What Your Colleagues Are Saying . . .

"With this new book, Karp, Fennell, Kobett, Andrews, Suh, and Knighten have delivered an innovative strengths-based intervention approach that focuses on priming rather than remediation. The structures they have designed around co-planning, assessment, and accessible tasks can provide much-needed clarity to the complex task of math intervention work. This work takes the idea of building from student strengths and makes it tangible. I am so excited to see schools and districts implement this work!"

Rachel Lambert
Associate Professor of Special Education and Mathematics
Santa Barbara, CA

"What a great resource for supporting interventions! One of the key features of this book is that it provides a detailed process for planning interventions that will assist students in accessing grade-level content. The tasks provided are especially helpful in using rich tasks that engage students as they make sense of mathematics."

Barbara J. Dougherty
Mathematics Instructional Coach
Key West, FL

"This book transforms mathematics intervention! It skillfully weaves together research-based practices of mathematics education and special education to empower educators and their students to be active doers of mathematics. The innovative, strengths-based approach positions all students to be successful by promoting student agency, educator collaboration, and a solid mathematical foundation. This is a must-have resource for all as it offers a new way of thinking about mathematics intervention to drive much-needed change."

Dawn Pilotti
K–12 Faculty Chair of Mathematics,
McRae Family Foundation, Currey Ingram Academy
Brentwood, TN

"*Proactive Mathematics Interventions* is a game changer! The authors masterfully combine research-based frameworks and instruction to create a coherent picture on how to effectively implement interventions. This must-read book provides clear examples, detailed descriptions, and numerous resources."

Joleigh Honey
Founder & Consultant, JHoneyMath
Former K–12 STEM Coordinator, Utah State Board of Education
Salt Lake, UT

"This book reminds us that effective intervention isn't about fixing kids. It's about fixing systems. With deep respect for teachers and students, the authors share a proactive, strengths-based approach full of practical strategies that help students engage, reason, and see themselves as capable, confident math learners. It's a must-have for every educator."

Zak Champagne
Chief Content Officer, Flynn Education
Olympia, WA

"*Proactive Mathematics Interventions* advocates for rethinking our traditional deficit approaches to intervention and provides a vision for a strengths-based approach that uncovers and builds upon what students know and can do in time for them to shine within their classrooms. In addition to advocating for a priming approach, this resource supports educators to enact this instructional shift with tasks and activities that revisit and strengthen foundational understandings while proactively positioning every student to thrive with grade-level content."

Nicole Rigelman
Professor of Mathematics Education and Education Program Officer,
Portland State University and The Math Learning Center
Portland, OR

"As mathematics specialists, we're always looking for ways to enhance our support for both teachers and students. *Proactive Mathematics Interventions, Grades 2–5* offers precisely that shift—moving us from a reactive stance to a proactive one within our mathematics and MTSS frameworks. This resource champions the development of a more robust system of support, one centered on a truly transformational approach to mathematics intervention. This book emphasizes a strengths-based perspective, where we leverage the insights gained from formative assessment to guide students in 'doing the math' through thoughtfully chosen, purposeful tasks. This book is an invaluable tool to lead the way in fostering a more proactive and effective mathematics learning environment."

Spencer Jamieson
Elementary Mathematics Specialist
Fairfax, VA

"This book will have a permanent spot on your professional bookshelf, but it will hardly ever actually be on the bookshelf. It makes the path for shifting from reactive interventions to proactive interventions clear and the authors provide a comprehensive plan to get there. The task resources are robust and the critical discussion of how to transform a system will impact students for years."

Karla Bandemer
Grades 3–5 Math Teacher Leader,
Lincoln Public Schools
Lincoln, NE

"*Proactive Mathematics Interventions* shifts the focus from remediation to readiness with a powerful 'priming' approach. Designed for grades 2–5, it offers timely, targeted strategies grounded in math progressions. With practical tasks and clear guidance, this resource equips teachers, coaches, and leaders to support all learners—especially those who struggle—before they fall behind. A must-have for proactive, meaningful math instruction."

Hampden-Wilbraham Regional School District Math Team
Wilbraham, MA

Productive Mathematics Interventions

Grades 2–5

Priming for Success Through Engaging Tasks and Purposeful Design

Karen S. Karp
Francis (Skip) Fennell
Beth McCord Kobett
Delise R. Andrews
Jennifer Suh
Latrenda Knighten

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Mathematics

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https://companion.corwin.com/courses/ProactiveMathIntervention
for appendices and downloadable printables.

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Preface

Welcome! If you have picked up this book, you are one of the important adults working with elementary-aged students who will benefit from supportive intervention opportunities in mathematics. You play a critical role in shaping students' confidence and mathematical abilities, helping them unlock what already exists within them to leverage for mathematical success.

What Is This Book About?

Many educators suggest that they are in need of ideas to create the structures necessary for student success in mathematics learning because they have not seen the improvements in students' performances they wish to see. This book focuses on mathematics intervention and related practices that make multitiered systems of support (MTSS) and its academic component, response to intervention (RtI), effective and successful.

Multitiered systems of support (MTSS) is a preventative framework designed to support student learning. It has two components: academic (response to intervention) and behavioral (positive behavior support).

This book also posits that adopting a proactive approach to intervention offers the potential to create a more robust support system that addresses educational and behavioral needs, ensuring every student can thrive. We call this approach *Priming*.

Priming means to proactively address foundational skills that need strengthening for students to become successful in grade-level mathematics content.

Throughout the book, we will share the voices of educators to communicate their wisdom on how they have implemented these ideas and how student improvement has emerged and expanded on several levels. For example, let's hear from a fifth-grade teacher who, along with many others in her school system, is dedicated to Priming students for success:

> *Our district has been really working hard over the last 2 years to implement an MTSS model and we have a dedicated time for students to receive mathematics intervention, acceleration, and so on. However, math was a bit of a mystery for us. There wasn't a program we could buy or a framework we could adopt that felt good to us or matched what we wanted math instruction to look like. After attending presentations where we heard about the thinking shared in this book, we started to talk in larger teams about the idea of introducing prerequisite skills weeks before new content in our intervention sessions. After more conversation with the authors, we got to work! Priming felt like the answer we were ready to work with. Grade-level teams met this past summer and talked about formative and summative assessments and how we were going to identify the prerequisite skills to Prime.*
>
> *Now, students are working on prerequisite skills, teachers are giving pre-assessments to identify students to Prime and figure out what their prior knowledge and strengths are. We are not over-assessing, there are some students who never get the pre-assessments because we know*

> *(based on other data) they won't need the intervention, and other students that we know will absolutely need the intervention. We are not progress monitoring constantly and in so doing not taking away valuable instructional time. We are seeing far more success on end-of-unit assessments than we would have ever seen historically from students.*

Another fifth-grade teacher added,

> *By the next week, we were looking at our curriculum in a whole new way. We used the summer to map out prerequisite skills and planned small, targeted sessions to introduce them to students before the upcoming lessons. It wasn't about "fixing kids"—It was about giving them the tools they needed to walk into class ready to succeed.*
>
> *And it worked. The shifts were subtle at first—students answering questions with more confidence, trying problems they might have avoided before. But those small changes built momentum, and we saw something we hadn't seen in a while: students excited about math. For the first time, it felt like we were ahead of the curve, giving kids what they needed before they even knew they needed it. "This is the way forward," one of us said, and we all cheered.*

Unlike other intervention resources, we aim to go beyond defining and explaining existing approaches, models, and tiers for instruction. Instead, we describe a transformative approach to mathematics intervention. We provide a support system for educators working to change the school's instructional structure to serve students better—both those with and without formal diagnoses of disabilities—who are identified as needing intervention or in-school tutoring.

We address the needs of educators and staff who embrace diverse students, including those with learning disabilities, extensive needs, who are twice exceptional (both exceptional abilities and learning disabilities documented by federal or state criteria; Asbell-Clarke, 2023; King, 2022), and without any disabilities who may be challenged with an upcoming topic area or need to build confidence in their ability to succeed in mathematics. Also, our approach is flexible and can be successfully implemented across various instructional settings and intervention formats. Whether in inclusion settings where learners receive Tier 1 instruction and are pulled out for intervention or identified for tutoring and/or in settings with a specific self-contained classroom, we are committed to providing the support needed with this book.

As educators, we know that tailoring and modifying our instruction helps us meet the unique needs of our diverse students regardless of the setting. Whether one is implementing a formal tiered approach, providing before- or after-school tutoring, or working in general education or small-group intervention classrooms, this book advocates for a proactive model of pedagogical support for the optimal mathematical experience. In our view, four principles set our approach apart from traditional intervention practices:

1. **Our approach is proactive**—As mentioned, instead of waiting until after instruction to identify and address student gaps, we employ a practice called *Priming*. This proactive strategy prepares students for *upcoming* instruction, ensuring they have the foundational knowledge to succeed. Our goal is to fix structures, not children.
2. **Our approach is strengths based**—Rather than defaulting to the prevailing model, which often focuses on repairing students' perceived weaknesses, we emphasize using a strengths-based model. This approach, supported by Cohen and Lotan (2014), allows teachers to recognize and build students' competencies, fostering their positive mathematical identities and confidence in their mathematical abilities.
3. **Our approach heavily leverages formative assessment**—By using intervention-focused formative assessment, teachers may directly impact their planning and instruction. This approach provides valuable, student-centered, individualized insights that help monitor student progress and provide timely feedback.
4. **Our approach focuses on the right tasks**—We emphasize "Doing Math" tasks (Kobett et al., 2021), which we'll explore at length in Chapter 1.

Strengths-based approaches focus on what students know and can do rather than on their deficits, "gaps," or "learning loss."

A positive mathematical identity refers to an individual's belief in their ability to understand and succeed in learning mathematics. It involves seeing themselves as capable, competent, and valued within the mathematics community.

With the right tasks and tools, you can enact a truly preventative and proactive approach to intervention. Our aim with this book is to help students enter their classrooms prepared for grade-level learning and full of confidence in their strengths. Additionally, as research suggests (Harbour et al., 2022), this book emphasizes the powerful combination of co-teaching models that pair special education with mathematics education and employ a high-quality series of mathematics tasks for intervention.

Who Is This Book For?

We designed this book with many audiences in mind. First and foremost, it is intended for people working with students in Grades 2 through 5, though the principles apply to any intervention setting. You may wonder why the book focuses on Grades 2 through 5. First, it is because in many, if not most, elementary schools, students aren't typically formally considered "at risk" until second grade, and they often aren't identified with a learning disability until third grade. We know that targeted and proactive interventions for children who need intensive support, delivered in this grade range, can set them up for long-term success.

Second, we know from dynamic development systems theory (Osher et al., 2020) that humans—in this case, children—are expected to be highly variable and have multiple development pathways in a learning landscape. We want to recognize and celebrate this variability based on this complexity and consideration of individuals and their development as a backdrop (Lambert, 2024). By exposing such variability, we may better explain students' mathematical thinking and provide learning opportunities that can ensure success among all students.

With this in mind, you are likely one of many adults who influence this success among children. You may be a general education teacher, a special education teacher, an elementary mathematics specialist, or a coach. You may be an interventionist, a paraprofessional, a mathematics coordinator, a special education coordinator, or a school principal. You may use this book as part of a professional learning experience, as a focus area within a professional learning community (PLC), or as a book club at your elementary school. You may even be a homeschooling parent, caregiver, or tutor working in a school-based setting before and after the regular school day. You may work in higher education as a mathematics teacher educator, or you may prepare special education teachers and hope to use this book in your methods classes or field-based experiences.

Regardless of your role, we have designed this book to be as valuable and implementable as possible. At the heart of it, what matters most is the children who need you. We aim to equip you with the right mindset and tools to help them shine their brightest in mathematics.

How Does This Book Work?

Part 1 includes the first four chapters of this book. These chapters will help us explore what proactive intervention looks like in terms of fixing structures, not children (Chapter 1); moving next into the value and characteristics of effective strength-based interventions (Chapter 2); Chapter 3 discusses formative assessment in the intervention setting; and Chapter 4 shows you what a proactive preventative mathematics intervention/tutoring model looks like in action.

Part 2 of the book comprises the task section. These 43 tasks and the more than 100 instructional activities within those tasks are designed for intervention and tutoring and draw from strong foundational "must-have" mathematics content on essential grade-level (Grades 2–5) understandings.

The tasks go beyond whole-number concepts and related operations, which can be a limitation of many intervention tasks found elsewhere. Why? Although working with numbers and operations is foundational, particularly at the elementary school level, we recognize and value the importance of learning experiences and related connections to numbers and operations. Such connections involve algebraic thinking, geometry, measurement, and data. Our task-based activities will align with the current curriculum standards while ramping students up or *Priming* them. As previously mentioned, to Prime means to address foundational skills that need strengthening for students to become successful in grade-level mathematics content.

The Standards for Mathematical Practice (SMPs) were developed based on the National Council of Teachers of Mathematics (NCTM, 2000) processes of problem-solving, reasoning and proof, communication, representation, and connections and the strands of mathematical proficiency specified in *Adding It Up* (Findell et al., 2001). The SMPs guide mathematics teachers in suggesting instructional considerations related to important mathematics content and elements of student engagement as their mathematical understandings develop (they can also serve as grade-level mathematics objectives). This intervention model prepares students to truly engage in the SMPs as they learn mathematics. Beyond teaching mathematics content through tasks, the intervention regularly exposes them to

the practices and processes needed to successfully engage in and do the mathematics they are learning. In *Rethinking Disability and Mathematics*, Lambert (2024, p. 59) described the following features of accessible math tasks:

1. They have a low floor (within reach), which ensures that every student can engage in the problem, even with limited knowledge of the topic.
2. They have a high ceiling (adaptable to higher sophistication), meaning the problem has pedagogical possibilities, allowing extensions into more complex mathematical topics.
3. They are multimodal, meaning they have many options for arriving at solutions.

Each task presented in this book has these features. You can use such features to work with every child at their current learning level. Then, you can find students' strengths and work toward advancing their mathematical understanding to more complex ideas.

We recognize the significant demands on teachers' time and the varied lengths of intervention opportunities or tutoring sessions; thus, the intervention options in this book are ready to use and adaptable. Given the variety of activities *within* each task, you can use the tasks to engage students across multiple grade levels. You can also repeat the tasks with students so that they can practice their growing knowledge of concepts and skills and build confidence.

Across this book, we also provide plenty of the following:

- connections to recent research on the critical components of intervention;
- emphasis on students' strengths and how teachers can capitalize on them;
- effective classroom-based formative assessment techniques and tools adapted for use in intervention settings;
- collaborative planning structures;
- student work samples;
- examples that describe instructional practice and instances of teacher–student and teacher–teacher dialogue;
- end-of-chapter reflection opportunities for use in professional learning; and
- ready-to-use intervention tasks to build concepts and skills for upcoming grade-level lessons, including printable recording pages and other tools to implement the intervention activities.

Finally, we provide viewpoints from teachers who have implemented the Priming Approach, moving from "pulling skills from here and there" to a cohesive strategy in which "previewing what's coming" is the norm. These are teachers who shifted their focus from constantly assessing students to instructing students during intervention and classroom time. Throughout the book, you'll find feedback from educators using this approach, including their success stories and helpful comments. Through this book, we invite you to join us in learning how to bring these ideas to life in your classroom.

More on Priming

As mentioned, Priming is the time teachers spend with students within math interventions, teaching what they need to know to succeed in the *upcoming* instruction. However, this is *not* the same as preteaching the topic. Priming is a way to develop skills and conceptual knowledge to be used across one or more future lessons; Priming is *not* focused on simply covering the content that will occur in the next lesson.

To better explain Priming, imagine entering a room and knowing only that you will learn something new in math class. You don't know exactly what you're going to learn, how you're expected to learn, or even how others will determine that you've learned it. For some, this lack of knowing may be just fine. However, others may want time to "warm up" and acclimate to the topic over time. If you fall into the latter category, you may wish to relate foundational experiences to make the most of this next mathematics learning opportunity. Priming removes such ambiguity and uncertainty; students are supported with the key ingredients for preparing them to understand the particular mathematics focus of a lesson or series of lessons.

Priming is like a carefully considered and organized set of warm-ups, conditioning, and practice activities one may complete before that long run or big game. These activities are targeted to the specific muscles one intends to engage when it is time to *do* the long run or *play* the big game. Similarly, parents prime their children for kindergarten by telling them what they will hear, what they will see, and how to behave while having them listen to stories and count items around the house. In both scenarios, Priming reduces anxiety and creates space for optimal performance—whether learning in a classroom or excelling in a sport. All students do best when they have the necessary preparation for learning.

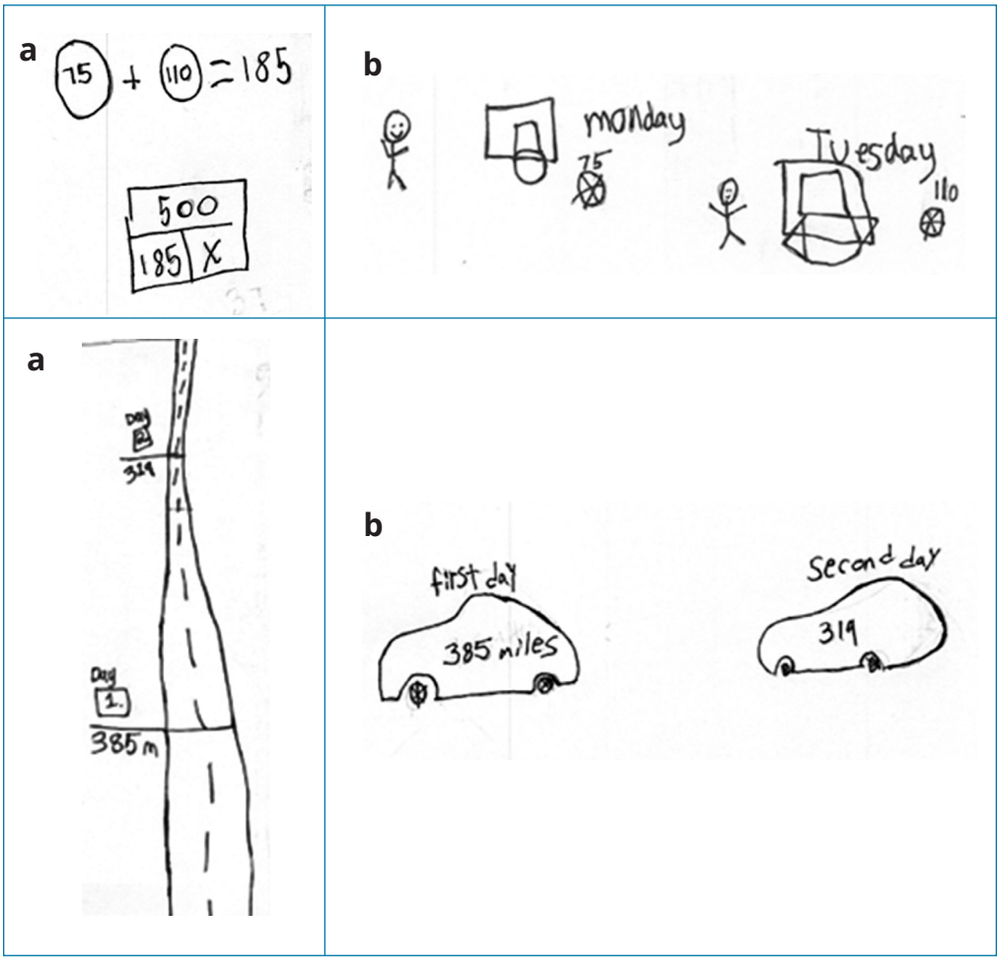
Priming is like a carefully considered and organized set of warm-ups, conditioning, and practice activities one may complete before that long run or big game.

Let's look at how the brain works to demonstrate the benefits of the Priming model. Cognitive and neuroscience research suggests students learn best through active engagement (Fischer, 2009). To be best prepared, there's no substitute for students actively thinking about and doing mathematics, supported by teachers who can keep them engaged in the content. For quite a while, research in cognitive psychology and neuroscience recognized a change in a person's ability to produce information by providing previous encounters with the phenomena—this is known as Priming (Tulving & Schacter, 1990). Originally, this was sometimes unconscious Priming—but here, we are consciously telling the learners we are preparing them with what they need for success.

Priming helps students identify useful and relevant information from what they already know and mentally organize those ideas to best employ them for upcoming mathematics topics. Taking students down familiar pathways makes learning less complicated; new knowledge connects to prior learning, making the content more accessible in their memory (Wyer, 2007). Unsurprisingly, the background knowledge students bring to new content predicts how easily they will learn it (Fennema et al., 1993; La Paro & Pianta, 2000). As we define it in this book, time spent on stimulating and expanding students' precisely needed prior knowledge is the essence of Priming. Priming requires collaborating educators to locate the logical threshold of knowledge necessary to facilitate understanding mathematics content while leveraging individual students' strengths and needs. More discussion on that process can be found in Chapters 2 and 4.

Priming aims to positively support cognitive processes such as reasoning and decision-making—important components for acquiring mathematics knowledge. Priming can also help to build lasting understandings, such as what representations to use or what schema to employ when solving word problems. Research on cognition suggests that objects and drawings are more easily remembered and expressed than abstract concepts or words (Paivio & Csapo, 1973 (picture superiority); Paivio, 2013). For instance, teachers often encourage students to "make a picture" to help them strategize an approach to a word problem. Translating to a new format facilitates students' remembering the information. However, without precise guidance initially, these images may not fully support the mathematical relationships needed to solve the problem. They can even be time-consuming and counterproductive. You have probably had a moment when you asked a student to represent or show their thinking using a visual model, and you found yourself staring at an illustration of a story where the mathematics was lost in the art. For example, let's consider several visual images created by students with learning differences to solve problems; see Figure I.1. One set refers to a problem about shooting baskets in basketball, trying to reach 500 baskets by the end of the week. Another is of a 900-mile family trip where they are driving a distance each day.

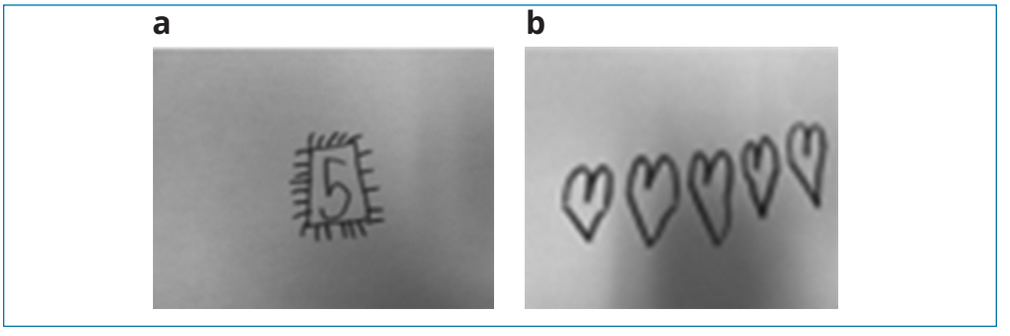
Figure I.1 Comparing Useful (a) and Not as Helpful (b) Semiconcrete Representations



As you can see, image (a) in both cases meaningfully represents the mathematical context the student is trying to understand—in these cases, a representation of the completed parts is presented, providing a potential comparison to the total (whole). The other images shown in part (b) are more like pictures or illustrations of the story that do not show the relationships between the mathematical ideas needed to solve the problem. They are likely being used as thinking tools to organize the information given but may not always lead to a solution strategy.

In intervention settings, students need direct guidance on what drawings and sketches are the most "telling" concerning the context and making the mathematical information meaningful (Scandurra, 2024). Scandurra (2024) found that young students benefit from instruction about math sketches (Figure I.2), which enhanced their ability to visualize and gain number sense. Developing and connecting such mental representations through concrete, semiconcrete, and abstract means are critical to student success (Fuchs et al., 2021). This deliberate practice in making useful representations serves the student well in the short term for the planned new mathematical content and in the long term for their future mathematics studies (see Task 9 in Part 2 of this book for a Priming Activity related to this idea).

Figure I.2 Students' Images of Five



Source: Adapted from unpublished paper by J. Scandurra, 2024. Used with permission.

Figure I.2a displays an image made by students responding to the prompt, "When you see the number five in your mind, what do you see?" (Scandurra, 2024, p. 20). After working with multiple mathematical representations, including 10 frames and other discussions, students drew representations of five, like the hearts on the right in Figure I.2b. This second illustration was more helpful for taking the next steps in understanding numbers and developing number sense. These examples suggest the importance of teachers consistently engaging students in reading, writing, and representing their thinking when doing math.

In summary, Priming is many things: locating the sweet spots for instructional support, digging into such necessary details as how to get students to use multiple representations effectively, and explaining how to prepare students for immediate success with mathematics lessons focusing on new topics. Most importantly, interventions become a preventative point, where interventionists can Prime students for what is coming with a carefully choreographed set of preparatory intervention sessions and related activities. We will explore in more depth exactly how you, as an interventionist, can achieve this goal in the coming chapters.

How Do We Use Certain Language in This Book?

The language teachers use matters. It shapes how they think about students, interact with them, and perceive themselves. In this book, as teachers ourselves, we have made intentional choices about the language and terms we use to describe students, their abilities, and teaching and learning processes. We made these decisions based on a commitment to respect learners' abilities, build inclusivity, and empower all learners and teachers of mathematics.

Why Do We Choose Certain Terms?

When referring to students with disabilities, we use person-first language (e.g., "students with disabilities" rather than "disabled students"). This word choice emphasizes the individual first, not their diagnosis or learning challenge. It aligns with what is currently suggested by the National Council of Teachers of Mathematics and the Council for Exceptional Children Joint Position Statement on Teaching Mathematics to Students With Disabilities (NCTM/Council for Exceptional Children [CEC], 2024). We believe this approach highlights each student's unique identity and reminds us that no single label defines an individual's abilities or potential.

At the same time, we recognize that language evolves. Thus, some individuals or organizations may prefer identity-first language (e.g., "autistic student"). Although this book primarily uses person-first language to maintain consistency, we encourage educators to remain sensitive to individual preferences when working with students and families.

How Does Strengths-Based Language Change Mindsets?

Throughout the book, you'll notice a focus on strengths-based language. Instead of framing students by what they "cannot" do or where they "struggle," we aim to emphasize what students *can* do and how their unique skills and perspectives can serve as valuable assets in their mathematical growth. For instance, rather than describing a student as "behind in math," we may say they are "building foundational skills" or "developing confidence in mathematical reasoning." NCTM (2023) strongly advises against using labels like "high," "medium," and "low" to categorize students' mathematical abilities and instead advocates building on students' strengths. Our book supports this recommendation and focuses on strength-based language.

How Do We Define Terms Throughout the Text?

Instead of providing a separate glossary, we define technical language or specialized terms directly within the text as they appear. This process ensures a "just-in-time" approach, where definitions are provided in context. We hope to make it easier to connect the meaning of a term with its application. By embedding definitions, we hope to maintain the flow of the text while ensuring clarity and accessibility for readers. By making these intentional choices, we hope to foster an environment of respect, equity, and high expectations for all learners. Language is

a powerful tool, and we encourage you, as an educator, to use it to inspire, uplift, and connect with your students.

Now, we are ready to move onward. The Preface was intended to prepare you to consider the importance and potential of proactive mathematics intervention opportunities. By embracing proactive, strengths-based approaches to mathematical intervention, you can make a profound difference in the lives of your students. Together, we can build learning environments in which every child feels capable, valued, and prepared to tackle new mathematical challenges. We appreciate your dedication to this critical work—it truly matters. Chapter 1 will delve into all elements of our approach. Let's get started!

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We would like to acknowledge our families and friends who support us during work on large projects such as the preparation for and writing of this book. We are privileged in that they gave us the space to occasionally postpone other happenings and allowed us to be occupied with all the thinking and activities that go into an effort of this nature. We are most appreciative of the many educators who provided feedback and suggestions to us and for the early adopters of the Priming Approach. This collection of amazing teachers, interventionists, coaches, curriculum specialists, administrators, researchers, and teacher educators includes Isabella Adkins, Lauren Alben, Karla Bandemer, Jay Blackstone, Lisa Curtin, Meaghan Ferrera, Phil Howell, Mistie Parsons, and Sara Wright, with special thanks to Dawn Pilotti for her important contributions. We also celebrate the amazing children with learning differences who contributed their thinking to this book through samples of their problem-solving. We are indebted to their families, who generously gave permission and shared their children's work with us.

We are also very grateful for the continuing cheerleading and support from Erin Null, STEM associate director and publisher at Corwin. She is a champion for equity for students with disabilities and believes that all students deserve the opportunity to learn mathematics by building on strengths instead of highlighting their gaps or "lack ofs." She is patient and gives "just-in-time" feedback to move manuscripts to new heights. We also want to thank Nyle De Leon, whose attention to detail made the numerous figures and resources find just the right places in the book and on the companion website, where readers can easily locate them.

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from RCML, and Lifetime Achievement Awards from both MCTM and NCTM. Skip's many publications, including *Achieving Fluency: Special Education and Mathematics* (NCTM, 2011) and *The Formative 5: In Action* (Corwin, 2024), have been influenced by his classroom experiences and decades-long focus on assessment, number sense, fractions, elementary mathematics specialists, and teacher education.

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Delise R. Andrews is the 3–5 mathematics coordinator for Lincoln Public Schools in Lincoln, Nebraska. During her career, she has worked in both rural and urban districts and has taught mathematics to students at every age from Kindergarten through the eighth grade, undergraduate mathematics methods and mathematics content courses for preservice teachers, and graduate-level courses for teachers of mathematics. Delise is a recipient of the Presidential Award for Excellence in Mathematics and Science Teaching and is a Robert Noyce Master Teaching Fellow. Delise is an active member of the NCTM, serving as a past member and chair of the Professional Development Services Committee, member of regional conference committees, chair of the St. Louis annual conference committee, Professional Services facilitator, and associate editor for the *Mathematics Teacher: Learning and Teaching K–12* journal. She is a co-author of the Grades K–1 and Grades 4–5 books in the *Classroom-Ready Rich Math Tasks: Engaging Students in Doing Math* series.

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Latrenda D. Knighten is president (2024–2026) of the National Council of Teachers of Mathematics (NCTM) and a retired mathematics supervisor from Baton Rouge, Louisiana. She has been an educator for more than 30 years, during which she has been a classroom teacher, science specialist, mathematics coach, instructional coach, and mathematics coordinator. An active member of many professional organizations, Latrenda is a past member of the board of directors for the National Council of Teachers of Mathematics, NCSM: Leadership in Mathematics Education, and the Benjamin Banneker Association, Inc. She is also the co-author of two books: *Classroom-Ready Rich Math Tasks, Grades K–1* and *Five to Thrive: Answers to Your Biggest Questions About Teaching Elementary Math, K–5.*

This book is dedicated to the late Eunice Kennedy Shriver, whose goal was to meld together the wisdom and energies of general education and special education to benefit students with disabilities. We honor her vision with the work provided within these pages.

PART 1

INTRODUCTION TO PRIMING

Introduction

CHAPTER 1

Proactive Intervention: Fixing Structures, Not Children

As an experienced classroom teacher and school-based math coach, I get it. Many schools and school districts recognize a need to improve the mathematics performance of their students. Providing mathematics intervention opportunities—however defined—has become a response. However, we must get this right! Attention to the goals of intervention programs, which includes engaging students in doing mathematics they are learning, and, importantly, recognizing that such programs do not replace daily mathematics class opportunities is an organizational and instructional priority. Mathematics intervention starts by identifying individual student strengths, and then addresses, daily, the planning to both support and supplement student learning.

—An elementary math coach

So What's the Problem?

Let's consider the following: Recent results from the National Assessment of Educational Progress (NAEP, 2019, 2022, 2024) are periodic reminders that clearly indicate that students' scores remain below those prior to the pandemic even with recently improved scores at the fourth-grade level (Table 1.1). Among the many suggestions for finding time to help accelerate and deepen student learning of mathematics are well-designed and carefully implemented and monitored mathematics intervention and tutoring programs.

The **National Assessment of Educational Progress** is a congressionally mandated, large-scale assessment administered by the National Center for Education Statistics for Grades 4 and 8. The Nation's Report Card provides results on student performance based on gender, race/ethnicity, public or nonpublic school, teacher experience, and hundreds of other factors (see https://nces.ed.gov/nationsreportcard./).

Table 1.1 Percentages of All Students on the NAEP in the Below Basic Level in Mathematics

	2019	2022	2024
Grade 4	19	25	24
Grade 8	31	38	39

Source: 2019, 2022, and 2024 NAEP Assessment Highlights.

Starting in 2020 and subsequent years, the long-term effects of the COVID-19 pandemic became apparent in communities, schools, and students. Children lacked access to consistent education, indicating the need for reinforcement in their learning. As teachers, we saw the need to change instruction in response

by creating new and evolving long-term plans to address *all* our students' learning needs.

During this period, many people identified students with disabilities as the most vulnerable population that would be disproportionately affected (Stelitano et al., 2021b). However, the magnitude of the resulting disparities in student performance at the Below Basic level continues to be of concern (Table 1.1).

Let's also consider the long-term trend (LTT) NAEP scores. Since the 1970s, the NAEP has monitored the academic performance of 9-, 13-, and 17-year-old students over time using what's known as the NAEP LTT assessments. The average scores on the LTT assessments for mathematics for 9-year-olds in 2022 were higher than the earliest assessments in the 1970s but lower compared to the previous assessments in 2020 (see https://qrs.ly/i1gjc7u for more details). The average LTT-NAEP mathematics score for 13-year-olds in 2023 was 5 points higher than in 1973 but 9 points lower than in 2020.

The NAEP (2024) scores also demonstrated that eighth-grade students with disabilities are at a level of achievement that is close to what average fourth graders score, with only 5% reaching the Proficient (4%) or Advanced (1%) levels.

Interestingly, the LTT-NAEP also reported that the percentage of 13-year-old students missing 5 or more days of school monthly has doubled since 2020, which, as is often reported, has become a topic of national concern. It was also reported that mathematics scores declined compared to 2020 for most student groups and students at all reported levels of parental education (NAEP, 2023). The NAEP (2024) also demonstrated that eighth-grade students with disabilities are at a level of achievement that is close to what average fourth graders score, with only 5% reaching the Proficient (4%) or Advanced (1%) levels (NAEP, 2024).

Based on these data, what's our takeaway here? Until recently (NAEP 2024), mathematics scores have decreased on both the main and LTT national assessments. In addition, the survey data provided by the LTT NAEP indicates that student absenteeism has become an issue of concern. The findings suggest the need to control mathematics learning opportunities for all, including interventions and tutoring. To validate our statement about the importance of mathematics learning opportunities, we suggest considering what Tom Kane, an economics professor at Harvard University, has to say. Kane suggested that the current national need for learning support is enormous (Sparks, 2022a). As an economist, he predicted that if this situation is ignored and the drop in scores continues (or remains permanent), an eventual 1.6% decline in income might occur for students when they grow up. Considering all the children in K–12 schools, that equals trillions of dollars in lost income! The long-term impact can be significant! Further, the estimated time it will take for early elementary-aged students to return to grade-level growth progression is 3 years; upper-grade students may require 5 years to regain the needed levels of learning (Sparks, 2022b).

We share these data not to fixate on test scores but to raise awareness of the challenges ahead when increasing students' standards-based understandings, which persist after the lesson as "mental residue" (Dougherty, 2008). So here's our starting line: Recent Main and LTT-NAEP results clearly indicate the critical need to prioritize mathematics teaching that connects mathematics to the lives of their students (Latrenda Knighten as cited in NCTM, 2025). Let's do this!

What's Being Done?

As a result of these realities, at the time of this book's publication, seven U.S. states required by law that students who struggle in learning mathematics get support (Schwartz, 2023). Following long-standing attention to reading practices, this legislation requires students to be identified and monitored through various assessments. They then receive targeted support to direct their learning to meet proficiency levels with grade-level mathematics standards.

In some states, there is also a mandate to support teachers. States must provide in-service teachers with learning opportunities to develop the mathematics knowledge and skills inherent in instruction based on best practices and preservice teachers with teacher-preparation programs that include this information. Some states require having at least one mathematics coach/specialist for every elementary school. Complying with this requirement would cause a significant shift from the current reality: Although expert reading support is available in about half of the elementary schools reporting, mathematics coaching from well-prepared specialists is hard to find, with only 23% of schools reporting that mathematics specialists are available (Korbey, 2024; NCES, 2022).

Often, interventions in mathematics rely on instructional practices that are not demonstrated to be effective. For example, perhaps you have had the experience or expectation that students in math intervention should receive a review of the same content taught in Tier 1 or general education class settings. Nothing is different except that you share this content in a small group rather than the whole class. Will providing the same instruction again help? Another example is only relying on abstract representations without interweaving the development of concepts utilizing concrete and semiconcrete models. If you provide time for students to grapple with the foundational concepts as a starting point, they will be better equipped to grapple with the new grade-level learning and find greater success. For example, students in intervention settings are sometimes taught repeatedly the current mathematics topic the class is learning. Although applicable in some situations, this model rarely addresses the need to find and focus on foundational concepts and related understandings underpinning students' confusion or driving challenges with the grade-level material.

One example is when students find it challenging to compare and order fractions because they do not understand the magnitude (size) of the fractions (e.g., they do not yet recognize that $\frac{3}{4}$ is a number with a value less than 1). So when the topic of adding fractions is presented, the same foundational understandings must come into play. Just as we would not expect learners to add whole numbers such as $3 + 5$ if they didn't already grasp the quantities of 3 and 5, they cannot add fractions successfully without knowing the underlying concepts of the magnitude of the fractions they are combining. Interventionists should recognize that learning-trajectory-based instruction can build solid understandings focusing on the progression of ideas.

When students build familiarity with foundational mathematical ideas by talking about, describing, and applying concepts and procedures, this familiarity

A **learning trajectory** refers to the path or progression of a learner's knowledge and understanding from foundational ideas to more advanced concepts. It describes how an individual moves from their initial level of understanding to a deeper, more sophisticated level of knowledge as they engage with mathematics tasks, experiences, and feedback.

is reinforced by different processes in the brain called recollection memory (Yonelinas et al., 2010). Those processes are the mental muscles learners should be encouraged to develop and regularly flex. These progressions may involve revisiting and strengthening student understanding, connecting concepts, and engaging with more complex ideas or problems.

Although a learning trajectory is often thought of as a linear progression, it's important to recognize that this path is not always linear.

Granted, a high dosage of interventions each week or double-dosing of tutoring both in school and outside of school in private settings may be options for students (Carr, 2022, as cited in Sparks, 2022b, n.p.), but it's what goes on in those sessions that actually makes the difference. Additionally, the expectations involved with access, cost, and availability of outside tutoring for many students are significant equity issues. States have considered other options supported by their public schools. As a significant percentage of students have been identified as needing extra math instruction (referred to throughout this book as *interventions or tutoring*), such scaled-up implementation can cause complications with resources and capacity, such as space, time, and availability of additional qualified mathematics educators in schools. It's not as much about the role of *who* provides the intervention—classroom teacher, special educator, interventionist, tutor, math specialist, etc.—but *how* the students are taught.

What Needs to Change?

In this book, we propose a refreshed vision of proactive intervention opportunities embedded throughout the school day. We also recognize that some schools are using intensive tutoring before and after school hours with learning opportunities designed to be genuinely preventative. While—as a starting point—we focus on students who are identified as having disabilities according to the Individuals with Disabilities Education Act (IDEA, 1997), we recognize that these ideas, assessments, models for instruction, and "*doing* math" tasks (Kobett et al., 2021) can and should be expanded. This expansion should include a broader audience of children with and without disabilities who may not have equal access to the grade-level curriculum (required by law). For example, many students face instructional barriers created by missing mathematics content from previous grades (NCTM/CEC Joint Position Statement, 2024). Mathematics intervention programs and learning opportunities should enhance student learning in MTSS Tier 2 and Tier 3 instruction but also, significantly, in Tier 1 instruction. So we encourage a cohesive and coordinated instructional shift to move all students forward.

Mathematics intervention programs and learning opportunities should enhance student learning in MTSS Tier 2 and Tier 3 instruction but also, significantly, in Tier 1 instruction. So we encourage a cohesive and coordinated instructional shift to move all students forward.

However, you may wonder, why not just buy a packaged intervention program or access one delivered electronically? Available commercial mathematics programs (print or electronic) for intervention sessions may only briefly address or even omit key topics, so people have posted on various online platforms that they need recommendations and suggestions for something that works. We find that student success in learning mathematics isn't about something you buy; it's about instructional strategies you try. It isn't just about teaching a commercially available or school district–designed curriculum; it's about understanding children where they are and bringing them to greater success in grade-level content through a structured intervention planning model. Priming is a major shift in instructional practice.

We suggest starting with a set of common grade-level curriculum materials as a tool to build consistency and predictability across the grades. This way, teachers in subsequent grades can expect and rely on the fact that the content has been taught in a particular way (Karp et al., 2021). You can, of course, also use supplements and modifications. However, be careful in how you do this. Research from 4,414 teachers found that 72% of special education teachers and 41% of general educators reported high levels of modification to the curriculum, including at least 50% or more for students with disabilities (Stelitano et al., 2021a, p. 4). Additionally, more than half of special educators and a third of general educators suggested they created their instructional materials from scratch. Sadly, this use of unaligned resources generally continues over the grades as the content knowledge of any given child gets more and more splintered and unpredictable. The researchers also stated that it is unknown what background and capacity these teachers have to develop well-aligned curricular content, and they recommended more professional learning in this area. Without this expertise, some teachers will mistakenly provide alternative mathematics instruction that reduces students' work—in mathematical reasoning and sense-making, for example—particularly for students with disabilities. Teachers may do so because they are unsure whether students can become engaged in and carry out this level of thinking.

We find that student success in learning mathematics isn't about something you buy; it's about instructional strategies you try.

However, as teachers ourselves, we know the students can! We do not advocate for children copying what the teacher presents using a step-by-step approach. Candidly, this book is not intended for someone who wants a script or a "foolproof" guide filled with procedures or quick-fix tricks as *the* recipe for student success. As Peter Liljedahl (2020) suggested, students tend to stop thinking once they start mimicking the teacher: "Mimicking is an addiction that is easily acquired at lower grades and difficult to give up" (p. 30). He added that it's even difficult for parents to think there are other better ways to teach than mimicking. This expectation to mimic causes students to wait for a teacher to explain the lesson over and over.

Candidly, this book is not intended for someone who wants a script or a "foolproof" guide filled with procedures or quick-fix tricks as the *recipe for student success.*

Proactive Priming interventions in mathematics are encouraged to shift the thinking process by eliciting students' thinking and guiding math discussions in small groups. This goal can be achieved through probing questions and then turning back to the students to hear their ideas. That's engagement! So our focus here is on the importance of a genuine investment in developing children into active thinkers about mathematical ideas by investing in the preparation for your instructional time together. The criterion for doing this work is believing that—whenever possible—you should refuse to accept limitations on what children can learn. That means examining your beliefs about who can access and learn important mathematics. Children must also be exposed to and practice reasoning; hence, you are encouraged to provide interventions to help them practice just that.

We think of instructional practice as "doing math." This mantra is key to the success of all students, including students with disabilities. The relative scarcity of high-quality interventions in mathematics that fully develop the Standards for Mathematical Practices (CCSS-M; NGA, 2010) and focus on multiple representations emerges from two related concerns. First, a hyperfocus on procedurally focused activities (frequently timed) is often generated by the nature of overly specific computationally based IEP goals (e.g., those measured by increases in the

correct number of digits in computation-focused assessment responses; Lambert et al., 2023). Second, it is difficult to find high-quality intervention tasks that combine conceptual and procedural understanding. Again, this book aims to help.

As mentioned in the Preface, we firmly believe in the Priming Approach guiding us in this solution. This direction requires us to set the following goals in three different areas:

- working cohesively and systematically from strengths while building rapport and relationships,
- regularly using formative assessment to monitor student progress, and
- using rich tasks focusing on students *Doing Math* to prime important intervention-focused mathematics learning proactively.

We encourage noting the important connections between strengths-based instruction, classroom-based formative assessment, and progress monitoring tools (e.g., unit tests and district benchmarks required in many school settings). Embracing this approach and understanding the connections will help you directly monitor and plan to assess individual learning needs using the most effective teaching. Additionally, it is essential to highlight activities and lessons that provide engaging interventions to support student success. We are not looking to fix children (they do not need fixing) but to fix the structural obstacles that hinder inclusion and prohibit student progress.

The message throughout this book is deliberately incorporating well planned, strengths-based instruction to support students who struggle to learn mathematics as they strive to make substantial learning gains. We know that strengths develop best "in response to other human beings" (Clifton & Nelson, 1992, p. 124). So effective teachers are indeed central to making a difference and delivering this message! Worksheet packets, digital options, or even AI-enhanced digital feedback cannot replace an effective teacher engaging students in *doing* math.

The **Individualized Education Program (IEP)** is the cornerstone of a quality education for each child with a disability. Public school students who receive special education and related services *must* have an IEP. The IEP guides the delivery of special education supports and services for the student with a disability. The IEP creates an opportunity for teachers, parents, school administrators, related services personnel, and students (when appropriate) to work together to improve educational results for children with disabilities (U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2000. https://www.ed.gov/sites/ed/files/parents/needs/speced/iepguide/iepguide.pdf).

We are not looking to fix children (they do not need fixing) but to fix the structural obstacles that hinder inclusion and prohibit student progress.

What Is the Research Base?

Is this book based on research? YES. We base our research framework for this work on a variety of sources, including the research-based recommendations outlined within the Institute of Education Sciences (IES) Practice Guide *Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades* (Fuchs et al., 2021), the NCTM's (2014) *Principles to Actions: Guidelines for Teaching Mathematics*, Universal Design for Learning (CAST, 2024), the NCTM/CEC *Joint Position Statement* (2024), CEC and the CEEDAR Center's High Leverage Practices in Special Education (2017), and the NCTM's (Huinker et al., 2020) *Catalyzing Change in Early Childhood and Elementary Mathematics*.

The co-authors and researchers of the IES Practice Guide initially identified 2,635 research studies between 2009 and 2020 for review. The final number that met the standards of strong research aligned with the target population of elementary students with disabilities was 47 studies. In this book, we suggest how to adapt and use elements of the Practice Guide's recommendations.

We aim to guide thinking regarding an intervention "plan" and how it should play out in schools. We uniquely weave together the following six Practice Guide recommendations, along with research from mathematics education throughout the book:

Recommendation 1: Systematic Instruction

Provide Systematic Instruction During Intervention to Develop Student Understanding of Mathematical Ideas. We use this thinking to guide our instruction and approach in all intervention lessons. Systematic instruction uses models with concrete, semiconcrete, and abstract (CSA) representations interwoven throughout. However, systematic instruction does not equate to teaching by telling. It is not "I do, we do, you do." Instead, systematic instruction focuses on learning progressions. It provides purposeful, structured learning opportunities. These opportunities can build on conceptual and procedural understanding, promote inquiry, and draw out students' prior knowledge as a foundation for rich mathematical thinking and discussion. So we have designed the tasks in this book to do just that.

Recommendation 2: Mathematical Language

Teach Clear and Concise Mathematical Language and Support Students' Use of the Language to Help Students Effectively Communicate Their Understanding of Mathematical Concepts. Language is key to helping students become "ready to learn" new content. Words they've already learned can be reviewed with them, and they should be prepared to hear those words again as new content is introduced. We suggest ensuring the content is as familiar as possible so students can hit the ground running. However, we don't advise preteaching mathematics vocabulary. Liljedahl (2020) discussed this idea by suggesting that the names of concepts should come when students have experience with those concepts. So it's best to name the term while the model, image, or idea is being explored (Dixon, 2018; Van de Walle et al., 2023), not before (too early) and not after (too late). This connection of vocabulary to actions and representations in context is crucial for students with language-based disabilities. Indeed, it's how we introduce new concepts in this book.

Recommendation 3: Representations

Use a Well-Chosen Set of Concrete, Semiconcrete, and Abstract Representations to Support Students' Learning of Mathematical Concepts and Procedures. The CSA representations are presented simultaneously. When students grasp their interrelationships, that is a sign of their level of understanding. In this book, we also include applications and situations as representations. These may include the use of children's literature and relevant contexts that we hope will align with students' interests. To avoid buggy procedures (Thompson, 1999)—because the steps of the procedures are mixed up, forgotten, or used for the wrong operation—we shift to multiple representations as a significant focus of the tasks (Van de Walle et al., 2023).

Recommendation 4: Number Lines

Use the Number Line to Facilitate the Learning of Mathematical Concepts and Procedures, Build Understanding of Grade-Level Material, and Prepare Students for Advanced Mathematics. You may be surprised that number lines are being called out separately as a recommendation, as they are a representation. Nevertheless, the research and importance of using number lines were so compelling that this important representational tool was elevated to a "must use" status. Number lines need everyone's full attention regardless of grade and should be used and carefully sequenced across the grades. As another influential IES Practice Guide entitled *Developing Effective Fractions Instruction for Kindergarten Through 8th Grade* (Siegler, 2010) noted, number lines should be used as a central representational tool from the early grades onward.

Recommendation 5: Word Problems

Provide Deliberate Instruction on Word Problems to Deepen Students' Mathematical Understanding and Support Their Capacity to Apply Mathematical Ideas. Word problems are a first step to having students apply the number-focused computational mathematics they are learning in various contexts and situations. Rather than just taking the numbers and "doing something with them," students learn that different problem scenarios drive them to set up equations and solutions. For example, unlike in the past, where a keyword strategy suggested the term *more* was equivalent to saying the solution automatically required addition, students are encouraged to imagine situations and determine what operation is needed (Hardy et al., 2025; Karp et al., 2019).

The **keyword strategy** involves identifying words in a word problem such as *altogether*, *share*, *more*, or *left* and thinking that alone determines which computation to use. Research suggests this approach is not useful, particularly with multistep problems (Powell et al., 2022).

This moment is also ideal for weaving in the mathematical practices and processes that enhance their learning.

Recommendation 6: Timed Activities

Regularly Include Timed Activities as One Way to Build Students' Fluency in Mathematics. Although named "timed activities" in the practice guide, it is important to note that the aspect of the recommendation we will focus on is "fluency activities."

Fluency activities help students gain flexibility, accuracy, and efficiency with appropriate strategies for such skills as basic number facts or computational procedures.

Timed activities may be a concluding component of the process, but an important trajectory comes first (Table 1.2).

Table 1.2 Three Phases of Fluency

Phase I	**Modeling and/or counting (e.g., counting by ones/skip counting) to find the answer** • Example: Solving 6 + 4 by drawing 6 dots and 4 dots and combining them by counting the dots
Phase 2	**Deriving answers using reasoning strategies based on known facts** • Example: Solving 8 × 7 by thinking 7 × 7 equals 49 and adding one more group of 7 equals 56
Phase 3	**Fluency (efficient production of answers)** • Example: Knowing that 8 + 5 = 13 or 5 × 5 = 25

Source: Adapted from *Elementary and Middle School Mathematics: Teaching Developmentally*, by Van de Walle, Karp, and Bay-Williams, 2023, Pearson. Adapted with permission.

Based on the movement from Phases 1 through 3, fluency approaches based on automaticity, or the efficient production of answers, come only after students have moved through modeling and counting (skip counting in the case of multiplication and division) and then derive answers from known facts. Only then do they move toward the efficient generation of answers. As teachers, we focus on first building students' confidence in their capacity to figure out a solution, as opposed to a focus on recalling memorized answers. Therefore, we do *not* endorse any activities that focus on speed. Instead, we encourage strength-based learning activities that build fluency through efficiency, flexibility, and accuracy (Bay-Williams et al., 2022). Such activities will emphasize effort and persistence, leading students to achieve their "personal best" in achieving automaticity and building their mathematics strategic competence.

To increase our understanding of this subject, let's now attend to the nine major (revised) Guidelines of Universal Design for Learning (UDL 3.0; CAST, 2024).

Universal Design for Learning (UDL) is a framework that supports students' access to learning. Teachers provide flexible materials, methods, and learning environments. UDL promotes multiple means of representation, expression, and engagement.

First, Table 1.3 presents the guidelines that are written with a new focus on equity that includes critical teacher actions:

Table 1.3 Revised UDL Guidelines 3.0

	Teacher actions to support students	**Examples**
1	Welcome interests and identities	Provide choices and make relevant
2	Sustain effort and persistence	Optimize challenge and foster belonging
3	Enhance emotional growth	Promote individual and collective reflection
4	Engage perception	Offer multiple ways to perceive information
5	Clarify language and symbols	Support decoding of mathematical notation and symbols
6	Build knowledge	Connect prior knowledge to new learning, explore patterns, develop generalizations
7	Generate interaction	Vary response methods, provide access to tools
8	Enhance expression and communication	Build fluencies and encourage discussion
9	Develop strategies	Plan, anticipate challenges, and organize information

Source: Adapted from *UDL Guidelines 3.0*, by CAST, 2024. Adapted with permission.

Second, in 2017, the CEC and CEEDAR Center (2017) identified important areas of effective teaching called high-leverage practices (HLP). We emphasize the examples of those HLPs in special education in this book, including collaboration, assessment, social/emotional/behavioral supports, and instructional practices. Each contributes to improving learning environments and outcomes.

Finally, we turn to the landmark work of the National Council of Teachers of Mathematics (2014) in their policy document, *Principles to Actions*. Their

six principles for effective teaching include articulating goals, making connections, fostering engagement, differentiating challenges, structuring lessons, and promoting fluency and transfer. We embark on this work with these research-driven themes and powerful guidance.

When We Talk About Intervention, What Do We Mean?

Let's explore what interventions are and are not (Table 1.4).

Table 1.4 Interventions

 Math interventions are:	 Math interventions are not:
Proactive and preventative	A repeat of the grade-level lesson either before or after it takes place
Addressing the foundational knowledge that students may not have learned or have forgotten and providing "on-ramps" to the new lesson's mathematics content	Time provided to do homework, study, or make corrections to graded work/ assessments
Focusing on students' strengths *and* targeted to their specific needs	Focused on test preparation
Providing students with opportunities to be "doing math" in small groups	Passive worksheets or computer activities
Engaging, challenging, and memorable	Computer-driven sessions focused on speed
Structured to allow communication and interaction	A replacement for the general education class
Co-orchestrated and often co-taught	The class students get pulled from for other things (e.g., instrumental music, breaks)
Developed to build students' confidence, positive attitudes, and math identity	One size fits all
Dependent on dedicated planning time during the school day	Overreliance on extrinsic motivators like "compliance charts"
Focused on reasoning and sense-making	"Math made easy"
An opportunity for students to shore up essential mathematics content and process knowledge and skills	A behavior management plan

Source: Adapted with permission from *Strengthening Math Intervention in the Middle Grades*, by Brodesky et al., 2022, Education Development Center.

Icon Source: thumbs up and thumbs down icon by istock.com/vlan Yarovyi

Because schools are mandated to provide intervention opportunities for students with disabilities, many issues must be considered. These issues may include important decisions related to student identification and intervention implementation. Additional areas to consider (e.g., program size, instructional materials) are discussed in Chapter 4. Consider the following policy and program issues:

- **Identification:** How will students be screened and identified for participation in your school's intervention offerings? Which will include responses to the following:
  - What will such screening involve? What mathematics, length of screening assessment, or aspect of the resulting data will be useful to plan future instruction?
  - How much time should be spent screening students for the intervention offerings?
  - Who will screen students, share results, and determine the next instructional steps?
- **Implementation:** How will the intervention opportunities be implemented, and when will they occur (e.g., daily, three times a week; before school, after school, online)?
  - If the intervention opportunity occurs online, how will students receiving intervention still receive the same amount of class/grade-level instructional time as their classmates?
  - What materials will be used? How will online students have access to those materials?
  - How will you determine that the materials address important mathematics based on the standards?
  - Will both print and online materials and related activities be used?

Although critical and impacting much of what you will engage in while reading this book, state and school district regulations primarily determine student identification and intervention implementation issues. Therefore, they are not the focus of this book.

It is also important to understand that interventions are not a "fix" without full coordination with Tier 1 instruction. Our goal is to provide engaging and memorable intervention sessions in which children run to the table, door, or interventionist excited to do mathematics!

We clear the path to reasoning and sense-making. Here are some ways to make that happen:

- Engage students using *Doing* Math Tasks (in Part 2 of this book, we provide a complete collection of Intervention Tasks and variations).
- Plan deliberate acts of teaching that address instructional needs. They are not "the next page in the textbook."
- Work together, as mathematics intervention opportunities are collaborative. Special education teachers, interventionists, paraprofessionals, teaching assistants, general education teachers,

Our goal is to provide engaging and memorable intervention sessions in which children run to the table, door, or interventionist excited to do mathematics!

coaches, tutors, and school-based support staff (e.g., occupational therapists or speech therapists) are often partners in intervention planning, instruction, and assessment.

- Follow recommendations from the *IES Practice Guide* (Fuchs, 2021), UDL 2.0 (CAST 2024), *Principles to Actions* (NCTM 2014), *Catalyzing Change* (Huinker et al., 2020), the NCTM/CEC (2024) Joint Position Statement, and other research-informed sources.
- Plan intervention offerings within sessions devoted to this work and potentially at varied additional times (e.g., before or after school).

What Do We Mean by Tutoring?

We define intensive tutoring (sometimes called high impact or high dosage) as supplemental instruction within a school-based setting. However, it is offered before or after school (out-of-school time, also known as OST) instead of during the school day. These programs are often sponsored with Title 1 funding or with recent infusions of funding to improve student achievement, such as the 2024 budget proposal of $8 billion (D'Souza, 2024; The White House, 2024). With small groups of one to four students, such intervention tutoring can be delivered face-to-face or virtually, customarily two to five times a week, using high-quality instructional materials. Its purpose is to enhance the performance of students who previously were considered "at risk of failing" (Ludwig & Guryan, 2023; Robinson & Loeb, 2021). Again, like the model for interventions, we suggest a preventative approach for heading off issues rather than responding to poor performance. This must be done as a collaboration with the person providing the tutoring and the classroom teacher providing the grade-level mathematics content. Any tasks we share in this book can be used in these proactive tutoring sessions just as they are used in the interventions.

One concern is that states sometimes use an "all-call" approach to attract possible volunteers to guide intervention tutoring programs. There is preparation for the volunteers, but there are likely not enough hours to give these potential educators the mathematics pedagogy and content they may need to align and provide coherence with the schools' instructional plan. Again, we hope this book can help with that process as we provide high-quality materials through sets of tasks.

What Are Some Key Elements of the Intervention Instruction?

We will examine more deeply the importance of key elements to intervention-focused mathematics instruction such as instruction that regularly engages students in learning via multiple representations, collaboration across teams, and our preemptive and proactive approach—Priming.

Employing Multiple Representations

As mentioned, the CSA (concrete, semiconcrete, abstract) approach in various forms has been an important instructional consideration in mathematics

education for many years (Fuchs et al., 2021; Heddens, 1964; Heddens & Speer, 2009).

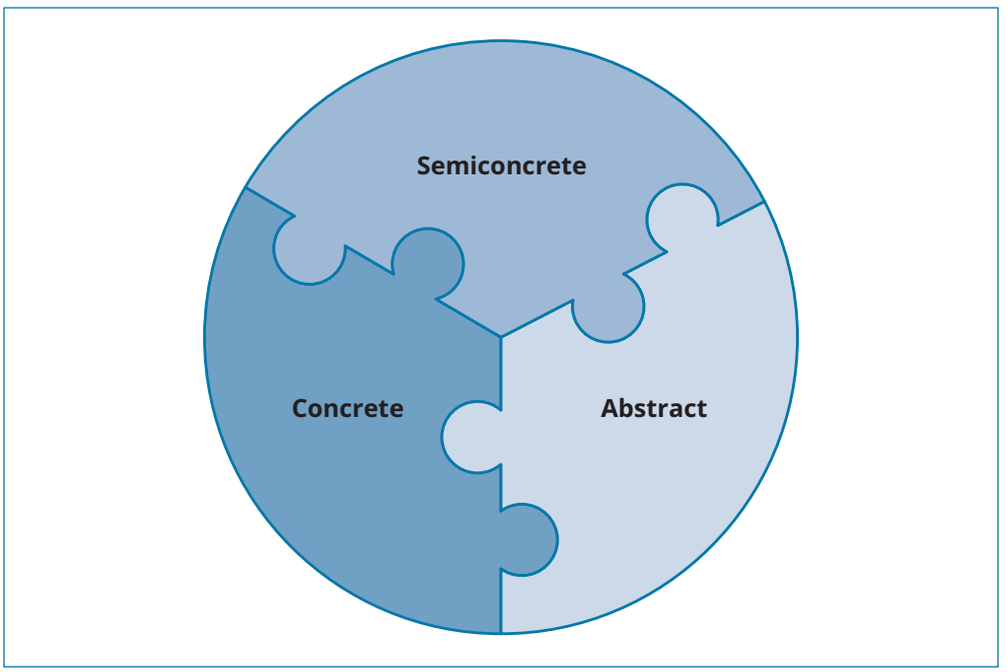
Based on Bruner's (1966) theory of enactive, iconic, and symbolic reasoning, this model reflects simultaneous and fluent movement between an instructional focus on concrete representations/models (manipulative materials), semiconcrete (using drawings, math sketches, and graphs), and abstract (incorporating symbols, numerals, equations, mentally solving problems, or using stories with mathematical ideas). The need for multiple representations does not cease as students age (Bismark & Prosser, 2024; Kestel & Forganz, 2024; Thomas et al., 2024). The use of models and visuals must not fade away.

CSA stands for the concrete, semiconcrete, abstract approach that presents these models to show the concept from a connected set of representations. The integrated model suggests using various representations in the same time frame to highlight the linkages between them.

Importantly, this approach should not be rigid, where one only moves to abstraction after the long-term experiences with the other phases. Instead, there should be intertwined and parallel modeling of number symbols throughout this use of multiple interpretations of the situations. In this way, students can directly relate the concrete models and visual representations to the corresponding numerals and equations (Figure 1.1; Van de Walle et al., 2023). Modeling the mental conversations about reasoning and sense-making in a teacher's mind may help students articulate their thinking through what is known as a "think-aloud" (Evans et al., 2024).

A **think-aloud** is where the teacher gives an account of the thinking going on in their head by saying it out loud to the students. The idea is that hearing another's mental actions can support a learner's thinking process.

Figure 1.1 Interwoven CSA - Concrete-Semiconcrete-Abstract Model



CSA often centers on combining manipulative materials, math sketches, and symbolic representations on the same concept. CSA aims to develop a concept and equip students with thinking strategies and skills needed for more independent learning. The model initially emphasizes conceptual understanding on a continuum to procedural knowledge (Skemp, 1978). In this way, it honors that both are critical components to students' mathematics proficiency (Findell et al., 2001).

This model should be aligned across the general education classroom in Tier 1 and the interventions in the Tier 2 or Tier 3 stages of RtI. Aligning instructional interventions with the CSA approach in general education classrooms provides continuity. No matter what CSA may be called (e.g., CRA—concrete-representational-abstract, CPA—concrete-pictorial-abstract), results of studies indicate that interventions and whole-class mathematics lessons regularly using the CSA instructional representations are successful with children with disabilities (Jitendra et al., 2023).

Another way to build connections between representations of mathematical ideas is by using children's storybooks. Recommended children's literature is included in the tasks found in Part 2 of the book, and there is an overall bibliography in Appendix A on the companion website. When woven into instruction, children's literature has been shown to positively affect achievement, attitudes toward mathematics, and the ability to make connections between representations (Zhang et al., 2022). These opportunities can help students consolidate their previous knowledge. They can use that foundation to develop new ideas (which are precisely aligned with the direction of our intervention approach). Reading part or all of a children's literature book together creates a shared context from which all students can draw. So reading facilitates the opportunity for interactive learning.

In addition, these stories and literature provide examples and realistic situations of how mathematics is a human endeavor. Such connections are important to honor. They connect with the students' lived experiences, thus rehumanizing mathematics (Zavala & Aguirre, 2024) and bringing a personal relationship to the learning process. Some may think that time is a barrier to this integration, but all the books do not need to be read cover to cover.

An example is using sticky notes as a guide. You can share excerpts containing the main points and the key storylines, including mathematical situations or wisdom. That way, you can still spend time on the mathematics discussion, and students will be motivated to read the entire book at another time.

Collaborating Across the Team

When the special education teacher thinks the general education teacher is responsible for teaching the mathematics content and the general education teacher thinks the special education teacher is responsible, students with disabilities sometimes become invisible. Then, who is responsible for mathematics instruction? Yes, it's both of you (Blanton et al., 2018; Karp, 2013); this must be a partnership. Collaboration is critical, and planning and implementing should be a reciprocal activity.

We know from research that the results are powerful when teachers consciously enter a professional learning opportunity, whether within a formal professional learning community (PLC), a partner PLC, a small group, or a self-selected thought partner. "Communal support structures" (Pilotti et al., 2023, p. 15) build shared leadership and collective learning. They lay the groundwork for personal growth. What may begin as a group of individuals who have "siloed practices" can eventually move to "joint responses" and a shared vision—characteristics of a team (Pilotti et al., 2023, p. 14).

We suggest beginning with the interventionist or special education teacher and the general education teacher regularly co-planning at least 4 weeks ahead

of instruction planned for the general education classroom. Everything revolves around the instructional planning to prepare for the upcoming mathematics content by refreshing students' prior knowledge or constructing needed foundational knowledge. The general education teacher partners in this work by using the opening move of the new lessons based on the interventions that just occurred. They will ask questions extending the precise prior knowledge selected and practiced during the intervention (i.e., Liljedahl, 2020). We suggest the following aspects to agree on:

- consistently co-planning and co-teaching the mathematics content, with teachers co-owning and co-orchestrating the content delivery
- capitalizing on the strengths of general education teachers, special education teachers, interventionists, and math coaches, compounding the power of jointly made contributions
- working together to avoid repetitive IEP goals (i.e., needs to learn multiplication facts) that travel from year to year. Did you know the U.S. Supreme Court ruled that it is against the law to repeat an IEP goal from year to year (*U.S. Supreme Court Endrew F. et al. vs. Douglas County Colorado School District RE-1*, 2017)? That's not making adequate progress, as mandated by legislation. Think about it! How many students have IEPs that are not aligned with the law?
- avoiding IEP goals that emphasize low expectations by focusing on narrowly defined arithmetic skills, instead focusing on conceptual understanding and the Mathematical Practices
- agreeing as a team to practice "never say anything a kid can say" (Reinhart, 2000, p. 20), instead vowing to ask questions to prompt thinking. This includes when a child is working on a strategy that the teacher won't interrupt, erase what they've done, work the manipulative materials for them, or move the materials, using brief questions that are closed rather than open (Jacobs et al., 2014). We also know that "teaching as telling" does not reach an outcome of long-term learning (Lobado et al., 2005).
- addressing the role of administrators, coaches, and supervisors—what should they look for in this new collaborative arrangement? Do they know that CSA and "*doing* math" are the focus? How can they be supportive in providing time and resources to these teams?
- Aligning paraprofessionals with the intervention may require providing them with experiences related to learning more mathematics content and pedagogy background to deliver instruction.

Using a Preemptive and Proactive Approach

We repeat this here because it is essential to the success of our instructional model. We also believe this paradigm shift can "switch the script" and "change the narrative" for many students who may feel that they are not a "math person."

Rather than consistently using interventions to work backward as a reaction to a student's failure, we suggest working ahead in a proactive mode.

We call this a Rewind as we flip an old intervention model on its head. This Rewind may require a do-over of some things that have been practiced for several decades. This sequence aligns with our suggested strengths-spotting approach (see Chapter 2), in which strengths are identified and intentionally developed (Kobett & Karp, 2020). What students know and can do—their strengths—become the starting point for the intervention provided.

Again, interventions provide a preventative point where students get Primed for what is coming mathematically with a carefully choreographed set of preparatory sessions. So interventions are reoriented away from a reaction to classroom performance where the student isn't showing grade-level growth on a standard. This standard may be set as a way of working ahead of time to anticipate and then provide the perfect groundwork for upcoming lessons. This preemptive approach anticipates the needed foundational understanding of the mathematics topic using the strength-based learning trajectory-based instructional approach (Suh et al., 2022). The approach proactively provides the language, representations, and actions so that they become familiar and known to the student (Bahr et al., 2023). Interventions are reoriented from a reaction to classroom performance where the student isn't showing grade-level growth on a standard to a way of working ahead of time to anticipate and then provide the perfect underpinnings for upcoming lessons.

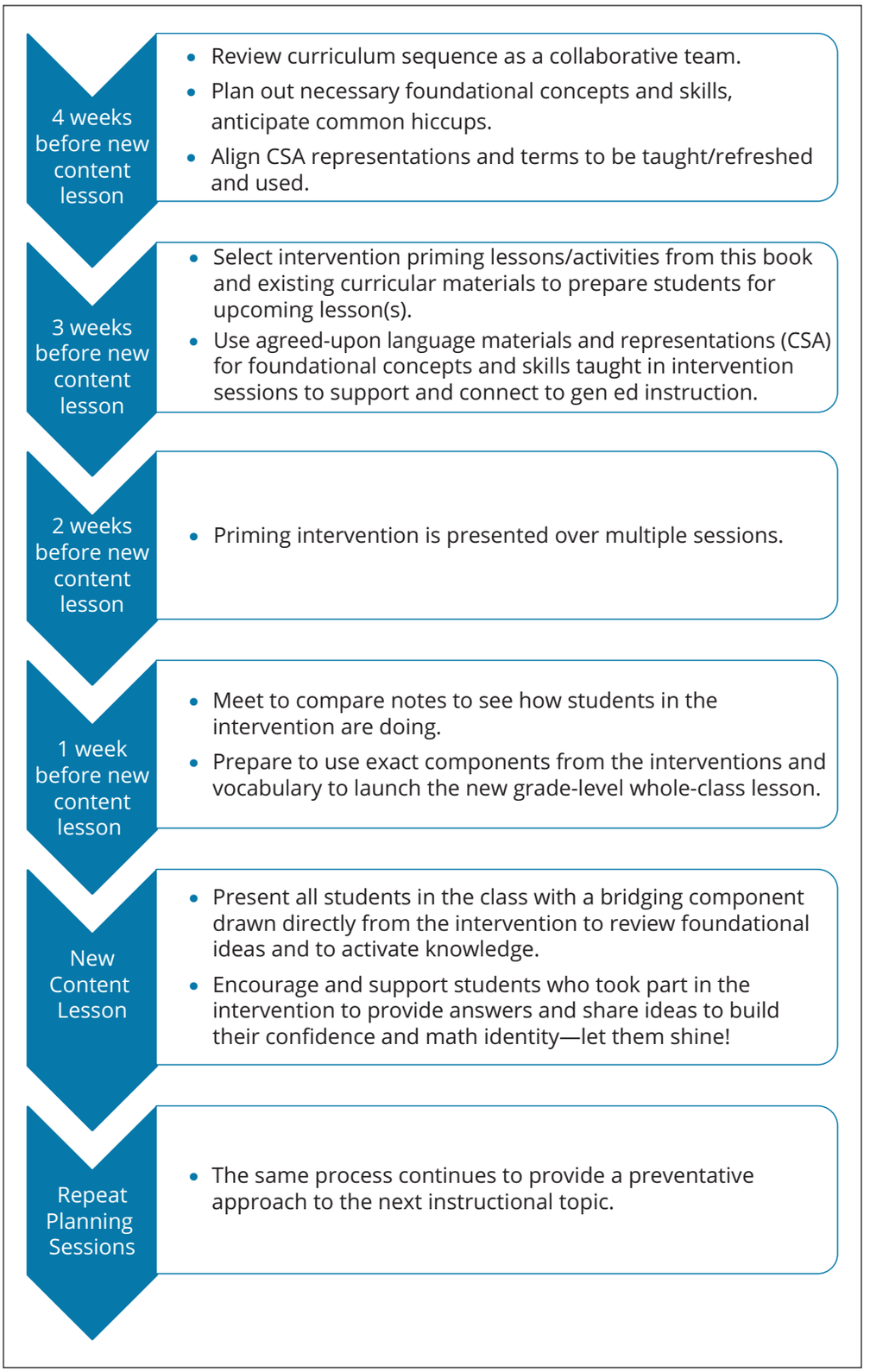
Interventions are reoriented from a reaction to classroom performance where the student isn't showing grade-level growth on a standard to a way of working ahead of time to anticipate and then provide the perfect underpinnings for upcoming lessons.

Delivering a solid background early on generates student confidence. It builds competence in students' mathematical ability so that students can feel and experience the agency to say, "I am a math person." In a study that interviewed secondary students with disabilities, rather than receiving sessions of reteaching content they were learning, they preferred a model of teachers presenting what they had as unfinished learning in advance of the new content (Munk et al., 2010). Students said this approach built their self-confidence and made them feel they could participate actively in class. These are important reflections to consider.

Preloading material during intervention sessions is a teaching turnaround that aligns with a strengths-based instructional theme. Through this proactive approach, students gain knowledge and can contribute to their grade-level mathematics lessons. By now, they will already be equipped with the background knowledge that ensures success in connecting to the mathematics. Let's look at the planning model in Figure 1.2.

By capitalizing on what the teacher knows is coming up instructionally, students' best qualities as learners are fueled by prior knowledge. That "on-ramp position" leads to greater success than prior approaches that chase perceived deficits or weaknesses. Applying strengths-based approaches early on opens the chance for familiarity with the materials and, ultimately, higher performance. We will discuss more strengths-based approaches in Chapter 2. We will go deeper into the planning model in Chapter 4.

Figure 1.2 Planning Model: General Education and Special Education Teacher Teams



online resources Available for download at **https://companion.corwin.com/courses/ProactiveMathIntervention**

What Should We Think About Next?

As noted, we are considering what students can do and refusing to accept limitations. To do so, we need to pair formative assessments with data already collected in summative assessments that can be used as benchmarks. Understanding the learning progression allows teachers and tutors to see where students are in the learning trajectory (Clements & Sarama, 2014), build on what they know, and move them forward. This strength-based approach (Kobett & Karp, 2020) prompts the following questions:

To **leverage** students' prior knowledge, use purposeful questioning and thoughtfully selected tasks. The goal is to provide opportunities to make meaningful connections between something students *know* and something we want them to learn. To do this effectively, teachers must attend to students' ideas *with curiosity*—a desire to truly understand the students' thinking.

- What are students bringing to the new mathematics content?
- How can they leverage that prior knowledge to be prepared for upcoming mathematics content?
- How can we facilitate that leveraging of prior knowledge?
- How can our actions be preventative rather than after-the-fact responses to repeated errors and confusion?
- How can we proactively build on where students are and simultaneously build their mathematics confidence and mathematics identity?

Reflection Opportunities for Chapter 1

1. How are you involved, in any way, with providing mathematics interventions at the classroom or school level? How is your school district involved?
2. To what extent does your school provide your students with mathematics tutoring or intervention opportunities? Is there evidence that these opportunities are making a difference?
3. Describe essential elements of a mathematics intervention program that you want to see provided for your students. How would YOU be involved in such a program?
4. What does the following statement mean to you: *"A math intervention program identifies instructional needs and starts with student strengths, instructionally, monitoring progress along the way as students become engaged in doing math they are learning"*?
5. How are you currently involved in providing or just having students participate in mathematics tutoring or intervention? What challenges do you see with such programs, and how would you suggest that things change?
6. We hear a lot about "learning loss" and how tutoring and intervention may answer such concerns regarding mathematics achievement. What do you think?
7. What about families? How should your intervention activities and student progress in math intervention opportunities be communicated to family members?
8. Have you analyzed the IEPs in your district? Do they focus on mathematics concepts and procedures? Are any IEPs repeated from a previous year? How can individual IEPs become a source of intervention goal setting and planning?