



How to Use This Resource

Why This Resource?

Solving for Why: Understanding, Assessing, and Teaching Students Who Struggle with Math, Grades K–8 blends current research on ways to understand and identify the math with which learners struggle with practical, mainstream classroom practice. The gap between those who learn math with relative ease and those who struggle creates inequities in opportunities for higher education and for the workplace. *Solving for Why's* research-driven, practical, friendly approach supports educators in narrowing this achievement gap. The contents are primarily focused on learning about struggling students and assessing student knowledge and understanding to guide intervention aimed at student success. This focus, on *understanding the mathematical thinking of struggling learners* and using that knowledge to design instruction for their success, is remarkably different from recipe-type approaches that assume the same solution applies to learners with similar struggles. Rather, the solution to mathematical struggles is often revealed from a rich understanding of each individual learner.



It is estimated that, for every two years of school, children who struggle with math acquire only one year's worth of mathematical proficiency . . . struggling learners who are not subjected to early intervention may reach a learning plateau by middle school and acquire the equivalent of one year of mathematical proficiency during grades 7–12 . . . the disparity between those who learn math with relative ease and those who struggle with math disabilities is widening at an alarming rate.”

—PBS, “Difficulties with Mathematics”

Who Is This Resource For?

Solving for Why is a resource for anyone who teaches mathematics, grades K–8. It is useful for classroom teachers, resource room teachers, special educators, math leaders (curriculum specialists, math coaches, etc.), and principals. These professionals have reported benefits from the perspectives, assessments, and approaches to remediation shared in this resource.

My Story

The Louder and Slower Approach

One of my own struggles as a classroom teacher—and one of the most helpful experiences I’ve had as a teacher—is finding ways to help students who have difficulty understanding the math I am teaching. There seems to be a broad range of student difficulties. Some students grapple with remembering math facts. Some have difficulty with problems. Others seem to learn something one day and forget it the next.

Whenever I researched how to help these students, or asked one of the school’s learning specialists for help, I frequently seemed to get the same response: Take it slower. Practice longer. Don’t expect too much understanding. I have come to call this method the “louder and slower approach.”

Louder and slower is similar to how my friend Michael approaches speaking to locals when he’s traveling in another country. When the person he’s trying to speak with doesn’t understand what he’s saying, Michael reverts to talking louder and slower. He makes it seem like the person he’s talking to is deaf, not that they simply don’t share the same language.

If we stretch this analogy, we can imagine Michael, a native English speaker, trying to speak to Joan in another country who, rather than having no understanding of English at all, has learned a few phrases:

Michael: Hi. Do you speak English? Do you know where the ATM is?

Joan: Good day. Pleased to meet you.

Michael: Pleased to meet you, too. Do you know where . . .

Joan: Thank you. Pleased to meet you.

Michael: DO YOU KNOW WHERE . . .

Being a struggling learner, it turns out, can be a lot like being a foreigner when your teacher is Michael. Teaching a struggling learner can be a lot like being Michael. We want to communicate but we only have an instinct for louder and slower. When I was a new teacher I had a discouraging

conversation with a colleague in which he urged me not to spend too much time helping a fourth-grade student understand multiplication. His view was (this was, and still is, very common) that this student did not have the capacity and/or time to learn what multiplication was and how it worked. His prescription was to drill the algorithm and facts and hope for the best. At the time I deferred to his judgment, though it felt like putting up a white flag. I remember feeling that a ten-year-old was too young for us to give up on. (Are they ever old enough for that?)

What's called for is understanding. After years as a math specialist in rural and urban schools, and hundreds of hours reading others' research and conducting my own, I've learned that there are alternatives to louder and slower. I feel we, as a community of educators, are at the beginning of what will be a productive period of research and exploration of mathematical difficulties. This resource represents an effort to bring together research and classroom practice and to create a model for instruction that recognizes the importance of conceptual understanding, of understanding our students, and of helping them gain access to important mathematical ideas in appropriate ways. We do this, to return to my foreign-language metaphor, by learning the language of the students whom we teach. Rather than shouting slowly, we must try to understand how our students think, how they make sense of mathematical ideas (if they do), and how to create a learning environment for them that allows them to do their best work.

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Solving for Why represents a new set of tools for teachers—something beyond louder and slower. As more teachers test these ideas in the field, and as empirical research on their effectiveness grows, we will develop better and better ideas of how to serve our students who struggle with mathematics. If you've chosen to read this resource and apply its principles, congratulations—you are now part of the process.

What Is the Research?

This resource is centered around what I call the Math for Struggling Learners (MSL) approach. MSL is the marriage of research and practice in what researchers sometimes call “design research.” What that means is that I used whatever I could glean from current literature and research and had teachers try it out and help me make it better. I worked with about two hundred teachers over four years to develop and hone these ideas. Each group tested assessments, gave suggestions and feedback on the nitty-gritty details of how to administer them, and shared their insights into how developing theories for instruction helped them teach struggling learners.

The teachers whom I worked with (in professional development settings) represent the full range of classroom experience. Teachers from kindergarten through high school have tested and worked with the ideas in this



What Is RTI and Does This Resource Address It?

Response to Intervention (RTI) is an approach to identifying special needs that relies on creating and using research-based interventions to support struggling students and to gain information about their understanding. The RTI approach uses increasingly focused forms of intervention to address student needs. The goal is to serve students in the least restrictive and most appropriate environment.

Solving for Why takes a similar approach to supporting struggling learners. The idea is to “solve for why”—to gain insight into student understanding—through frequent assessment and communication with students. These insights into student thinking help inform instruction and create an evolving intervention to meet student needs. This is the kind of focused instruction that RTI calls for.

This resource also makes use of several instructional formats that allow for the development of problem-solving skills. It addresses the development of conceptual models, focused practice, and feedback with those models during strategy development, as well as the development of procedural skill with algorithms. Part 3 shares a lesson plan format that allows teachers to practice both inclusion and differentiation to meet the needs of a wide variety of learners. Practitioners of RTI will find *Solving for Why* to be a resource that informs both the evaluation of struggling math students and the creation of effective instructional plans for these students. ■

resource. The work of the kindergarten teachers in the MSL courses helped me realize how the MSL approach should be modified for early childhood. The high school teachers articulated the numerous connections between their work and the work in earlier grades. They helped me understand how important conceptual models are, even for students in higher math.

Many special-education professionals have also helped refine what I have come to think of as “our thinking” about teaching struggling learners. One particular teacher stands out. She taught a self-contained classroom for profoundly challenged learners. I was unsure whether she would be able to apply our assessments and thinking in such a difficult setting. By knowing her students well, and by adapting the activities, she showed me that a skillful teacher can have meaningful mathematical interactions with her students, even when they have significant challenges.

One particular MSL class was noteworthy in that there were several teachers who exclusively taught children with behavioral/emotional difficulties. They helped me to appreciate how important affect is to developing mathematical understanding. These professionals gave me a great deal of insight into the importance of setting and pace in conducting clinical interviews with volatile learners.

How Is This Resource Organized?

This resource is organized into three parts: “Understanding Why Students Struggle,” “Three Assessment Strategies to Identify Why Students Struggle,” and “Supporting Students Who Struggle.” These parts can be read in any order, though I suggest starting with Part 1 because it is a good foundation for the underlying concepts that inform the text. I encourage the reader to avoid the temptation to skip to Part 3 in order to find quick fixes for everyday issues in instruction. The reference lists in Chapter 9 for teaching struggling students are only worthwhile if you understand each student’s thinking. The tools for achieving this make up the heart of the resource, Parts 1 and 2.

Part 1 identifies what to look for in student understanding, and why uncovering understanding is so important. It explores some of the definitions currently used for struggling learners and presents three frames (learner, content, instruction) for understanding their thinking. It shares how supporting struggling learners is an iterative process that requires the development of theories rather than prescriptions. Part 1 forms the conceptual basis for the assessments and remediations introduced in Part 2.

Part 2 shares well-tested assessments for uncovering student thinking. It explores the three assessments that were developed in MSL classes:

How to Use This Resource

Concrete–Representational–Abstract (CRA), Collaborative Study, and Student Interviews. While all teachers who take the MSL class learn to use all three assessments, they find that continuing to use particular assessments after the course is a product of their role as math educators.

Part 3 offers suggestions for supporting the struggles you uncover. It features a chapter on supporting students with cognitive challenges, a chapter exploring a main lesson—menu lesson plan (which gives practitioners a lesson structure that supports both inclusion and differentiation), and a chapter of resources for students who struggle with specific math concepts (to address these in depth is the scope of several more resources; I’ve chosen instead to identify the resources on the market that excel in doing this already). The suggestions in these chapters come from the experiences of teachers in the field and are closely linked to the general approach outlined in Part 1.