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Comparing the Effectiveness of Mathematical Intelligence Enhancement Training and Storytelling-Based Problem-Solving Skills Training on Attention and Problem-Solving Skills in Children with Specific Learning Disabilities

Mahsa. Asghari[1], Ali. Naghi Aghdasi[2*], Mahdi. Aghapour[3], Alireza. Aghdami Baher[4]

[1] Ph.D. Candidate in Educational Psychology, Ta.C., Islamic Azad University, Tabriz, Iran
[2] Assistant Professor, Department of Psychology and Counseling, Ta.C., Islamic Azad University, Tabriz, Iran
[3] Aassistant Professor, Department of Psychology, Ah.C., Islamic Azad University, Ahar, Iran
[4] Aassistant Professor, Department of Psychology, Ta.C., Islamic Azad University, Tabriz, Iran

*** Corresponding author email address**: m-abbaszadeh@tabrizu.ac.ir

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A B S T R A C T

Purpose: This study aimed to compare the effectiveness of Mathematical Intelligence Enhancement Training and Storytelling-Based Problem-Solving Skills Training on improving attention and problem-solving skills in children with specific learning disabilities.

Methods and Materials: This quasi-experimental study employed a pre-test/post-test control group design. The statistical population included first-grade elementary school children with specific learning disabilities who were referred to a learning disability center in Khoy during the 2024–2025 academic year. A total of 45 students were selected through convenience sampling based on inclusion and exclusion criteria and randomly assigned to three groups: Mathematical Intelligence Enhancement Training (15 students), Storytelling-Based Problem-Solving Skills Training (15 students), and a control group (15 students). The interventions lasted for five weeks, with the math group receiving 15 sessions and the storytelling group receiving 10 sessions. Data were collected using the Conners' Continuous Performance Test to assess attention and the Problem-Solving Skills Scale to measure problem-solving skills. Data were analyzed using the Shapiro–Wilk test, one-way ANOVA, and Bonferroni post-hoc tests via SPSS-26 at a significance level of $p < 0.05$.

Findings: The results showed significant improvements in both attention and problem-solving skills in the two experimental groups compared to the control group ($p < 0.001$). Repeated measures ANOVA indicated significant intrapersonal, interactive, and interpersonal effects for all attention subscales and problem-solving scores. The storytelling-based group significantly outperformed the mathematical intelligence group in the number of correct responses, reduction of response errors,

faster reaction times, fewer missed stimuli, and higher problem-solving scores ($p < 0.05$).

Conclusion: Both interventions were effective, but storytelling-based problem-solving training produced greater gains in attention and problem-solving skills, suggesting it as a superior instructional approach for children with specific learning disabilities.

Keywords: *Problem-Solving Skills, Storytelling, Mathematical Intelligence, Learning Disability.*

1. Introduction

Specific learning disabilities (SLDs) are complex neurodevelopmental disorders that significantly affect children's ability to acquire and apply core academic skills, particularly in reading, writing, and mathematics. Although children with SLDs typically demonstrate average or above-average intelligence, they struggle with basic cognitive processes related to memory, attention, and information processing, which impede their academic performance (Bansal & Singh, 2021; Nasab et al., 2024). This discrepancy between intellectual potential and academic achievement often leads to frustration, low self-esteem, and diminished motivation. In particular, attention deficits are a hallmark of SLDs and contribute to challenges such as poor reading comprehension, difficulties in mathematical reasoning, and limited problem-solving capacity (Wickens, 2021; Wilterson & Graziano, 2021). Given the centrality of attention in learning and cognitive development, targeted interventions to enhance attention and related executive functions are essential for this population (Mohagheghi et al., 2022; Mohammadlou et al., 2024).

Attention serves as the gateway to all other cognitive processes, enabling learners to select and focus on relevant stimuli while inhibiting distractions. Theoretical frameworks such as the attention schema theory propose that attentional control arises from neural models representing one's own focus of attention, supporting adaptive behavior (Wilterson & Graziano, 2021). Deficits in this domain are highly disruptive for students with SLDs, as attentional regulation underpins tasks requiring working memory, planning, and problem-solving (Wickens, 2021). Furthermore, research indicates that the developing brain exhibits high levels of plasticity, allowing for structural and functional reorganization in response to targeted stimulation (Chen & Goodwill, 2022; Kolb & Gibb, 2011). Such neuroplastic potential highlights the value of early cognitive interventions aimed at strengthening attention and executive functions in children with learning difficulties (Bornstein et al., 2013).

One approach to leveraging neuroplasticity in this context is cognitive rehabilitation, which involves structured, repetitive practice to improve specific cognitive functions. Studies have shown that cognitive rehabilitation can enhance selective attention, cognitive flexibility, and academic progress in students with SLDs (Mohammadlou et al., 2024; Shahmohamadi et al., 2019). Related research confirms that interventions designed to build mathematical skills can also indirectly strengthen attention by engaging working memory and executive control processes (Arsalani et al., 2019; Zilaey et al., 2017). This relationship is consistent with the systems and cascades model, which posits that cognitive domains develop interactively and that improvements in one domain can produce cascading benefits in others (Bornstein et al., 2013). Consequently, mathematical intelligence enhancement training has emerged as a promising avenue for addressing both academic and attentional challenges among children with SLDs.

Mathematical intelligence encompasses not only computational ability but also logical reasoning, pattern recognition, and problem-solving capacity (Kenedi et al., 2019). Research indicates that training in these skills promotes stronger neural connectivity and enhances executive functioning, thereby improving attention regulation (Nasab et al., 2024). Programs based on the response-to-intervention (RTI) framework are particularly effective in this regard, as they provide systematic, tiered support tailored to students' learning needs (Amin Abadi et al., 2021; Bemana et al., 2017). By explicitly scaffolding foundational number concepts, operations, and measurement skills, such programs not only raise mathematical achievement but also foster confidence, motivation, and persistence, all of which are critical for sustained attention (Jalilabkenar et al., 2012; Karami et al., 2023). Studies further demonstrate that realistic mathematics education, which situates mathematical learning in meaningful real-world contexts, significantly enhances students' problem-

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solving performance and cognitive engagement (Şanal & Elmali, 2024).

Alongside mathematical training, storytelling has gained increasing attention as an innovative pedagogical strategy for children with learning difficulties. Storytelling taps into children's innate narrative comprehension abilities, engaging them emotionally and cognitively while simultaneously developing language, memory, and social skills (Mar & Oatley, 2008; Miller & Pennycuff, 2008). Cognitive theories suggest that fiction allows learners to simulate social experiences and rehearse problem-solving behaviors in a safe, imaginative space (Mar & Oatley, 2008). When stories incorporate challenges and resolutions, children learn to analyze problems, consider alternatives, and evaluate consequences—skills that transfer to real-life situations (Treffinger et al., 2023). This aligns with evidence that narrative-based instruction promotes creative problem-solving and higher-order thinking (Irmayanti et al., 2025; Treffinger et al., 2023). Moreover, storytelling can improve attention by fostering sustained listening and engagement, which activate neural circuits associated with executive control (Bartan, 2020; Ginting et al., 2024).

Empirical studies underscore the educational benefits of storytelling for learners with attention and learning difficulties. For instance, storytelling interventions have been shown to reduce symptoms of Attention-Deficit/Hyperactivity Disorder and enhance concentration and behavioral regulation (Bayat et al., 2018). Similarly, integrating storytelling with mathematics instruction has been found to alleviate math anxiety, making abstract concepts more accessible and enjoyable (Irmayanti et al., 2025). Digital storytelling, in particular, has demonstrated positive effects on knowledge retention and transferability, suggesting its potential as an inclusive and engaging educational tool (Altindağ Kumaş, 2024; Ginting et al., 2024). These outcomes are further supported by research showing that digital story-based interventions can promote cognitive development in children with intellectual disabilities, indicating their relevance for diverse learners (Altindağ Kumaş, 2024). Storytelling also nurtures communication skills, self-confidence, and self-concept, all of which are essential for academic success (Júnior et al., 2023; Karami et al., 2023).

The integration of storytelling into problem-solving training aligns well with the cognitive and emotional needs of children with SLDs. Such learners often struggle not only with attention and executive functions but also with motivation and self-regulation. Storytelling can enhance intrinsic motivation by embedding learning tasks in meaningful, emotionally engaging narratives (Júnior et al., 2023; Miller & Pennycuff, 2008). It also supports social-emotional learning, as children observe characters overcoming challenges and regulating their emotions, thereby modeling adaptive coping strategies (Mar & Oatley, 2008; Vallefuoco et al., 2022). Moreover, storytelling can facilitate the development of metacognitive skills, as learners reflect on story events, predict outcomes, and evaluate problem-solving strategies (Treffinger et al., 2023). Such metacognitive engagement is critical for children with SLDs, who often exhibit deficits in self-monitoring and strategic thinking (Bansal & Singh, 2021).

In addition to fostering cognitive engagement, storytelling enhances language abilities, which are closely linked to mathematical and problem-solving skills. Language development provides the scaffolding for conceptual understanding and reasoning, enabling children to articulate problems, justify solutions, and internalize abstract ideas (Kaveh et al., 2021). Research shows that interventions strengthening verbal abilities can improve problem-solving performance in students with intellectual and learning disabilities (Arsalani et al., 2019; Zilaey et al., 2017). Storytelling, by exposing children to rich vocabulary and complex sentence structures, naturally supports this linguistic growth (Miller & Pennycuff, 2008). Enhanced language proficiency can in turn boost working memory and attentional control, reinforcing the bidirectional relationship between these domains (Bornstein et al., 2013; Kolb & Gibb, 2011). Thus, storytelling serves as a holistic educational tool that addresses multiple cognitive dimensions simultaneously.

Despite the growing body of evidence supporting both mathematical intelligence training and storytelling-based interventions, few studies have directly compared their effects on attention and problem-solving skills in children with SLDs. This represents a critical gap, as determining the relative efficacy of these methods could inform the design of more targeted and efficient educational programs. Previous research suggests that while mathematical training may provide more direct cognitive stimulation of numerical and executive processes, storytelling might achieve greater engagement and transfer of learning by leveraging emotional and narrative structures (Irmayanti et al., 2025; Şanal & Elmali, 2024). Given that attention is foundational to all learning, interventions that can simultaneously enhance engagement and cognitive control hold particular promise for improving outcomes in this population.

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In this context, the present study aims to compare the effectiveness of two distinct yet potentially complementary interventions—Mathematical Intelligence Enhancement Training and Storytelling-Based Problem-Solving Skills Training—on the attention and problem-solving abilities of children with specific learning disabilities.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a quasi-experimental design with a pre-test/post-test and control group. The statistical population included all first-grade elementary school children with specific learning disabilities who were referred to the learning disability center in Khoy during the 2024-2025 academic year. From this group, 45 children were selected using convenience sampling based on specific inclusion and exclusion criteria and were then randomly divided into three groups: the Mathematical Intelligence Enhancement Training group, the Storytelling-Based Problem-Solving Skills Training group, and a control group.

The inclusion criteria for the study were a diagnosis of a specific learning disability from a psychiatrist and psychologist, a normal intelligence quotient, and no other behavioral or emotional disorders. Exclusion criteria included more than two absences or a desire by the child or their family to withdraw from the study.

After selecting participants based on the study's inclusion criteria, a pre-test was conducted to assess attention and problem-solving skills. Participants were then randomly divided into three groups of 15 people each, for a total of 45: a control group, a math intelligence enhancement training group, and a storytelling group.

The problem-solving skills through storytelling group attended 10 intervention sessions, held twice a week. The math intelligence enhancement training group participated in 15 sessions, three times a week. The control group went about their daily activities. A post-test was administered to all participants after the sessions were completed.

2.2. Measures

Continuous Performance Test (CPT): This test was originally designed by Rosvold et al. in 1965 to measure sustained attention in children (23). The Persian version is a computer-based software test consisting of two sets of stimuli (numbers and letters), each with 150 stimuli. Of these, 30 (20% of the total) are target stimuli, which the test taker is expected to respond to by pressing a key. The original creators of the test examined its reliability over a three-month period on a population of 520, achieving a retest reliability coefficient ranging from 0.50 to 0.92. The construct validity was also reported as favorable (24).

Problem-Solving Skills Scale (PSS): Developed in 1982 by Heppner and Petersen, this questionnaire measures how individuals approach problems and their problem-solving abilities. The PSS has 32 questions with a six-point Likert scale response ranging from "strongly agree" to "strongly disagree." The tool includes the subscales of Problem-Solving Confidence (11 items), Approach-Avoidance Style (16 items), and Personal Control (5 items). The psychometric properties of the questionnaire were examined by Chaji et al. (2022), who confirmed the model's fit. The reliability of the components and the entire Problem-Solving Skills scale were also found to be appropriate using Cronbach's alpha (Problem-Solving Confidence, 0.80; Approach-Avoidance, 0.78; Personal Control, 0.70; and Problem-Solving Skills, 0.91).

2.3. Interventions

The Mathematical Intelligence Enhancement Training was conducted over 15 sessions (three times a week) and aimed to build foundational mathematical concepts while strengthening attention and cognitive processing skills. In the first phase, children were introduced to the program and its objectives, followed by activities on understanding numbers and comparing them, learning addition and its symbol, performing single- and multi-digit addition without carrying over, practicing addition with carrying over alongside learning the concept and symbol of multiplication, performing single- and multi-digit multiplication without carrying over, practicing multi-digit multiplication with carrying over while introducing the concept and symbol of subtraction, learning single- and multi-digit subtraction with and without carrying over, and finally learning the concept and symbol of division and practicing basic division. The second phase focused on reinforcing and expanding these skills, starting with reading and writing numbers, then practicing addition, subtraction, multiplication, and division operations along with related problem-solving exercises, and concluding with the introduction of geometric shapes. Throughout these sessions, exercises were scaffolded to gradually increase complexity, encourage active participation, and strengthen sustained attention and problem-solving strategies.

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The Storytelling-Based Problem-Solving Skills Training was delivered in 10 sessions (twice a week), each lasting 60 minutes, designed to enhance children's problem-solving abilities through engaging narratives from 101 Healing Stories for Children and Adolescents by George W. Burns. After the selection and faculty approval of the stories, each session centered on a specific narrative with targeted problem-solving themes. Sessions included "Dolly and Debbie" (overcoming difficulties), "Storm on the Mountain" (optimism and pragmatic thinking), "Insomnia" (generating practical solutions), "Wally the Wizard" (accepting strengths and weaknesses), "The Bird" (evaluating pros and cons and fostering self-reliance), "The Short Man" (goal setting and adaptive thinking), "Two Countries" (self-evaluation, communication, negotiation), "Pete" (caring, cooperation, creativity), "Natalie" (self-control and habit formation), and "Creating a Wish" (goal setting and personal responsibility). Each story was followed by guided discussions and reflective exercises to help children identify the problem within the narrative, analyze the strategies used to solve it, and connect these approaches to their real-life challenges, thereby strengthening their problem-solving and attention skills through emotionally meaningful, context-rich learning experiences.

2.4. Data Analysis

For data analysis, the Shapiro-Wilk test was used to check for the normal distribution of data. A one-way ANOVA and the Bonferroni post-hoc test were used to examine the differences between the groups. The analysis was conducted using SPSS version 26, with a significance level of less than 0.05.

3. Findings and Results

Table 1 presents the pre-test and post-test scores for the dependent variables across the three groups. A repeated measures ANOVA was used to analyze the differences between the groups. The assumptions for the repeated measures ANOVA, including homogeneity of variances, normality of data distribution, and sphericity of variances, were first checked and were found to be valid.

The results of the repeated measures ANOVA, which was used to test the hypothesis and compare the pre- and post-test scores of the attention and problem-solving subscales in the three groups, are presented in Table 2.

Table 1

Results of the Inductive Thematic Analysis of the Dimensions of Suffering in Individuals with Irritable Bowel Syndrome

Variable	Source of Variation	Sum of Squares	Df	Mean Square	F	P	Eta Squared
Number of Correct Responses	Within-group factor	448.9	1	448.9	57.21	0	0.83
	Interaction effect	193.06	2	96.53	45.28	0	0.68
	Between-group comparison	93.06	2	46.53	12.34	0	0.37
Response Errors	Within-group factor	157.34	1	157.34	136.53	0	0.76
	Interaction effect	73.75	2	36.87	32	0	0.6
	Between-group comparison	99.09	2	49.54	10.19	0	0.32
Average Reaction Time	Within-group factor	479.32	1	479.32	117.12	0	0.73
	Interaction effect	218.59	2	109.29	26.7	0	0.56
	Between-group comparison	99.8	2	49.9	11.98	0	0.36
No Response to Target Stimulus	Within-group factor	448.9	1	448.9	218.89	0	0.83
	Interaction effect	203.46	2	101.73	49.6	0	0.7
	Between-group comparison	117.68	2	58.84	18.19	0	0.46
Problem-Solving Skills	Within-group factor	883.6	1	883.6	415.42	0	0.9
	Interaction effect	594.06	2	297.03	139.65	0	0.86
	Between-group comparison	781.35	2	390.67	19.91	0	0.48

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The results of repeated measures analysis of variance in Table 1 for intrapersonal, interactive and interpersonal effects of attention subscales in three groups and in two stages of pre-test and post-test showed significant differences. As the results showed, there was a significant difference in all three intrapersonal, interactive and interpersonal effects.

To examine the location of pairwise differences, Bonferroni post hoc test was used, the results of which are presented in Table 2.

Table 2

Pairwise comparison of groups

Variable	State	State	Mean Difference	P
Number of Correct Responses	Control	Math Intelligence Enhancement Training	-0.93	0.07
	Math Intelligence Enhancement Training	Problem-Solving Skills Training	-2.46	0
		Problem-Solving Skills Training	-1.53	0
Response Errors	Control	Math Intelligence Enhancement Training	-1.4	0.01
		Problem-Solving Skills Training	2.56	0
	Math Intelligence Enhancement Training	Problem-Solving Skills Training	1.16	0.04
Average Reaction Time	Control	Math Intelligence Enhancement Training	1.13	0.03
		Problem-Solving Skills Training	2.57	0
	Math Intelligence Enhancement Training	Problem-Solving Skills Training	1.44	0
No Response to Target Stimulus	Control	Math Intelligence Enhancement Training	1.33	0
		Problem-Solving Skills Training	2.8	0
	Math Intelligence Enhancement Training	Problem-Solving Skills Training	-1.33	0
Problem-Solving Skills	Control	Math Intelligence Enhancement Training	-4.03	0
		Problem-Solving Skills Training	-7.2	0
	Math Intelligence Enhancement Training	Problem-Solving Skills Training	-3.16	0

The results in Table 2 showed that both the math intelligence and storytelling groups performed better than the control group in attention subscales. This was evidenced by an increase in the number of correct responses and a decrease in response errors, average reaction time, and failure to respond to the target stimulus. Furthermore, the storytelling group performed significantly better than the math intelligence group. The results also indicated that both the math intelligence and storytelling groups had better problem-solving skills compared to the control group, with the storytelling group performing significantly better than the math intelligence group in this area as well.

4. Discussion and Conclusion

The results of this study demonstrated that both the Mathematical Intelligence Enhancement Training (MIET) and the Storytelling-Based Problem-Solving Skills Training (SBPSST) had significant positive effects on the attention and problem-solving skills of children with specific learning disabilities (SLDs), with the storytelling-based approach proving more effective than the mathematical intelligence enhancement program. This finding reinforces the growing body of literature emphasizing that multi-modal, developmentally appropriate interventions can substantially improve cognitive functioning in children with SLDs, who often struggle with persistent deficits in attention, working memory, and executive functioning (Bansal & Singh, 2021; Mohammadlou et al., 2024; Nasab et al., 2024).

The enhancement of attention observed in the MIET group aligns with previous research showing that engagement in structured mathematical training stimulates neural systems involved in attentional control and executive functioning. Training in number concepts, arithmetic operations, and problem recognition requires sustained cognitive effort, thereby activating prefrontal and parietal regions implicated in attentional regulation (Bornstein et al., 2013; Kolb & Gibb, 2011). The repetitive nature of math practice strengthens working memory and inhibitory control, both critical components of attention (Wickens, 2021). Moreover, the RTI-based design of the MIET program,

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which offers graduated levels of support tailored to students' learning needs, has been shown to enhance engagement and cognitive persistence (Amin Abadi et al., 2021; Bemana et al., 2017). These mechanisms explain why the MIET group exhibited improved accuracy, faster response times, and fewer errors on the Continuous Performance Test. Similar outcomes have been reported by studies showing that math-based cognitive training enhances attention and executive functions in children with SLDs (Arsalani et al., 2019; Shahmohamadi et al., 2019; Zilaey et al., 2017).

Despite the positive effects of MIET, the SBPSST group outperformed it across all measured attention subscales. This superiority is consistent with prior evidence suggesting that storytelling-based interventions naturally foster sustained attention through their emotionally engaging and cognitively stimulating nature (Bartan, 2020; Ginting et al., 2024). Listening to stories requires children to track narrative sequences, anticipate events, and maintain focus on relevant details—processes that directly engage and strengthen attention networks (Wilterson & Graziano, 2021). Neurocognitive studies indicate that storytelling activates the default mode and executive control networks simultaneously, enhancing both engagement and self-regulation (Chen & Goodwill, 2022; Mar & Oatley, 2008). Furthermore, the intrinsic enjoyment associated with stories boosts motivation, which in turn supports sustained concentration, particularly in children who typically find academic tasks aversive (Irmayanti et al., 2025; Miller & Pennycuff, 2008). These findings explain why the storytelling group showed marked reductions in reaction times and errors compared to the MIET group.

A key factor underlying the superior impact of SBPSST on attention may be its ability to reduce math-related anxiety. Anxiety consumes cognitive resources, reducing working memory availability and disrupting attentional focus (Bortolon et al., 2019). Storytelling can present mathematical ideas in an emotionally safe and engaging context, lowering anxiety and enabling children to allocate more cognitive resources to the learning task (Irmayanti et al., 2025; Karami et al., 2023). This emotional regulation effect likely contributed to the heightened attentional engagement observed in the storytelling group. Additionally, storytelling offers multimodal stimulation—visual imagery, auditory narration, and emotional resonance—which has been shown to enhance attention span and focus in children with learning difficulties (Altindağ Kumaş, 2024; Bayat et al., 2018). Thus, while MIET strengthens attention primarily through cognitive demand, SBPSST appears to achieve both cognitive and emotional engagement, producing stronger attentional gains.

In terms of problem-solving skills, the study also found that both interventions led to significant improvements compared to the control group, with the storytelling-based method again yielding superior results. The positive impact of MIET on problem-solving aligns with findings that mathematical training enhances analytical thinking, logical reasoning, and executive functioning—all of which underpin effective problem-solving (Kenedi et al., 2019; Nasab et al., 2024). Engaging with numerical patterns and operations trains children to identify problems, plan steps, and monitor progress, thereby generalizing to broader problem-solving contexts (Şanal & Elmali, 2024). Research indicates that structured mathematics programs can build perseverance and self-confidence, which are critical motivational resources for problem-solving (Arsalani et al., 2019; Jalilabkenar et al., 2012). These mechanisms explain why the MIET group displayed marked gains on the Problem-Solving Skills Scale.

However, the storytelling-based group showed even greater improvements in problem-solving. This finding echoes evidence that narratives inherently model the problem-solving process by presenting characters who confront obstacles, generate solutions, and evaluate outcomes (Mar & Oatley, 2008; Treffinger et al., 2023). Children who listen to and engage with such stories internalize these cognitive scripts and can transfer them to real-life situations. Storytelling also fosters perspective-taking and flexible thinking, enabling children to generate multiple possible solutions to a problem (Miller & Pennycuff, 2008; Vallefuoco et al., 2022). These qualities are particularly valuable for children with SLDs, who often exhibit cognitive rigidity and struggle to consider alternative strategies. Additionally, storytelling enhances language and communication skills, which are closely linked to problem-solving ability, as articulating problems and reasoning through solutions requires robust verbal capacities (Kaveh et al., 2021; Zilaey et al., 2017). The synergistic combination of cognitive, emotional, and linguistic stimulation likely explains the superior outcomes of the SBPSST group.

The multimodal and affectively rich nature of storytelling also promotes deeper encoding and retrieval of problem-solving strategies. Studies show that digital storytelling enhances the retention and transferability of knowledge by creating meaningful contextual associations (Ginting et al., 2024). Similarly, early mathematics programs that integrate storytelling have been found to improve not only conceptual

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understanding but also self-efficacy and engagement (Altindağ Kumaş, 2024; Karami et al., 2023). By embedding problem-solving strategies within compelling narratives, SBPSST may enable children to more effectively consolidate and retrieve these skills during novel tasks. The motivational and self-regulatory benefits of storytelling further support this process: observing story characters persist through challenges can inspire resilience and persistence in young learners (Júnior et al., 2023; Miller & Pennycuff, 2008). In contrast, while MIET develops problem-solving skills through cognitive challenge, it may not elicit the same emotional investment or personal relevance as storytelling, limiting its impact on spontaneous transfer and application of strategies.

Overall, these findings contribute to the growing literature suggesting that while both mathematical training and storytelling can enhance cognitive skills in children with SLDs, storytelling-based approaches may produce more robust and transferable improvements, particularly in attention and problem-solving. This aligns with the theoretical perspective that cognitive development occurs through interactive cascades across domains, and that emotionally meaningful, context-rich learning experiences promote broader cognitive gains than decontextualized skill drills (Bornstein et al., 2013; Treffinger et al., 2023). By simultaneously engaging cognitive, emotional, and linguistic systems, storytelling appears to leverage neuroplasticity more holistically than purely cognitive training approaches (Chen & Goodwill, 2022; Kolb & Gibb, 2011). These results underscore the importance of incorporating narrative-based methods alongside traditional cognitive interventions to support the multifaceted developmental needs of children with SLDs.

This study, while yielding valuable insights, is subject to several limitations. First, the sample size was relatively small, comprising only 45 children, which may limit the generalizability of the findings. A larger and more diverse sample could produce more robust and externally valid results. Second, the use of convenience sampling from a single learning disability center in Khoy may have introduced selection bias, as participants may not represent the broader population of children with SLDs. Third, the study's quasi-experimental design, although incorporating random assignment to groups, does not provide the same level of control over confounding variables as a fully randomized controlled trial. Fourth, the intervention duration was relatively short (five weeks), which may not have been sufficient to observe the full range of potential cognitive changes. Fifth, the study relied solely on performance-based assessments and self-report scales, without incorporating neurophysiological or observational measures that could provide convergent evidence of attentional and problem-solving improvements. Lastly, the absence of a follow-up phase limits the ability to determine the durability of the observed effects over time.

Future research should address these limitations to deepen our understanding of effective interventions for children with SLDs. Larger-scale randomized controlled trials are needed to confirm the comparative effectiveness of mathematical intelligence training and storytelling-based approaches, ensuring more rigorous control over confounding variables. Researchers should also explore the long-term effects of these interventions through follow-up assessments at multiple time points to evaluate the stability and durability of cognitive gains. It would be valuable to examine how individual differences—such as baseline cognitive profiles, comorbid conditions, and motivational factors—moderate responsiveness to each intervention, allowing for more personalized instructional planning. Additionally, future studies could incorporate neuroimaging or electrophysiological measures to elucidate the neural mechanisms through which storytelling and mathematical training influence attention and problem-solving processes. Researchers should also explore hybrid models that integrate the strengths of both approaches, potentially combining the cognitive rigor of math training with the engagement and emotional resonance of storytelling. Finally, cross-cultural studies are warranted to assess the generalizability of these findings across diverse educational contexts and cultural settings.

In practice, educators and intervention specialists should consider incorporating storytelling-based methods into instructional programs for children with SLDs, particularly when the goal is to enhance attention and problem-solving skills. Storytelling can be woven into mathematics lessons to make abstract concepts more concrete, engaging, and emotionally meaningful. Teachers should also receive training in narrative techniques, including how to select or craft stories that model effective problem-solving strategies and self-regulation. Additionally, integrating visual, auditory, and kinesthetic elements within storytelling can further enhance engagement for diverse learners. While storytelling may offer broader cognitive and motivational benefits, it should not replace mathematical training entirely; instead, educators can adopt a blended approach that leverages the complementary strengths of both methods.

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Collaborative planning between special educators, psychologists, and curriculum designers can ensure that interventions are developmentally appropriate, culturally relevant, and aligned with individual students' learning profiles. Through such integrative practices, educational systems can more effectively support the cognitive and academic development of children with specific learning disabilities.

Authors' Contributions

All authors significantly contributed to this study.

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.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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