# High Impact, Time Efficient Math Intervention for Students with Learning Difficulties

Michael R. Terry

Columbia College

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Dr. Lindsay Zeiter

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## Introduction

The educational needs of students who have learning difficulties in mathematics require specific teaching methods which focus on their particular needs and work at an optimal pace. Teachers in actual classrooms must work under multiple limitations which include brief intervention periods and multiple educational requirements and students with different learning requirements. The traditional remediation approach requires students to perform extended practice sessions which include repeated attempts at the same material. However, additional time alone doesn't ensure a durable understanding for all students.

Learning science suggests that instructional clarity, cognitive load management, and intentional transfer design matter more than duration. When intervention emphasizes structured modeling, strategic practice, and metacognitive regulation, students are more likely to demonstrate independent problem solving beyond guided contexts.

Over the course of this inquiry, my focus became more refined. Early research explored broader structural influences shaping educational systems and support mechanisms. As the project developed, the emphasis narrowed toward instructional practice, specifically how teachers can design high impact, time efficient math intervention for students with identified learning difficulties. This progression reflects a shift from examining systems broadly to analyzing classroom level strategies that can be implemented immediately and effectively within real instructional limits.

The purpose of this inquiry is to synthesize research identifying instructional strategies that are high impact, efficient, and transferable. Rather than asking what is ideal in theory, this project examines what works in practice.

## Research Synthesis

Across the literature, five consistent themes emerge regarding high impact, time efficient math intervention. Although studies vary in methodology and context, the findings converge around instructional precision, cognitive design, responsiveness, and deliberate transfer. Collectively, these studies suggest that effectiveness is driven less by increased time and more by how instruction is designed.

### *Theme 1: Explicit, Structured Instruction Reduces Cognitive Load*

The research demonstrates that when students receive explicit models, systematic step-by-step instruction, and guided practice, they demonstrate significantly better learning outcomes compared to unstructured remediation approaches. Worked examples and gradual release of responsibility support learning by reducing extraneous cognitive load, allowing students to allocate their working memory resources to meaningful problem-solving rather than procedural confusion.

The research shows that intervention effectiveness depends primarily on instructional precision and organizational clarity rather than on the duration of instruction. Without well-structured implementation, interventions are unlikely to produce meaningful gains.

### *Theme 2: Retrieval Practice and Distributed Review Strengthen Retention*

Practice structure remains a critical factor consistently emphasized throughout the literature. Research on spaced practice, cumulative review, and interleaved problem types demonstrates that brief, frequent retrieval practice produces superior long-term retention compared to massed practice sessions. Students develop stronger pattern recognition and strategy selection skills through varied problem presentation rather than through consecutive exposure to

identical problem types. Importantly, these retention gains do not require additional instructional time.

This pattern persists across the literature: strategic instructional design produces superior outcomes compared to simply extending existing interventions.

***Theme 3: Strategy Instruction and Metacognitive Regulation Promote Independence***

Effective intervention prioritizes student agency in problem-solving rather than mere procedural accuracy. Research on self-regulation and metacognitive scaffolding demonstrates that students with learning difficulties benefit substantially from explicit instruction in planning, monitoring, and evaluating their mathematical reasoning. Think-aloud protocols and structured problem-solving frameworks enable students to develop cognitive ownership of the problem-solving process. Critically, these gains extend beyond performance metrics to include increased learner independence.

For durable improvement, instruction must strengthen students' thinking processes, not merely their capacity to produce correct answers.

***Theme 4: Data Driven Micro Adjustments Increase Instructional Precision***

The research consistently demonstrates the importance of instructional responsiveness. Intervention models incorporating regular progress monitoring produce superior outcomes compared to static, predetermined approaches. Brief, targeted assessments enable teachers to adjust instruction immediately, preventing misconceptions from solidifying into entrenched learning obstacles. Efficiency stems not from acceleration but from continuous, data-informed instructional adjustments.

Responsive instruction simultaneously improves outcomes and optimizes instructional time.

### *Theme 5: Authentic Transfer Requires High Fidelity Application Tasks*

The research consistently emphasizes a critical distinction: successful performance with scaffolding does not guarantee transfer to novel situations. Students may demonstrate competence during guided practice yet struggle when confronted with complex, ambiguous problems featuring competing constraints or multi-step reasoning requirements. Transfer improves when students must independently select strategies and articulate their reasoning in unfamiliar contexts.

For math intervention, that means you need to build in structured simulations, things like applied budgeting scenarios, modeling tasks with multiple constraints, or data interpretation problems where they have to write out their justification. These are the high-fidelity applications that create productive struggle while still connecting to what you're teaching.

Transfer requires deliberate instructional design; it does not emerge spontaneously from traditional practice.

## Recommendations for Educators

The research converges on a central principle: instructional impact derives from precision, structure, responsiveness, and intentional transfer design. The following recommendations operationalize these principles for classroom implementation.

### *1. Set Up Structured Daily Intervention Cycles*

Begin each session with brief retrieval practice reviewing previously mastered content. Follow with explicit modeling of target concepts or strategies, then provide guided practice with

systematic scaffolding. Gradually release instructional support as students demonstrate increasing competence. Conclude with structured reflection requiring students to articulate their reasoning or identify persisting areas of confusion. Consistent session structure reduces cognitive load and enhances retention without requiring additional instructional time.

***2. Use Micro-Assessments to Drive Your Decisions***

Implement brief, skill-specific exit slips or formative assessments to gauge student understanding before proceeding to subsequent content. Use assessment data to make immediate instructional adjustments regarding grouping configurations, pacing, and content delivery approaches. Identify misconceptions early in each instructional unit rather than at summative assessment points. Evidence-based responsiveness prevents error accumulation and improves instructional efficiency.

***3. Teach One Consistent Problem-Solving Framework***

Teach a consistent problem-solving framework applicable across mathematical contexts. Students should learn to: identify problem types, select appropriate strategies, monitor their reasoning process, and evaluate solution reasonableness. Consistent use of this framework develops cognitive stability and promotes student independence from direct teacher support. This structured approach builds self-reliance as students encounter novel problem situations.

***4. Design High-Fidelity Transfer Tasks***

Following intervention cycles, implement applied tasks requiring independent strategy selection and written justification. Examples include multi-constraint word problems, budgeting scenarios, or data interpretation tasks featuring inherent ambiguity. These tasks create productive

struggle while maintaining connection to instructional content. Transfer occurs when students must authentically apply learned concepts rather than simply replicate procedures.

***5. Go for Depth, Not Volume***

Prioritize explanatory depth over problem volume. Instruction should emphasize conceptual understanding rather than procedural fluency alone. Provide students opportunities to revise their work following targeted feedback. Learning is optimized when students develop robust reasoning abilities rather than simply completing additional practice exercises.

**Annotated Bibliography**

Banerji, O. (2025). The best ways to teach word problems so all students understand. *Education Week*, *44*(26), 12–14.

The article combines existing research to identify successful methods for teaching word problems which benefit students who have learning challenges and those who learn differently. The author investigates educational approaches which help students understand material better and solve problems effectively while teaching students at various skill levels. The research shows that students learn to decode problem structures through explicit strategy instruction which works together with schema-based methods instead of using surface-level keyword strategies that confuse struggling learners. The article demonstrates that students need to learn two essential skills for word problem success which include recognizing mathematical connections and choosing correct solution methods depending on problem characteristics. The main restriction of this document stems from its concise structure which delivers general information instead of complete execution instructions. The third theme receives support from this research because problem structure instruction in strategic approaches leads students to develop independent problem-solving abilities which they can apply to new situations instead of repeating learned procedures.

Brave, K. L., Berman, I., Basu, D., & Szkotak, A. (2025). Using manipulative-based instructional sequences to increase the understanding of fractional concepts of students with mathematical learning disabilities. *Teaching Exceptional Children*, *57*(5), 368–378. https://doi.org/10.1177/00400599241231228

The research evaluated how manipulative-based teaching methods help students with mathematical learning disabilities learn fraction concepts. The participants received their instruction through the concrete-representational-abstract framework which started with physical objects then moved to visual aids before ending with abstract mathematical symbols. The research findings demonstrated that students learned fraction concepts better and their skills for working with fractions became more effective. The authors explain that the methodical sequence leads to better learning because it starts with concrete experiences which progress to abstract conceptual understanding. The program structure enables students to create mental models which help them reason instead of learning procedures by memory. The research focuses on fractions as its main subject but the teaching method works for all mathematical content areas. The research evidence confirms the first theme which shows that teachers need to use scaffolded teaching methods to deliver information which controls student mental workload effectively through precise instructional approaches.

Chan, C. T., Zulnaidi, H., & Leong, K. E. (2025). Mediating role of metacognitive awareness between attitude and mathematics reasoning in pre-service teachers. *European Journal of Science and Mathematics Education*, *13*(2), 90–102.

This study investigated the relationship between metacognitive awareness, attitudes, and mathematical reasoning in pre-service teachers. The researchers used structural equation modeling to study 100 participants who showed that metacognitive awareness acts as a mediator which connects positive math attitudes to reasoning abilities. The research shows that students need metacognitive awareness which includes planning and monitoring and evaluation skills to solve mathematical problems effectively. Teachers who showed higher metacognitive awareness

demonstrated better skills to analyze problems and choose suitable strategies and assess their thinking process. The research focuses on pre-service teachers instead of K-12 students but the discovered principles probably work for students at lower grade levels. The research findings from this study demonstrate that metacognitive regulation helps students develop their mathematical reasoning abilities and strategic thinking competencies which exceed their fundamental arithmetic skills. The process of building thinking process awareness leads to student independence and better application of learned skills.

Cohen, J., Jones, N., & Gibbons, L. (2025). The missing middle? General and special educators' views of effective mathematics instruction. *AERA Open*, *11*, 1–14. https://doi.org/10.1177/23328584251344901

The research used mixed-methods to investigate how teachers from general and special education classrooms define successful math teaching methods for their students who have learning challenges. The researchers conducted surveys and interviews with 215 educators who showed strong agreement about three essential teaching methods which include explicit instruction and visual representations and systematic scaffolding. Teachers employed two distinct math teaching methods which emphasized either conceptual understanding or procedural fluency but special educators primarily used explicit modeling with structured practice for their teaching approach. The authors state that successful intervention needs both conceptual and procedural instruction to work together instead of being used as individual targets. The research depends on teacher opinions instead of using direct methods to evaluate teaching methods. Research evidence shows that instructional design with particular model presentation methods and practice guidance and review sequences leads to better results than extended instructional time.

Hughes, S., & Cuevas, J. (2020). The effects of schema-based instruction on solving mathematics word problems. *Georgia Educational Researcher*, *17*(2), Article 2. https://doi.org/10.20429/ger.2020.170202

The research investigated how schema-based instruction impacted word-problem solving skills of seven second-grade students who received individualized education programs. The research used a multiple-baseline design to teach students how to identify problem schemas (total, difference, change, equal groups) through explicit instruction while they learned to create graphic organizers for problem structure representation. The research findings showed that students applied their strategies more often while achieving better results throughout the instructional period while their ability to identify problem types and select proper solutions improved. The authors explain that students achieve better results through direct instruction of problem organization instead of learning basic vocabulary terms. The research contains two main restrictions because it works with a limited number of participants and studies students who are in their first years of elementary school. The research findings from this study show that students who get direct strategy instruction with metacognitive support will learn to solve problems independently and use their acquired knowledge for solving different problems.

Mouanoutoua, J., McComas, J., Xiong, E., & Almalki, M. (2024). The effects of a math intervention identified during a brief experimental analysis for middle-school students. *Journal of Behavioral Education*, *33*(4), 1–32. https://doi.org/10.1007/s10864-024-09567-3

The research used brief experimental analysis to identify the most effective intervention approaches which would benefit middle school students who required math skill support. The

researchers conducted systematic tests of various instructional elements which included explicit modeling and guided practice and immediate feedback to identify the most effective combination for student learning progress. The research results showed that using data to choose intervention components resulted in quicker skill development than when using established intervention protocols. The authors demonstrate that brief experimental analysis helps teachers find the best teaching methods for individual students instead of using extended interventions which might not solve their learning problems. The analysis process takes up valuable time but this investment leads to future time savings because it helps avoid delivering useless educational content. This source strongly supports the fourth theme by showing that data-driven, individualized adjustments increase both precision and efficiency—you're not extending time, you're optimizing what happens during that time.

Namkung, J. M., Peng, P., & Goodrich, M. J. (2025). The relation between mathematics anxiety and mathematics competence for students with versus without mathematics learning difficulties. *Learning Disability Quarterly*, *48*(2), 143–153. https://doi.org/10.1177/07319487241301410

The research used 73 studies which studied mathematics anxiety in relation to student competence while investigating students who did and did not have math learning difficulties. The research results showed anxiety created a moderate negative impact on student performance which became more pronounced because of learning difficulties among students. The authors discovered that teaching methods which combined direct skill teaching with student strategy development produced better results for both anxiety reduction and performance enhancement than methods which only taught skills. The research shows that teaching students to recognize

their thinking processes and develop strategic learning methods will help them control their emotions while they become better at mathematics. The research contains different intervention methods which makes it difficult to compare results between studies. The research evidence demonstrates that metacognitive instruction enables students to develop problem-solving independence while building their confidence and emotional control during problem-solving activities.

Nelson, G., Hunt, J. H., Martin, K., Patterson, B., & Khounmeuang, A. (2022). Current knowledge and future directions: Proportional reasoning interventions for students with learning disabilities and mathematics difficulties. *Learning Disability Quarterly*, *45*(3), 159–171. https://doi.org/10.1177/0731948720932850

The research study combined multiple studies which investigated proportional reasoning intervention methods for students who have learning disabilities and math learning challenges. The researchers studied 15 research papers to discover three essential elements which proved successful in teaching mathematics: students learn through explicit instruction which follows the concrete-representational-abstract sequence and they use visual models including double number lines and ratio tables and they practice with different problem types through structured activities. The research findings showed effect sizes which spanned from medium to large in magnitude. The authors demonstrate that educational programs which unite conceptual learning with procedural training methods produce better results than programs which concentrate on either aspect independently. The current research faces a major restriction because scientists have conducted only a few studies which demonstrate that this subject needs additional investigation. The review confirms the first and second themes because it shows that students achieve better

results through structured teaching methods which combine visual support with practice distribution instead of doing more practice without strategic planning.

Powell, S. R., Lariviere, D. O., & Clemens, N. H. (2025). Strategy instruction in mathematics and reading for elementary students with learning disabilities. *Teaching Exceptional Children*, *58*(2), 98–107. https://doi.org/10.1177/00400599251335678

The research article combines studies about teaching strategic methods to elementary students who have learning disabilities in their reading and math classes. The researchers studied how students used mnemonic-based strategies (FOPS and RUN) together with schema instruction to solve word problems and they discovered that teaching students to follow specific problem-solving steps led to better results. The instructional approach consisted of three essential elements which started with teacher demonstrations through think-alouds followed by guided practice with feedback and ended with student independence through progressive release. The authors state that strategy instruction requires students to learn both the steps of a strategy and the specific conditions for using each step because metacognitive skills enable students to apply strategies to new situations. The research shows that mathematical education and reading methods have a direct connection because direct instruction produces the same learning outcomes for these two subjects. Research evidence shows that students who receive problem-solving framework instruction through organized teaching methods will learn to solve problems independently while using their acquired knowledge for different situations.

Powell, S. R., Mason, E. N., Bos, S. E., Hirt, S., Ketterlin-Geller, L. R., & Lembke, E. S. (2021). A systematic review of mathematics interventions for middle-school students

experiencing mathematics difficulty. *Learning Disabilities Research & Practice*, *36*(4), 295–329. https://doi.org/10.1111/ldrp.12263

The research analyzed 29 middle school mathematics intervention studies which studied students with math difficulties from 2000 to 2019. The authors studied intervention characteristics together with instructional components and effect sizes which they measured across various mathematical subject areas. The research findings showed that teaching methods which used direct instruction combined with visual aids and performance tracking and step-by-step support achieved the best results. The length of intervention time did not determine results because what produced success depended on the effective design of teaching methods. The research found that teaching methods which use concrete-representational-abstract sequences together with schema-based instruction produced the best results for word problem solving. The research contains different measurement methods which make it difficult to compare results between studies. The research results from this review study confirm two vital principles which demonstrate the requirement for particular teaching approaches and the need to use student achievement results for educational intervention planning instead of prolonging programs.

Swanson, H. L., Orosco, M. J., & Reed, D. K. (2025). The mathematical word problem-solving performance gap between children with and without math difficulties: Does working memory mediate and/or moderate treatment effects? *Child Neuropsychology*, *31*(3), 391–427. https://doi.org/10.1080/09297049.2024.2382202

The research study used meta-analysis to determine if working memory functions act as either a linking factor or a controlling element for math intervention programs which help students who struggle with math. The researchers analyzed 47 studies which included 3,847 participants to

discover that working memory-friendly interventions with direct teaching methods achieved better results than interventions which ignored working memory capacity. The research demonstrated that students who had limited working memory capacity achieved better results through three particular teaching methods which consisted of systematic sequencing and visual scaffolds and structured problem-solving routines. The authors state that intervention programs need to reduce unnecessary mental effort which allows students to dedicate their thinking capacity to problem-solving instead of handling task requirements. The research study demonstrates that students with learning difficulties achieve better results through specific teaching methods which decrease mental workload instead of spending more time in class.

Vostanis, A., Padden, C., Chiesa, M., Rizos, K., & Langdon, P. E. (2021). A precision teaching framework for improving mathematical skills of students with intellectual and developmental disabilities. *Journal of Behavioral Education*, *30*(4), 513–533. https://doi.org/10.1007/s10864-020-09394-2

The research used precision teaching methods which included regular assessment and data-driven choices and structured practice to enhance math abilities of students who have intellectual and developmental disabilities. The researchers conducted single-subject design studies with six participants to monitor their daily math skill development of number identification and basic operations and money skills while making educational adjustments according to their progress rates. The research demonstrated that students acquired new skills more efficiently through teacher monitoring of their progress and immediate educational adjustments rather than following a predetermined timeline. The authors state that practice efficiency results from ongoing data-based small adjustments instead of adding more time to practice. The program

teaches only basic skills instead of teaching students to solve complex problems. The research evidence from this study confirms the fourth theme by showing that using data to create flexible teaching methods produces better results at a faster pace without needing students to spend more time in class.