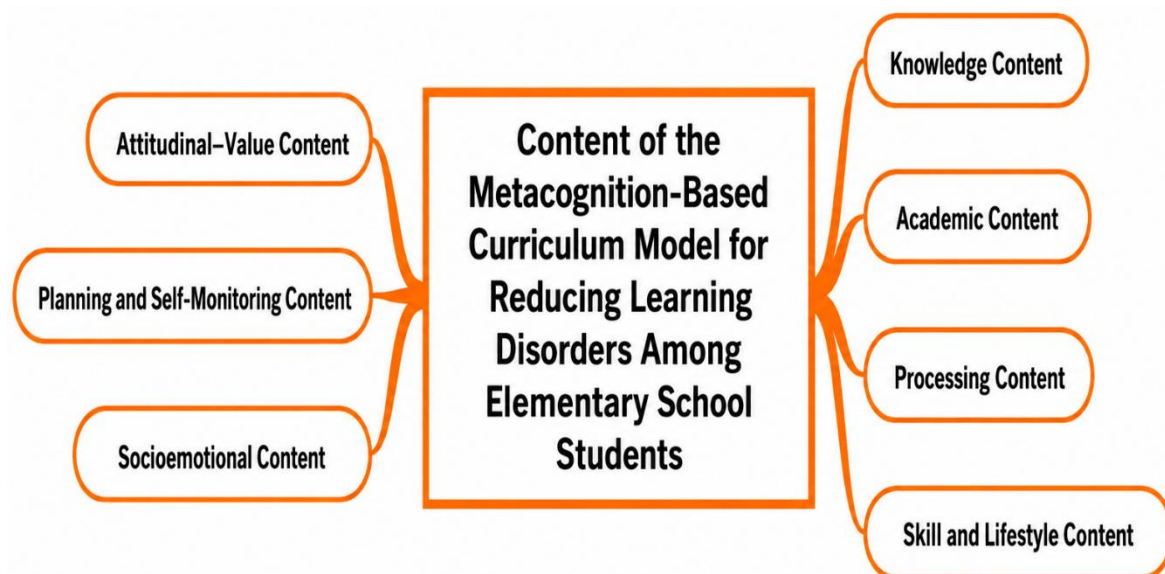
6. **Attitudinal-Value Content:** These themes show that part of the content should address the strengthening of attitudes, values, and beliefs necessary for learning, including the academic adjustment of students with special needs, the necessary characteristics of teachers in special-needs schools, cognitive and behavioral flexibility, abandonment of ineffective strategies, the ability to confront thoughts and emotions, belief in capability, increased self-efficacy, and emphasis on hierarchical structures in learning. These findings show that content should strengthen positive

beliefs, learning motivation, and supportive attitudes.

7. **Socioemotional Content:** Finally, the findings show that an important part of the content should be devoted to social and emotional skills, including the establishment of natural and normal relationships, strengthening social and emotional skills, adaptive behaviors, creation of positive emotional communication, family support and its role, respect for the child, and guidance of the child. This section shows that the proposed content should cover the socioemotional dimension alongside cognitive dimensions.

Figure 1

Organizing themes related to the overarching theme of content, that is, the content dimension, in the metacognition-based curriculum model for reducing learning disorders among elementary school students



4. Discussion

The findings of the present study showed that the curriculum content required for a metacognition-based program to reduce learning disorders among elementary school students can be organized into seven interrelated content domains: knowledge content, academic content, processing content, planning and self-monitoring content, skill and lifestyle content, attitudinal-value content, and socioemotional content. This structure indicates that

reducing learning disorders at the elementary level cannot be achieved through fragmented remedial exercises or isolated academic drills alone; rather, it requires a comprehensive curricular framework that simultaneously addresses students' cognitive knowledge, academic foundations, executive and processing capacities, regulatory skills, motivational beliefs, adaptive behaviors, and emotional-social functioning. This finding is consistent with the general literature on learning disorders, which conceptualizes these difficulties as multidimensional phenomena involving academic, cognitive, neuropsychological, motivational, and

contextual components (Mostafaei & Samavati, 2023; Seif Naraghi, 2022; Tabrizi et al., 2024). It also aligns with evidence showing that children with learning disorders differ in their use of cognitive and metacognitive strategies and require explicit support to apply these strategies effectively in learning situations (Dashtbani & Dashtbani, 2024; Mastrothanas et al., 2018).

One of the main findings was the identification of knowledge content as a central component of the proposed curriculum. This domain included students' awareness of cognitive strategies, the role of working memory and executive functions, metacognitive deficits, neuroplasticity, cognitive and neuropsychological theories, and the need to reorganize knowledge across different situations. This result suggests that students with learning disorders should not only be taught academic content but should also gradually understand how learning occurs, why difficulties emerge, and how strategies can be selected and modified. Such content is consistent with the theoretical foundations of metacognition, which emphasize awareness of cognition, strategy knowledge, monitoring, and regulation as core elements of effective learning (Sharifi Asadi, 2023). The importance of such knowledge is also supported by studies showing that metacognitive-based learning strategies improve decision-making and reduce cognitive dissonance, indicating that metacognitive knowledge can help learners regulate uncertainty and choose more adaptive responses during learning (Abadi et al., 2025). In addition, modern instructional approaches grounded in brain-based learning, constructivism, cooperative learning, and metacognitive research emphasize that learners should actively construct meaning, reflect on their learning processes, and connect new information with prior knowledge (Aghazadeh, 2022).

The second major finding concerned academic content, including verbal reasoning, reading, writing, comprehension, mathematical skills, and the recognition of reading disorder as one of the most common learning disorders. This finding reflects the necessity of maintaining a direct connection between metacognitive curriculum design and core academic skills. Although metacognition is a broad regulatory construct, its educational value becomes most evident when it is embedded in concrete academic tasks such as reading comprehension, spelling, writing, mathematical reasoning, and problem-solving. This interpretation is supported by findings showing that metacomprehension strategy training improves reading function among students with specific learning disorder (Fahami et al., 2023). Similarly, evidence on teachers' use

of metacognitive strategies for children with learning disabilities indicates that reading comprehension can be strengthened when learners are guided to monitor understanding, identify comprehension breakdowns, and apply corrective strategies (Lacin & Cetin, 2022). The effectiveness of reciprocal teaching as a reading comprehension intervention further supports the present finding, because reciprocal teaching integrates cognitive and metacognitive processes such as questioning, clarification, prediction, and summarization into structured instructional routines (Dew et al., 2021). Therefore, the academic content of a metacognition-based curriculum should not be limited to the repetition of reading or mathematical exercises but should explicitly teach students how to approach, monitor, and evaluate these academic tasks.

The findings also emphasized processing content, particularly attention, working memory, brain plasticity, neuropsychological rehabilitation, and repeated cognitive exercises. This result indicates that a metacognition-based curriculum for elementary students with learning disorders must include activities that strengthen the underlying cognitive processes required for academic performance. Many students with learning disorders experience difficulties not only in academic products, such as reading accuracy or mathematical calculation, but also in the cognitive operations that support these products, including attention control, information retention, sequencing, inhibition, and processing flexibility. This finding is consistent with research showing that metacognitive knowledge and skills programs can improve neuropsychological skills among students with reading learning disorder (Moradi & Mirbad, 2020). It is also supported by evidence that metacognitive-strategy training can reduce attention-deficit symptoms and symptoms of learning disorders, suggesting that metacognitive interventions may influence attentional control and executive functioning (Ghadiri Alamdari et al., 2021). Furthermore, research on metacognition and error processing among children with specific learning disabilities highlights the importance of self-regulatory training in helping children recognize and correct errors, which is directly related to processing efficiency and cognitive control (Lucangeli et al., 2019). Thus, processing content should be considered an essential bridge between cognitive capacity and academic performance.

Another important finding was the role of planning and self-monitoring content. This domain included goal-setting, sequencing activities, self-monitoring, control of cognitive

processes, attention regulation, inhibitory control, and the integration of neurocognitive exercises with strategy instruction. This finding is particularly important because learning disorders frequently involve difficulties in independently organizing learning activities, sustaining effort, evaluating performance, and shifting strategies when errors occur. The identified content domain is strongly aligned with the concept of self-regulated learning, in which students plan before learning, monitor during learning, and evaluate after learning. Research has shown that teachers' direct and indirect promotion of self-regulated learning in mathematics classrooms is crucial for developing students' regulatory competence (Dignath & Buttner, 2018). The present finding is also consistent with studies showing that metacognitive-strategy training improves cognitive self-awareness and self-regulation in students with learning disorders (Ghorbani et al., 2022). Moreover, an integrated model of socially shared regulation of learning emphasizes that regulation is shaped by metacognition, affect, motivation, and interaction, indicating that planning and self-monitoring should be taught not only as individual cognitive skills but also as socially supported classroom practices (Singh & Muis, 2024). Therefore, the proposed curriculum should include explicit activities for planning, self-questioning, checking, correction, and reflection.

The identification of skill and lifestyle content as one of the main curriculum domains shows that the proposed program should extend beyond narrow academic remediation and support students' broader adaptive functioning. This category included problem-solving, everyday decision-making, automatic performance of skills, adaptation to new situations, active lifestyle, vicarious experience, and transfer of skills to real academic tasks. This finding can be explained by the fact that students with learning disorders often struggle to transfer what they learn in intervention settings to classroom tasks, homework, and daily decision-making. Therefore, curriculum content should include practice opportunities that connect strategies with authentic academic and life situations. Evidence from mathematics and problem-solving research supports this interpretation. For example, metacognitive approaches have been used to support primary students with dyslexia in algebraic word problems, showing that structured metacognitive problem-solving can help students analyze tasks and regulate solution processes (Abdullah, 2023). Similarly, didactic designs based on metacognitive approaches have been used to overcome geometry learning difficulties by supporting creative thinking and strategic

engagement with mathematical content (Fauzi et al., 2024). Studies comparing metacognition and working-memory training in students with mathematics learning disorder further indicate that learning interventions should support both cognitive performance and emotional adaptation, including reduction of mathematics anxiety (Saeed et al., 2024). These findings support the view that curriculum content should enable students to use strategies in meaningful and transferable contexts.

The results also revealed the importance of attitudinal-value content, including academic adjustment, cognitive and behavioral flexibility, abandonment of ineffective strategies, confrontation with thoughts and emotions, belief in capability, self-efficacy, verbal persuasion, and hierarchical design. This finding indicates that reducing learning disorders requires changes not only in what students know and do but also in how they perceive their own learning capacity. Repeated failure can weaken self-efficacy, academic motivation, and willingness to engage with challenging tasks. Therefore, metacognition-based content must help students experience success, reinterpret mistakes, and believe that strategies can improve performance. This finding is supported by research showing the effectiveness of metacognitive strategies on self-efficacy and motivational beliefs among students with learning disorders (Afzalkhani & Ghadousi, 2022). It also corresponds with findings that cognitive-metacognitive strategy training can improve achievement motivation and academic vitality among students with learning disabilities (Nasiri Garmeh Cheshmeh et al., 2023). In addition, studies have shown that metacognition-based strategies can improve academic self-concept among students with spelling learning disorder, indicating that strategy mastery can gradually reshape students' beliefs about their academic competence (Rostami et al., 2019). The effectiveness of cognitive and metacognitive strategy training on academic motivation, academic engagement, and school quality of life also supports the inclusion of attitudinal-value content in the curriculum (Koukabi Rahman et al., 2022).

The final content domain identified in the study was socioemotional content, including family support, emotional communication, respect for the child, social skills, emotional skills, adaptive behaviors, and natural interpersonal relationships. This finding shows that a curriculum for reducing learning disorders should not be limited to cognitive and academic intervention but should also address the emotional and relational contexts in which learning occurs. Students with learning disorders may experience

frustration, avoidance, shame, peer comparison, weak school bonding, and dependence on adults. These experiences can intensify academic difficulties unless the curriculum includes supportive socioemotional components. This interpretation is consistent with studies showing that school well-being interventions can improve school bonding and academic self-regulation among students with learning disorders (Yahyanejad et al., 2024). It also aligns with phenomenological findings regarding parents' experiences, which show that learning disorders affect family interactions and require coordinated support between school and family (Mohammadi Armandi & Mottaghi, 2022). Moreover, the relationship between academic mediators, cognitive-metacognitive strategies, and motivational beliefs in children with specific learning disorders supports the idea that cognitive, motivational, and relational dimensions are interdependent (Ashrafzadeh et al., 2021). Therefore, socioemotional content is not a peripheral component but a necessary foundation for sustainable learning improvement.

Overall, the findings of the present study are consistent with systematic and review-based evidence indicating that metacognitive functioning plays a central role in students with learning disabilities or learning difficulties (Noureddine et al., 2024). Reviews of metacognition programs for elementary students with mathematics learning disorders have similarly emphasized the need for structured, explicit, and developmentally appropriate interventions (Hekmatnia et al., 2024). The present study extends previous findings by organizing the required curriculum content into a coherent multidimensional structure. While many previous studies have examined the effectiveness of a particular metacognitive strategy, academic intervention, or cognitive training program, the present findings suggest that curriculum content should be designed as an integrated system in which knowledge, academic skills, cognitive processing, planning, self-monitoring, lifestyle skills, attitudes, values, and socioemotional support function together. This integrated view is essential because students with learning disorders require more than short-term improvement in a single academic task; they require a curriculum that gradually develops awareness, strategy use, self-regulation, confidence, emotional adjustment, and transfer of learning to real educational contexts (Denis, 2023). Therefore, the results provide a conceptual and practical basis for designing a metacognition-based curriculum model capable of addressing the complex educational needs of elementary school students with learning disorders.

One limitation of the present study is that it was conducted using a qualitative thematic analysis of documents, scientific texts, and previous research, and therefore the findings depend on the scope, quality, and accessibility of the reviewed sources. Although the use of multiple Persian- and English-language documents strengthened the conceptual breadth of the study, the results were not tested through field implementation with elementary students, teachers, or families. In addition, because the study focused on identifying curriculum content, it did not empirically examine the effectiveness of the proposed content domains in reducing different types of learning disorders. Another limitation is that the heterogeneity of learning disorders may require more differentiated content than can be fully captured in a general curriculum framework.

Future studies are suggested to validate the proposed curriculum content through expert review, Delphi studies, and empirical implementation in elementary schools. Experimental and quasi-experimental studies should examine the effectiveness of the curriculum for students with different learning disorder profiles, including reading disorder, writing disorder, mathematics disorder, and mixed learning difficulties. Future research should also compare the effectiveness of individual, small-group, and classroom-based implementation formats and investigate the durability of outcomes through follow-up assessments. In addition, researchers should examine how teacher training, parental involvement, school climate, and students' developmental level influence the implementation and outcomes of metacognition-based curriculum content.

In practice, curriculum designers, elementary teachers, school counselors, and special education specialists should use the findings of this study to design structured, flexible, and developmentally appropriate educational programs for students with learning disorders. The curriculum should include explicit instruction in cognitive and metacognitive strategies, direct support for reading, writing, and mathematics, exercises for attention and working memory, planning and self-monitoring activities, and socioemotional support. Teachers should present tasks gradually, use modeling and guided practice, provide immediate feedback, encourage students to reflect on their own learning, and involve families in supporting strategy use at home. Practical activities, play-based tasks, short exercises, formative assessment, and real classroom assignments should be used to ensure that students can transfer learned strategies to authentic academic situations.

5. Conclusion

Taken together, the results support the view that mindfulness training is a useful psychological intervention for mothers of children with autism. The significant reduction in parenting stress and the significant improvement in parent–child relationship quality indicate that mindfulness can address both emotional and relational difficulties in these families. These findings are important because many interventions for autism focus primarily on the child’s behavioral, communicative, or educational outcomes, while the psychological needs of mothers may receive less direct attention. However, the well-being and emotional regulation of mothers are central to the quality of the caregiving environment. When mothers become less stressed and more mindful in interaction with the child, they may be better able to provide consistent, accepting, and emotionally responsive care. Therefore, mindfulness training can be viewed as a complementary intervention alongside educational, behavioral, and rehabilitation services for children with autism.

The present study had several limitations that should be considered when interpreting the findings. First, the sample size was relatively small and included only mothers of children with autism who referred to one autism center in Chalus; therefore, the generalizability of the findings to fathers, other caregivers, families from different regions, and families with different socioeconomic or cultural backgrounds should be made with caution. Second, the study relied on self-report questionnaires, and participants’ responses may have been influenced by social desirability, response bias, or temporary emotional states. Third, the follow-up period was limited to two months, which does not allow firm conclusions about the long-term durability of the intervention effects. Fourth, the study did not assess child-related outcomes, such as behavioral problems, adaptive functioning, communication skills, or emotional regulation, and therefore it is not possible to determine whether improvements in maternal stress and parent–child relationship quality were accompanied by measurable changes in child functioning. Finally, although the control group received no intervention, the study did not include an active comparison group, so the specific effects of mindfulness training cannot be fully separated from nonspecific factors such as group support, attention from the trainer, or expectation of improvement.

Future studies are recommended to replicate this research with larger samples and in multiple autism centers across

different cities to increase the external validity of the findings. It would also be useful to include fathers, grandparents, and other primary caregivers to examine whether mindfulness training has similar effects across different caregiving roles. Future research should use longer follow-up periods, such as six months or one year, to evaluate the long-term stability of intervention outcomes. In addition, future studies can compare mindfulness training with active interventions, such as parent management training, acceptance and commitment therapy, compassion-focused therapy, or combined parent-training programs, to identify the relative and specific effectiveness of each approach. Researchers are also encouraged to include observational measures of parent–child interaction, clinical interviews, physiological stress indicators, and child behavioral outcomes in order to provide a more comprehensive assessment of intervention effects. Examining mediating variables such as emotion regulation, self-compassion, parental acceptance, psychological flexibility, and coping strategies may also clarify the mechanisms through which mindfulness training reduces parenting stress and improves the parent–child relationship.

Based on the findings of the present study, mindfulness training can be recommended as a practical and supportive intervention for mothers of children with autism in autism centers, rehabilitation clinics, psychological counseling centers, and family therapy settings. Practitioners can use structured mindfulness sessions to help mothers identify stress responses, pause before reacting, regulate difficult emotions, reduce self-blame, and interact with their child with greater awareness and acceptance. The program can be integrated into parent education services and delivered in group formats to provide both skill training and emotional support. Clinicians and counselors should adapt mindfulness exercises to the real daily experiences of mothers, such as managing tantrums, sleep problems, feeding difficulties, repetitive behaviors, public judgment, and treatment-related pressure. It is also recommended that mothers be encouraged to continue brief daily practices after the end of formal sessions, because regular practice can help maintain gains in stress reduction and relational quality. Training professionals in autism centers to deliver mindfulness-based parent programs may improve the comprehensiveness of services by addressing not only the child’s needs but also the psychological well-being of the caregiver and the emotional quality of the parent–child relationship.

Authors’ Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

- Abadi, I. B. G. S., Widiana, I. W., Septiari, N. K., Listyana, I. G. A. A. P., & Rahayu, N. K. A. (2025). The impact of metacognitive-based learning strategies on enhancing students' decision-making and cognitive dissonance. *Indonesian Journal of Educational Development*, 6(1), 241-253. <https://doi.org/10.59672/ijed.v6i1.4805>
- Abdullah, A. (2023). The experiences of Primary 6 students with dyslexia using the metacognitive-based approach of problem solving for algebraic word problems. *Asia*. <https://doi.org/10.3850/S2345734123000274>
- Afshari, S., Sadeghi Nisiani, S., & Jafar Tabatabaei, A. S. (2022). The effect of metacognitive training on reducing mathematics problems in students with reading, writing, and mathematics learning disorders. *Cognitive Analytical Psychology*, 13(49), 43-53.
- Afzalkhani, M., & Ghadousi, S. (2022). The effectiveness of metacognitive strategies on self-efficacy and motivational beliefs in students with learning disorders. *Curriculum and Learner-Centered Instruction*, 2(4), 1-10.
- Aghazadeh, M. (2022). *Guide to Modern Teaching Methods Based on Brain-Based, Constructivist, Cooperative Learning, and Metacognitive Research* (14th ed.). Aeezh Publishing.
- Ashrafzadeh, S., Andishmand, V., & Soltani, A. (2021). A study of the relationship of academic mediators with cognitive-metacognitive strategies and motivational beliefs in children with specific learning disorders. *Learning Disabilities*, 11(2), 20-32.
- Dashtbani, E., & Dashtbani, M. (2024). The role of learning disorders in elementary students' use of cognitive and metacognitive strategies. 15th National Conference on Modern Research in Education, Psychology, Jurisprudence and Law, and Social Sciences, Shirvan.
- Denis, D. (2023). Using metacognitive instruction as a strategy for special needs students with.
- Dew, T. P., Swanto, S., & Pang, V. (2021). The effectiveness of reciprocal teaching as reading comprehension intervention: A systematic review. *Journal of Nusantara Studies*, 6(2), 156-184. <https://doi.org/10.24200/jonus.vol6iss2pp156-184>
- Dignath, C., & Buttner, G. (2018). Teachers' direct and indirect promotion of self-regulated learning in primary and secondary school mathematics classes: Insights from video-based classroom observations and teacher interviews. *Metacognition and Learning*, 13, 127-157. <https://doi.org/10.1007/s11409-018-9181-x>
- Fahami, Z., Norouzi, G., & Faramarzi, S. (2023). The effectiveness of training metacomprehension strategies on the reading function of students with specific learning disorder. *Biquarterly Journal of Cognitive Strategies in Learning*, 11(20), 189-209.
- Fauzi, K. M. A., Hia, Y., Darari, M. B., & Siagian, M. D. (2024). Efforts to overcome students' learning difficulties in geometry: A didactic design of creative thinking skills through metacognitive approaches. *Beta: Jurnal Tadris Matematika*, 17(2), 159-182. <https://doi.org/10.20414/betajtm.v17i2.648>
- Ghadiri Alamdari, G., Bigdeli, H., & Hosseinpour, R. (2021). The effectiveness of metacognitive-strategy training on attention-deficit symptoms and learning-disorder symptoms. *Exceptional Children*, 21(3), 93-102.
- Ghorbani, S., Kazemian Moghadam, K., & Haroun Rashidi, H. (2022). The effectiveness of metacognitive-strategy training on cognitive self-awareness and self-regulation in students with learning disorders. *Exceptional Children Quarterly*, 23(2), 119-130.
- Hekmatnia, M., Nozarinia, A., Elaji, A., & Golzari, M. (2024). A review of the metacognition program and its effect on elementary-school students with mathematics learning disorders. 3rd International Conference on Management, Education, and Training Research in Education, Tehran.
- Koukabi Rahman, E., Taghvaei, D., & Pirani, Z. (2022). The effectiveness of cognitive and metacognitive strategy training on academic motivation, academic engagement, and school quality of life among students with specific learning disorder in Hamadan. *Sociology of Education*, 8(2), 257-266.
- Lacin, E., & Cetin, E. (2022). An examination of teachers' use of metacognitive strategies in supporting the reading comprehension skills of children with learning disabilities. *International Journal of Contemporary Educational Research*, 9(3), 519-531. <https://doi.org/10.33200/ijcer.1091661>
- Lucangeli, D., Fastame, M. C., Pedron, M., Porru, A., Duca, V., Hitchcott, P. K., & Penna, M. P. (2019). Metacognition and errors: The impact of self-regulatory trainings in children with specific learning disabilities. *ZDM*, 51(4), 577-585. <https://doi.org/10.1007/s11858-019-01044-w>
- Mastrothanas, K., Kallianou, M., Katsifi, S., & Zouganali, A. (2018). The use of metacognitive knowledge and regulation strategies of students with and without special learning difficulties. *International Journal of Special Education*, 33(1), 184-200.

- Mohammadi Armandi, M., & Mottaghi, M. (2022). Experiences of parents of students with learning disorders: A phenomenological study. *Avicenna Journal of Nursing and Midwifery Care*, 30(3), 221-230.
- Moradi, M., & Mirbad, S. M. (2020). The effectiveness of Jager's metacognitive knowledge and skills program on neuropsychological skills of students with reading learning disorder. *Neuropsychology*, 6(1), 17-30.
- Mostafaei, A., & Samavati, M. (2023). Modeling nonverbal learning disorders based on neuropsychological skills and learning problems in 8- to 12-year-old female students. *Research in School and Virtual Learning*, 10(4), 103-112.
- Nasiri Garmeh Cheshmeh, M., Fathi, M., & Javidpour, M. (2023). The effectiveness of cognitive-metacognitive strategy training on achievement motivation and academic vitality among students with learning disabilities. *Learning Disabilities Quarterly*, 13(2).
- Noureddine, B., Abdellah, B., Mohammed, R., Mohammed, Z., & Amine, K. (2024). Metacognitive functioning in students with learning disabilities or difficulties: A systematic literature review. *International Journal of Learning, Teaching and Educational Research*, 23(10), 475-493. <https://doi.org/10.26803/ijlter.23.10.23>
- Rostami, M., Mousavian, S., Saeidi Aboueshaghi, R., & Shahani, S. (2019). A study of the effectiveness of metacognition-based strategies on academic self-concept among ninth-grade male students with spelling learning disorder. *Quarterly Journal of Applied Research in Counseling*, 2(4), 55-69.
- Saeed, Z., Karimi Gohari, F., Hasanpour, E., & Soltani, M. J. (2024). Comparing the effectiveness of metacognition and working-memory training on mathematics performance and anxiety in students with mathematics learning disorder and military parents. *Military Caring Sciences*, 11(1), 40-49.
- Seif Naraghi, M. (2022). *Specific Learning Disabilities: Diagnosis and Remediation Methods*. Arasbaran.
- Sharifi Asadi, R. (2023). *Metacognition in the Teaching-Learning Process*. Alim Noor.
- Singh, C. A., & Muis, K. R. (2024). An integrated model of socially shared regulation of learning: The role of metacognition, affect, and motivation. *Educational Psychologist*, 59(3), 177-194. <https://doi.org/10.1080/00461520.2023.2294881>
- Tabrizi, N., Tabrizi, A., & Tabrizi, M. (2024). *Treatment of Reading Disorders*. Fararavan.
- Yahyanejad, M., Janaabadi, H., & Kazemi, S. (2024). The effectiveness of the school well-being model on school bonding and academic self-regulation in students with learning disorders. *Learning Disabilities*, 14(2), 65-76.