Learning Disabilities Research & Practice, *30*(4), 182–192

DOI: 10.1111/ldrp.12087

Intensive Intervention in Mathematics

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Students who demonstrate persistent mathematics difficulties and whose performance is severely below grade level require *intensive intervention*. Intensive intervention is an individualized approach to instruction that is more demanding and concentrated than Tier 2 intervention efforts. We present the elements of intensive intervention that teachers should consider when planning for, implementing, and monitoring intensive intervention in mathematics. Each of these elements is based on evidence from validated interventions. We also highlight strategies for intensifying instruction. We provide two examples of intensive intervention, one of which launches from a Tier 2 intervention platform and the other which is completely generated by a teacher. We conclude with considerations for intensive intervention in mathematics.

INTENSIVE INTERVENTION IN MATHEMATICS

The mathematics performance of at-risk students can be improved with a secondary (i.e., Tier 2) intervention provided within a multitiered system of support (e.g., Bryant, Bryant, Gersten, Scammacca, & Chavez, 2008a; Fuchs, Fuchs, Craddock, et al., 2008). Some students, however, require more than a Tier 2 intervention. For students who demonstrate persistent mathematics difficulty (MD), that is, students whose performance is severely below grade level and who have not responded to Tier 2 intervention, *intensive intervention* is necessary. The purpose of this article is to introduce readers to the basics of intensive intervention for students with MD. Our model of intensive intervention relies on individualized instruction based on the needs of the student (Fuchs, Fuchs, & Vaughn, 2014; Vaughn & Wanzek, 2014; Wehby & Kern, 2014). This individualization often occurs at Tier 3 within the typical three-tier system of support (Stecker, Fuchs, & Fuchs, 2008).

Tier 3 intervention is more intensive, and the mathematics content and pedagogy are substantially different from that delivered at Tiers 1 and 2. This is necessary because a student only enters Tier 3 intensive intervention when instructional models employed at previous tiers have proven unsuccessful in meeting the student's needs. In an individualized approach to intensive intervention, frequent progress monitoring is essential. Teachers' use progress-monitoring data to make individualized, data-based decisions about the student's instructional program. Tier 3 is noticeably different from Tier 2 intervention, which involves a standard (nonindividualized) program, representing a single approach that is packaged in a manual.

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The intensive (individualized) intervention should be built upon existing structures, often starting with a validated Tier 2 *program* when available (McInerney, Zumeta, Gandhi, & Gersten, 2014). The Tier 2 program is used as a *platform*—a starting point from which the teacher modifies the validated, standard intervention, in response to ongoing progress-monitoring data, to formatively develop individualized, intensive intervention. It is important that the Tier 2 program be validated and address key mathematics deficits for the individual student. By *validated*, we mean that there is positive evidence, collected during at least one well-conducted randomized control trial, that the program improves the mathematics outcomes of students with MD in a Tier 2 intervention. To be clear, in this article, we refer to a Tier 2 *program* to denote its use at Tier 2, where the program is implemented with fidelity according to the procedures under which it was validated. For its use in intensive intervention, we use the term *platform* to denote a validated Tier 2 program that is modified in Tier 3 to meet a student's individual needs (i.e., the platform from which the individualization program is built).

When selecting a Tier 2 intervention program to use as a platform (i.e., starting point) for Tier 3 intensive intervention, it is important to consider whether the validated program provides evidence of efficacy for students with very severe or persistent MD (Fuchs, Fuchs, & Malone, 2015). The Academic Intervention Tools Chart from the National Center on Intensive Intervention (www.intensiveintervention.org) provides descriptions of efficacy studies of mathematics intervention programs, with summaries of results. Intervention developers are provided with the opportunity to report disaggregated results for students with very low mathematics performance from the larger sample of at-risk students who were included in the study. Selecting a program with demonstrated success for very low performers increases the likelihood of success with a student who has a history of poor response.

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It is also important to consider the types of learners with whom the intervention program has been validated. Some studies evaluating intervention programs include few students with very low initial mathematics performance. For example, in a recent evaluation of Mathematics Recovery (Smith, Cobb, Farran, Cordray, & Munter, 2013), which is designed for use with at-risk first graders, two-thirds of the study sample performed above the 25th percentile at the start of the study on a standardized mathematics test. Yet, a signature feature of students who are unresponsive to a Tier 2 intervention is extremely low scores on standardized mathematics tests (Fuchs et al., 2015; Toll & Van Luit, 2013). Students who are unresponsive to Tier 2 are likely to enter Tier 3 below the 15th percentile and will be in need of intensive intervention. Identifying an intervention program with demonstrated efficacy for this population of learners will provide a stronger platform for intensive intervention.

We realize, however, that many teachers may not have access to a validated Tier 2 intervention program. In some cases, a school may not have the resources to acquire a Tier 2 program and the necessary materials. In other cases, a Tier 2 intervention program may not currently exist at a specific grade level or for a set of distinct mathematics outcomes (e.g., geometry, measurement, algebra). For these reasons, in this article, we include descriptions of a general set of elements necessary within intensive intervention. First, we present the elements of intensive intervention. We also present strategies for intensification of instruction. Then, we present two examples of intensive intervention that incorporate these elements. Finally, we discuss considerations for intensive intervention.

ELEMENTS OF INTENSIVE INTERVENTION

We introduce the elements of intensive intervention that teachers should consider when planning for intervention, when implementing intervention, and when monitoring intervention in Figure 1. This set of elements is based on the research related to improving the mathematics outcomes of students with MD from several research teams across the United States.

Planning for Intensive Intervention

Before implementing an intensive intervention, teachers need to conduct a diagnostic assessment that describes the student's strengths and weaknesses. This assessment may be a standardized diagnostic assessment, such as the *KeyMath3* (Connolly, 2007), a standardized-progress monitoring measure that incorporates a diagnostic assessment (e.g., Foegen, Jiban, & Deno, 2007; Fuchs et al., 2007), or an error analysis of student work (Kingsdorf & Krawec, 2014; Riccomini, 2005). The diagnostic assessment should provide a snapshot of the student's mathematical strengths and weaknesses. With an understanding of the student's areas of difficulty, teachers can identify a validated intervention program (e.g., Bryant et al., 2011; Powell, Fuchs, et al., 2015) that focuses on the types of difficulties with which the student struggles. As mentioned, identifying a validated intervention program that provides evidence of efficacy for the subset of very low-performing students increases the chances that this platform will be effective for intensive intervention. Also, narrowing the focus of the validated intervention program—to skills with which the students in fact experiences difficulty—is one way of intensifying intervention.

For example, let's say a teacher has been implementing a Tier 2 intervention with a fourth-grade student on rational numbers (e.g., Fuchs, Schumacher, et al., 2013). The diagnostic assessment indicates the student continues to have difficulty, not only with understanding fraction concepts and calculations, but also with whole-number skills that are foundational to fractions. This includes fluency with addition and subtraction number combinations and multiplication and division concepts. Also, the student demonstrates low performance on any mathematics problem presented within a word-problem scenario. The knowledge gained from the diagnostic assessment helps the teacher identify a validated intervention platform with an appropriate scope and sequence (e.g., Fuchs, Geary, et al., 2013). A diagnostic profile of mathematics skills on which the student has strengths and weaknesses may also inform the teacher about the need to blend more than one validated intervention program or to adjust one intervention with supplementary material to address the student's weaknesses. When designing the intensive intervention's scope and sequence, and selecting an intervention program(s), teachers may need to incorporate instruction in foundational skills necessary to fill in knowledge gaps (e.g., difficulty with multiplication concepts, difficulty with solving word problems), while concurrently working on grade-level mathematics material (i.e., the Tier 1 general education curriculum). Teachers should also incorporate mathematics fluency building activities into the scope and sequence if the student experiences difficulty with automaticity of addition, subtraction, multiplication, or division number combinations (e.g., Burns, Kanive, & DeGrande, 2012).

Implementation of Intervention

We now explain how to implement intensive intervention. First, we describe daily activities that should occur during every intensive intervention session. Second, we describe strategies for intensifying the instruction to meet the individual needs of the student. The strategies for intensification should be embedded within the daily activities.

Activities

Based on our experience in designing intervention platforms for at-risk students and informed by the research of others, we now describe elements of intensive intervention that are critical ingredients when implementing intensive intervention. First, every lesson should begin with a *warm-up* that acts as a refresher for previously learned material (e.g., Swanson, Lussier, & Orosco, 2015). The warm-up helps students to engage in and focus on the mathematics lesson and to make connections to previously learned mathematics skills, concepts, vocabulary, or fluency. Depending upon a student's

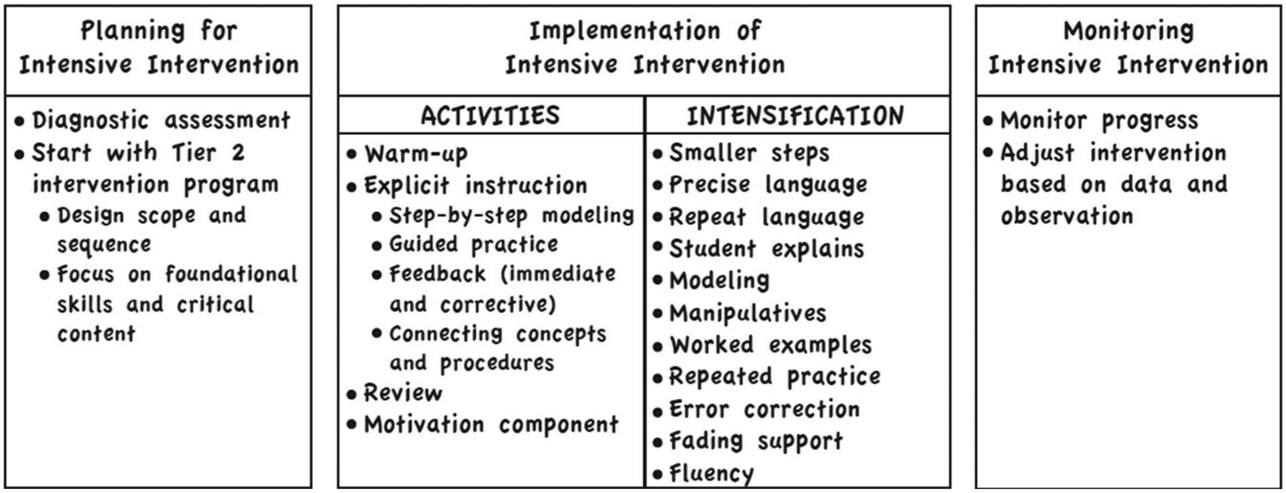

FIGURE 1 Elements of intensive intervention.

needs, the warm-up may include a think-aloud about a word problem solved during the previous lesson (e.g., Fuchs et al., 2009). Alternatively, the warm-up may be a 1 min fluency practice focused on addition and subtraction number combinations (e.g., Powell, Fuchs, et al., 2015) or a brief review of vocabulary related to fractions (e.g., Fuchs Schumacher, et al., 2013). The warm-up should last no longer than 2 to 3 min.

After the warm-up, the teacher should employ *explicit instruction* to teach a specific concept, procedure, strategy, or rule. Explicit instruction refers to a set of principles that the teacher employs to design, deliver, and assess instruction. See Archer and Hughes (2011) for a detailed explanation of explicit instruction. Explicit instruction includes step-by-step modeling by the teacher (e.g., Clarke et al., in press; Dennis, 2015). For example, if the teacher is using a Tier 2 intervention platform about early numeracy skills (e.g., Powell, Driver, & Julian, 2015), the teacher might model how to subtract with manipulatives, as illustrated in the following scenario:

Teacher: Look at this problem. 11 minus 8. Let's say that together.
Students: 11 minus 8.
Teacher. This problem has a minus sign (point). What sign?
Students: Minus sign.
Teacher: When we see the minus sign, we subtract. What do we do?
Students: Subtract.
Teacher: Watch as I model subtraction with these bugs. I start with 11 bugs. I place the 11 bugs on the counting mat. Let's count them together.
Together: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.
Teacher: Now, the minus sign (point) tells us we need to take away 8 (point). How many do we take away?
Students: 8.
Teacher: I take away 8: 1 (take 1 bug off mat), 2 (continue taking away bugs), 3, 4, 5, 6, 7, 8. Did we take away 8?
Students: Yes.
Teacher: Now we count how many bugs remain on the counting mat. 1, 2, 3. So, 11 minus 8 equals 3. Let's say that together.
Together: 11 minus 8 equals 3.

During this *step-by-step modeling*, the teacher involves students by asking questions and asking for feedback. Step-by-step modeling is not the teacher talking about and doing mathematics without some involvement from the students. Sometimes step-by-step modeling is conducted under the auspices of a think-aloud (e.g., Jitendra et al., 2013). A think-aloud shows students a meta-cognitive strategy for solving problems independently. Step-by-step modeling may also include introduction of steps via a prompt sheet that students can refer to during guided practice and review (e.g., Xin, Jitendra, & Deatline-Buchman, 2005). During step-by-step modeling, the teacher models one or several problems. The number of examples depends upon the concepts or procedures to be learned during the lesson and how quickly the student demonstrates understanding of the conceptual and procedural strategies. A lesson about word problems, for example, may involve the teacher modeling one word problem (e.g., Fuchs et al., 2009). A lesson about place value may allow for several examples before guided practice begins.

After the teacher engages in explicit step-by-step modeling, the teacher initiates *guided practice*. Guided practice involves the teacher and students working together on problems (Pool, Carter, Johnson, & Carter, 2012). The practice is guided because the teacher guides the student using the same step-by-step process presented within step-by-step modeling (e.g., Hunt, 2014). Teachers use explicit language and cues to guide the students. Cues may be low-reasoning questions (e.g., "What's 20 plus 10?"), high-reasoning questions (e.g., "How do mixed numbers and improper fractions have the same value?"), directives (e.g., "Solve for *x*."), reminders (e.g., "Remember, if you have more than 9 ones, what do you have to do?"), or prompts (e.g., "Use your SIGNS strategy.") In some cases, the teacher may show work during guided practice on paper, using a whiteboard, or using technology, and students might solve the problems using the same mediums.

Throughout guided practice and the entire lesson, teachers provide explicit *feedback*. Feedback may be affirmative and is always specific. For example, a teacher may say, "You counted well when you touched each bug and gave each bug a count," or "Excellent use of the FOPS strategy" (e.g., Jitendra et al., 2013). Feedback can also be corrective, and teachers should redirect all student errors. For example, "Look at the hundreds column again. What numbers do you subtract?" or "If the numerator is 3, how many blocks should we shade?" Corrective feedback should be provided immediately. During step-by-step modeling and guided practice, teachers provide corrective feedback as soon as it is apparent the student has a misconception or has made an error. This immediate corrective feedback helps students learn material correctly the first time instead of learning incorrectly and having to re-learn.

During the step-by-step modeling and guided practice, teachers *connect mathematics concepts and procedures* in an explicit manner (e.g., Fuchs et al., 2005). Teachers may use concrete hands-on materials or pictorial representations to reinforce concepts, such as those related to place value (e.g., Bryant, Bryant, Gersten, Scammacca, & Chavez, 2008). Hands-on materials, pictorial representations, and virtual manipulatives follow the concrete-representational-abstract framework for presenting mathematics in multiple modes (Flores, Hinton, & Strozier, 2014; Miller & Hudson, 2007). Teachers may also use graphic organizers to help students understand vocabulary or ideas. For example, Jitendra et al. (2013) used graphic organizers to set up information from word problems. The graphic organizers differed by word-problem type and represented the underlying schema of a word problem. Conceptual learning (i.e., learning about mathematical concepts instead of procedures) can also occur without extraneous materials. For example, when teaching fractions, teachers can discuss the denominator as a "whole divided into equal parts." This definition is conceptual, is mathematical, and is more meaningful than saying "bottom number." Conceptual and procedural ideas should be presented simultaneously. For example, when providing explicit instruction on an algorithm for multidigit addition, the teacher can focus on the procedural by prompting to "start in the ones column," but integrate the conceptual by asking, "What happens when there are more than 9 ones?" or "What does it mean to exchange?"

After step-by-step modeling and guided practice, teachers conduct a *review* of concepts and procedures at the end of each lesson. This review may be focused on the skill of the lesson or may be cumulative in nature, incorporating different types of problems. The review should be relatively brief (i.e., 1–3 min), and the teacher should provide corrective feedback for any problems answered incorrectly (e.g., Fuchs et al., 2009).

Finally, a *motivation component* is embedded within every lesson (e.g., Bryant, Bryant, Gersten, Scammacca, Funk, et al., 2008). This motivation component helps keep students on task and shows the student how they make progress through the lesson. For example, students may earn puzzle pieces for following directions, trying hard, and completing activities (e.g., Powell & Driver, in press). These puzzle pieces are placed into a puzzle, and when the puzzle is complete, students pick a small prize.

Intensification

We now highlight strategies for intensification of the Tier 2 intervention platform. These strategies have been described in several publications related to reading, mathematics, and behavior (Fuchs, Fuchs, Powell, et al., 2008; Kern & Wehby, 2014; Lemons, Kearns, & Davidson, 2014; Powell & Stecker, 2014; Vaughn, Wanzek, Murray, & Roberts, 2012). Most of these strategies should be familiar to teachers, but we provide this list as a launching point for enhancing intensive intervention.

Teachers can break problems into *smaller steps*. For example, when providing instruction on word problems that involve addition and subtraction, the Tier 2 intervention program may introduce a word-problem approach in one lesson (e.g., Fuchs et al., 2009). To intensify, teachers may spend one lesson each on the three steps to attacking a word problem: read the problem, underline the labels, and identify the underlying schema of the word problem. Instruction on each step of the word-problem process makes the task manageable for the student. Another strategy for intensification involves using *precise* language, and this language should be *repeated* often. Perhaps the Tier 2 intervention program suggests the teacher to prompt regrouping as, "Is the answer in the tens column more than nine? Do you need to regroup?" To intensify, the teacher could use precise language to ask, "More than nine? Regroup?" and repeat this saying in the same way every time the student works on computation.

Earlier we described how teachers could use think-alouds to model the process of solving problems. Think-alouds, conducted by the student, can also be used to encourage *student explanations*. For example, a student may explain their problem-solving process to the teacher. By encouraging the student to explain a procedure or concept, the teacher gauges student understanding and gaps in knowledge. The teacher could then use this information for re-teaching or extension. To intensify, the teacher could provide multiple opportunities for student explanations which could help students to internalize mathematical processes.

During explicit instruction, the teacher *models*. With intensive intervention, the teacher may provide more opportunities for teaching modeling or different types of modeling. For example, instead of one modeling, the teacher might provide three modeling examples. One particularly helpful tool for modeling is the use of *manipulatives*. When intensifying, the teacher might seek out manipulatives not used in the Tier 2 intervention program. For example, if a Tier 2 program utilizes fractions bars to demonstrate the length model of fractions, manipulatives used during intensive intervention might include Cuisenaire rods or numbers lines—two additional concrete manipulatives that represent the length model of fractions. The teacher could also use manipulatives to represent other models of fractions (e.g., area model, set model) not introduced in the Tier 2 intervention program.

To intensify intervention, a teacher can also used *worked examples*, that is, examples of problems that have already been solved. These worked examples could be teacher work, the work of hypothetical students, or prior work of the student; worked examples can include correct and incorrect work. With a worked example, the teacher shows the student the example, and the teacher asks questions about the work, asks the student to explain the work, or uses the worked example as a model for a subsequent and related problem. We are not aware of any Tier 2 intervention programs that employ worked examples, so this method of intensification may be especially novel and helpful to students (e.g., Booth, Lange, Koedinger, & Newton, 2013).

As we have already discussed, practice is necessary for learning mathematics and an important activity for intensive intervention. To intensify, teachers should provide *repeated practice* opportunities during guided practice or independent practice. As students practice, teachers should provide *error correction*. During Tier 2 with a small group of students, the teacher may not have the opportunity to provide error correction at the individual student level or correct all errors. Intensive intervention provides the teacher with this opportunity. Intensive intervention also allows the teacher, working individually with a student, to *fade support* when it is meaningful for the student.

Another method for intensification is to build *fluency*. Some Tier 2 intervention programs have an embedded fluency component (e.g., Powell, Fuchs, et al., 2015), whereas others do not. To intensify, a teacher could increase or alter the fluency building flash cards by increasing the time of the cards from 1 min to 2 min or by playing a fluency game instead of using flash cards. A teacher could also use fluency evidence-based practices such as cover-copy-compare or taped problems (Poncy, Skinner, & Jaspers, 2007).

Monitoring Intervention

During implementation of intensive intervention, teachers must monitor progress. This progress monitoring may be informal, such as an observation, or more formal, such as a daily set of problems that are tracked toward mastery (e.g., Bryant et al., 2011). Teachers should administer, on a weekly basis, standardized progress-monitoring measures with normative information about growth and benchmark scores to aid in the decision-making process for revising instructional programs and for supporting the multitier support system (e.g., Stecker et al., 2008).

Information gained from informal and formal progress monitoring is used to make adjustments to the student's instructional platform. That is, if a student requires re-teaching of a concept or procedure or the student is not making adequate progress to meet end-of-year Individualized Education Program (IEP) goals in mathematics, teachers should make focused, yet quick, changes to the student's instruction. For more detail about using progress monitoring data to make changes to intensive intervention, see Powell and Stecker (2014).

TWO EXAMPLES OF INTENSIVE INTERVENTION

Now we describe two examples of intensive intervention. First, we highlight Mr. Delgado and a fourth-grade student, Chloe. Mr. Delgado begins with a Tier 2 intervention platform with Chloe. Then, we describe Ms. Brown who conducts intensive intervention without a Tier 2 intervention platform with an eighth-grade student, Francisco.

Intensive Intervention Starting with a Validated Tier 2 Platform: Mr. Delgado and Chloe

Chloe is a fourth-grade student who is demonstrating inadequate progress in her mathematics program that includes Tier 1 whole-class instruction plus Tier 2 small-group intervention. The Tier 1 program consists of mathematics instruction from a popular textbook series, and the Tier 2 program relies on worksheets the interventionist had gathered.

Planning

Mr. Delgado, the school's special educator who delivers intensive intervention, begins with a diagnostic assessment of the work Chloe has completed in the last 4 weeks of her Tier 1/Tier 2 program. He identifies whole-number computation and fraction concepts as Chloe's two primary areas of weakness. Mr. Delgado is aware of the importance of fractions for success in mathematics at the middle and high school level; thus, he wants to make sure Chloe has a strong foundation in fractions. After consulting several sources to locate an evidence-based Tier 2 intervention platform, Mr. Delgado selects *Fraction Face-Off!* (Fuchs, Schumacher, et al., 2013; Fuchs, Schumacher, et al., 2014). This program, with a focus on developing fraction concepts and fraction computation skill, was identified by the National Center on Intensive Intervention as a program with strong evidence. Importantly, as reported on the website, findings for the effects of *Fraction Face-Off!* Were disaggregated for students at-risk for MD in two categories: mathematics performance below the 15$^{\text{th}}$ percentile and performance between the 15$^{\text{th}}$ and 35$^{\text{th}}$ percentiles. For both groups, students in *Fraction Face-Off!* made significant and substantial improvement on fractions compared to business-as-usual comparison students.

Mr. Delgado follows the scope and sequence provided by the *Fraction Face-Off!* program for Chloe. He plans to provide intensive intervention for 12 weeks, 3 times a week for 35 min each session. The *Fraction Face-Off!* platform focuses on fraction concepts, comparing and ordering fractions, adding and subtracting fractions, and word problems with fractions, Mr. Delgado intensifies Chloe's instruction by adding in fluency practice on multiplication and division number combinations, and a by focusing on addition and subtraction computation to address Chloe's other foundational skill deficits.

Implementation

The warm-up of *Fraction Face-Off!* is a word-problem warm-up where Chloe solves a word problem with Mr. Delgado's instruction. Then, Mr. Delgado uses explicit instruction to teach Chloe about the concepts of fractions. For example, in the eighth lesson, Mr. Delgado starts off the by reviewing the precise vocabulary terms "numerator," "denominator," "equivalent," and "proper fraction." Mr. Delgado makes sure to repeat these terms often during the lesson. Then, Mr. Delgado introduces the Doubling Rule that can be used to check if fractions are equivalent to one-half. Mr. Delgado models how to use the Doubling Rule with $\frac{4}{8}$ by engaging Chloe in the following dialogue:

Mr. Delgado:	The Doubling Rule is: when a fraction is equivalent to $\frac{1}{2}$, the denominator is double the numerator. What's the Doubling Rule? Let's say it together.
Together:	When a fraction is equivalent to $\frac{1}{2}$, the denominator is double the numerator.
Mr. Delgado:	We use the Doubling Rule to check each fraction. Let's do the first problem. What fraction?
Chloe:	$\frac{4}{8}$.
Mr. Delgado:	Let's check whether $\frac{4}{8}$ is equivalent to $\frac{1}{2}$. Let's double the numerator, 4. What's 4 plus 4?
Chloe:	8.
Mr. Delgado:	Right. We double 4 to get 8. 4 plus 4 equals 8. 4 is the numerator (point) and 8 is the denominator (point). The Doubling Rule always works to check if a fraction is equivalent to $\frac{1}{2}$. Is $\frac{4}{8}$ equivalent to $\frac{1}{2}$?
Chloe:	Yes!
Mr. Delgado:	$\frac{4}{8}$ is equivalent to $\frac{1}{2}$. Let's use the Doubling Rule to check if the next problem is equivalent to $\frac{1}{2}$.

After modeling the problems from *Fraction Face-Off!* and modeling several more problems not included in the Tier 2 intervention platform, Mr. Delgado seamlessly moves into guided practice where Chloe uses the Doubling Rule to check whether fractions are equivalent to $\frac{1}{2}$. Mr. Delgado asks Chloe questions such as, "What is the Doubling Rule?," "Do you double the numerator or the denominator?," and "How can you check that $\frac{6}{12}$ is equivalent to $\frac{1}{2}$?" Mr. Delgado provides affirmative feedback and error correction as Chloe works.

To help Chloe visualize fractions equivalent to $\frac{1}{2}$, Mr. Delgado uses fraction tile manipulatives to show fractions that have a length on a number line of $\frac{1}{2}$. In this way, Mr. Delgado is helping Chloe connect the procedure of using the Doubling Rule to the concept of fractions equivalent to one-half. Mr. Delgado conducts two activities during the review segment of the intervention. He uses the review of *Fraction Face-Off!*, and he supplements this review with a brief practice activity related to addition and subtraction computation (during the first 6 weeks) and multiplication and division fluency (during the second 6 weeks). For all of the review activities, Mr. Delgado checks every problem and provides feedback to Chloe, encouraging Chloe to correct mistakes.

Throughout the intervention, Mr. Delgado uses the motivation component of *Fraction Face-Off!* This component involves awarding Chloe half-dollars and dollars for on-task behavior and problems answered correctly. At the end of each week, Chloe can use her dollars to buy small prizes from a Fraction Store.

Monitoring

Mr. Delgado monitors Chloe's progress in two ways. First, he monitors her progress in an informal manner by asking questions throughout the intervention sessions, listening to Chloe's responses, and watching how Chloe solves problems when she is doing guided practice or review problems. He uses this information to re-teach material during subsequent lessons. Second, Mr. Delgado monitors Chloe's progress on a weekly basis using a standardized progress monitoring measure identified by the National Center on Intensive Intervention as a general outcome measure with high validity and reliability. Mr. Delgado enters Chloe's progress monitoring scores into an on-line scoring program, and this program provides Mr. Delgado with information about how Chloe is making progress to an end-of-intervention goal.

After the first 4 weeks of intensive intervention, Mr. Delgado studies a graph of Chloe's progress and notes that her trend line (i.e., line drawn among the first four data points) is not as steep as the goal line connected to Chloe's end-of-intervention goal. Mr. Delgado knows he needs to make timely decisions about the intensive intervention for Chloe (Powell & Stecker, 2014); otherwise, Chloe is unlikely to achieve her goal. So, Mr. Delgado decides to modify Chloe's intensive intervention in three ways. Based on the informal observations of Chloe's work (i.e., asking questions, listening to Chloe's responses, and watching Chloe's work process) and on an error analysis that he does for the last four tests Chloe completed for progress monitoring, Mr. Delgado decides to review mathematics vocabulary at the start of every lesson (i.e., precise language, repeat language), incorporate more think-aloud modeling and practice related to whole-number computation (i.e., student explains, fluency), and use a checklist for fraction word problems (i.e., smaller steps).

Mr. Delgado immediately institutes these changes to Chloe's intensive intervention and draws a vertical line on her graph to signify adjustments to her intervention program. As he implements intensive intervention with these adjustments, he continues to conduct informal and formal monitoring of Chloe's progress. At the end of the eighth week of intervention, he reviews Chloe's graph. Her trend line is steeper but still not as steep as her goal line. Based on his analysis of Chloe's response to the last round of instructional adjustments, Mr. Delgado decides to incorporate more hands-on opportunities when Chloe works on addition and subtraction of fractions (i.e., manipulatives). Also, because Chloe is demonstrating a stronger understanding of addition and subtraction, Mr. Delgado now deems work on foundational skills related to multiplication and division to be the higher priority. So he decides to eliminate the vocabulary review at the start of every lesson and instead use that time to work on multiplication and division number combinations (i.e., repeated practice, fluency). Mr. Delgado implements these changes to Chloe's intensive intervention and continues to monitor Chloe's progress.

This scenario illustrates how the intensive intervention process, which relies in part on a validated Tier 2 intervention platform, works. The teacher deliberately selects a platform that best addresses the student's needs, as identified through a diagnostic assessment process. Then the teacher implements the intervention, while systematically monitoring the student's progress. Contrary to the standard administration of the validated intervention program, however, intensive intervention involves a data-based individualization of that program to address the student's needs as they evolve over the course of intervention. When the student's progress-monitoring data reveal the need for adjustments, designed changes that are based on explicit instructional principles and intensification strategies are incorporated into the intervention platform. In this way, the intervention platform is tailored—but not replaced entirely. Sometimes, however, a validated intervention program that addresses the student's mathematic weaknesses is not available. In this case, the teacher designs intensive intervention as described next with Ms. Brown and Francisco.

Intensive Intervention Starting Without a Validated Tier 2 Platform: Ms. Brown and Francisco

Ms. Brown is Francisco's special education teacher. Francisco, an eighth-grade student, has been identified with a learning disability, and the school has specified IEP goals in mathematics. Francisco was unresponsive to the Tier 2 program the school had implemented.

Planning

Ms. Brown begins with a diagnostic assessment of Francisco's mathematics skills. An assessment of Francisco's performance in his Tier 2 intervention demonstrates that Francisco's understanding of whole numbers and fractions appears adequate, but his understanding of negative integers and functions is poor. He has difficulties with negative integers on a number line and with computation involving negative integers. He also experiences difficulty interpreting functions, function tables, and function equations. Finally, word problems cause trouble for Francisco, particularly word problems that require algebraic understanding. Ms. Brown knows that Francisco must have a good grasp of these skills before he starts high school. The assessments confirm Ms. Brown's observations and extend her understanding of Francisco's profile of mathematics strengths and weaknesses.

Ms. Brown consults several websites to find a Tier 2 intervention platform suitable to meet Francisco's needs. She also consults with the school psychologist and emails several other special educators for input. Ms. Brown and her colleagues cannot identify a Tier 2 intervention platform with an evidence base for middle school students who have difficulties mastering algebraic concepts. Ms. Brown realizes she needs to design the intensive intervention for Francisco on her own.

Ms. Brown reviews the elements of intensive intervention and creates a scope and sequence for an individual intensive intervention that will run 8 weeks, 4 times per week, 25 min per session. Ms. Brown starts off Francisco's intensive intervention with functions and word problems. She plans to spend the final 3 weeks shifting the focus to negative integers with continued practice on functions and word problems. During the 8 weeks, she will observe Francisco's performance and conduct systematic progress monitoring to determine when adjustments in the intervention program are required to assure satisfactory improvement in these critical mathematics milestones.

Implementation

Ms. Brown decides to start every lesson with a warm-up using a function machine (i.e., a pictorial representation of a robot with input and output arms; the rule of function is printed on the robot's belly), and she uses explicit instruction to introduce the function machine to Francisco. The first week's function machine focuses on addition and subtraction, then Ms. Brown works on multiplication and division for a week before transitioning to variables (e.g., *x*, *y*) with all operations. In some examples, Francisco is provided with the rule (i.e., the function) and determines output values. In other examples, Francisco determines the rule based on input and output values.

After the warm-up, Ms. Brown uses explicit instruction to teach Francisco about function tables during the first 2 weeks of intensive intervention. Ms. Brown models how to fill in missing information on function tables and how to determine the rule. She explicitly connects function tables to the function machine used during warm-up. Before guided practice, Ms. Brown provides a function table to Francisco and they work on filling out the function table together. Ms. Brown demonstrates filling into two lines of the table (i.e., worked examples), and Francisco answers questions and then fills in the same information. Then, Francisco fills in the next three lines of the table as Ms. Brown provides reminder prompts. After solving a table together, Ms. Brown uses guided practice to transition Francisco to solving function tables with less support (i.e., fading support).

During the next 6 weeks of intensive intervention, Ms. Brown shifts the focus of explicit instruction to solving word problems that require algebraic understanding. Ms. Brown realizes that Francisco gets overwhelmed when presented with a word problem, so she teaches him a word-problem strategy that breaks word-problem solving into a manageable task (i.e., smaller steps). The strategy she chooses is based on a research-supported program (Montague, 2008). Ms. Brown explicitly models for Francisco how to Read, Paraphrase, Visualize, Hypothesize, Estimate, Compute, and

Check whenever he is presented with a problem presented with text. As Ms. Brown teaches word-problem solving to Francisco, she uses a combination of worked and nonworked examples. She read about the recommendation in an Institute of Education Sciences practice guide focused on teaching algebra at middle and high school (Star et al., 2015).

Each lesson, after explicit modeling how to solve a word problem, Ms. Brown transitions to guided practice where she and Francisco work on word problems together. The following is a guided practice example:

Ms. Brown:	Francisco, here's a word problem. What's the first thing we do?
Francisco:	Read.
Ms. Brown:	That's right. When you see a word problem, the first thing you do is read the problem. Let's read this together.
Together:	Anita has a collection of postage stamps. She has one book that contains 35 stamps. She has a second book that has 7 stamps on each page. How many postage stamps does Anita have in all if the second book has 14 pages?
Ms. Brown:	Now, paraphrase. What's this problem about?
Francisco:	This problem is about stamps. I was told the number of stamps in the first book. I have to calculate the number of stamps in the second book, and then add all the stamps.
Ms. Brown:	Underline the important information. What will you underline?
Francisco:	I underline stamps. I underline 35, 7, and 14. (Underlines.)
Ms. Brown:	Now, visualize. Can you draw a picture or diagram to help you?
Francisco:	I'm not sure.
Ms. Brown:	Let's see. We have two books with stamps. Would it be helpful to draw two boxes to show two books?
Francisco:	Yes! I could write 35 in one of the boxes. I could write 7 and 14 in the other box. (Draws boxes.)

Ms. Brown continues uses guided practice, which incorporates explicit questions and prompts to help Francisco solve the problems. Francisco's explanations help Ms. Brown gauge his understanding of the word-problem process.

Ms. Brown gives Francisco affirmative feedback that is specific. For example, "When you underlined the important information in the word problem, you made it easier to find the information you needed for your equation." Ms. Brown also provides error correction when Francisco makes an error. At the end of every lesson, Ms. Brown asks Francisco to solve several function tables and one word problem for a review. She checks Francisco's work at the end of the review, and she provides corrective feedback when necessary. Ms. Brown uses questions and prompts to help Francisco work through his mistakes, and she asks Francisco to correct his work so the error review is meaningful to him.

Ms. Brown uses a motivation component tied to her school's motivation component. Students have the opportunity to earn Duck Bucks (the mascot of the middle school is a duck), which they can spend at the school store. If Francisco is on-task and using his intensive interventions strategies correctly, he can earn several Duck Bucks each lesson.

Monitoring

Ms. Brown monitors Francisco's progress informally and formally. The informal monitoring occurs during the lesson as Ms. Brown works with Francisco. She listens to his responses, observes his written work, and asks questions for understanding. Ms. Brown makes notations about Francisco's progress on the scope and sequence form she developed for his intensive intervention. In this way, she can refer to previous notations for re-teaching of material and planning for future instruction.

Ms. Brown does not, however, assume that her planned program will meet Francisco's needs. Instead, she implements the formal, online progress monitoring system her middle school has established. At eighth grade, these measures include a combination of computation and application problems that typical eighth-grade students should be able to solve by the end of the school year. Ms. Brown administers a 7-min progress monitoring measure to Francisco at the end of each week. She enters his scores into an on-line portal, and she receives a graph of Francisco's progress. Similar to Mr. Delgado and fourth-grade student, Chloe, Ms. Brown makes decisions about how well the intensive intervention is working for Francisco every 4 weeks. After the first 4 weeks, Ms. Brown adjusts Francisco's intervention program. Also, when she realizes it will take longer than 8 weeks to help Francisco achieve a level of mathematics performance that will permit success in the general program, she begins develops a plan for a next phase of intensive intervention for Francisco.

This scenario illustrates how the intensive intervention process, which did not rely on a validated Tier 2 intervention platform, works. The teacher consulted sources with evidence-based information to construct a scope and sequence based on the strengths and weaknesses of the student. The teacher then implements intensive intervention, as she monitors the student's progress and makes periodic adaptations to the intensive intervention to ensure ongoing progress.

CONSIDERATIONS AND CONCLUSION

Before implementing intensive intervention, teachers must be facile with important components of intensive intervention. First, teachers must be familiar with diagnostic assessments, and this familiarity includes how to select appropriate assessments, how to administer assessments with fidelity, how to score, and how to interpret scores. Teachers may have the assistance of another special education teacher or school psychologist to help with diagnostic assessments. The interpretation of diagnostic assessment data is vital because the interpretation provides the basis for decisions about the scope and sequence of intensive intervention for the individual student.

Second, teachers should be familiar with grade-level standards and well as standards from previous grade levels. Understanding and planning for standards within the grade-level curriculum is referred to as horizontal planning, whereas planning across grade levels is vertical planning (Witzel, Riccomini, & Herlong, 2013). Vertical planning is often more difficult than horizontal planning, but vertical planning is necessary for intensive intervention students because these students often have foundational knowledge gaps that must be addressed before or while focusing on grade-level mathematics standards.

Third, teachers need to understand the tenets of explicit instruction and be able to use these principles. For example, effective modeling incorporates many aspects of explicit instruction. It is *not* the teacher talking and explaining while the student sits idly by with no interaction with the teacher. Instead, the teacher should be prompting student responses, asking questions for understanding, and having the student complete parts of the solution he/she can do correctly. In this vein, the teacher should gradually transfer responsibility to the student for an increasing number of solution steps, systematically planning for the student to take full responsibility. This involvement keeps the student active in the learning process, causes fewer off-task behaviors, and results in stronger learning outcomes.

Fourth, teachers must be aware of strategies for intensifying intervention. In this article, we highlighted 11 strategies, but there are additional strategies that teachers can employ. Each strategy for intensification should be embedded within explicit instruction. Teachers need to be well versed in how and when to make such instructional adaptations. Knowing about some of the more common ways to intensify intervention (e.g., introducing smaller steps, incorporating visual representations and manipulatives, providing fluency practice; Clarke et al., in press; Fuchs, Schumacher, et al., 2013; Jitendra & Star, 2011) makes for more successful intensive intervention programs.

Fifth, teachers should be familiar with ways to provide affirmative feedback. “Good!” and “nice work!” are affirmative but fail to communicate what aspects of the student’s performance teacher appreciates. Specific affirmative feedback is a better approach. For example, “Nice work using your ratio equation of *x* over *y*!” is more specific and helps the student understand why his/her work was “nice.” Corrective feedback should be presented gently and positively. We cannot imagine any reader of *LDRP* needs this information, but negative feedback (e.g., “That’s wrong.”) or insulting feedback (e.g., “You know 5 times 3. 5 times 3 is so easy!”) should be avoided entirely. Instead, teachers might say, “Let’s look at this problem together,” or “Look at the multiplication chart for 5 times 3. To find the answer, skip count by fives.” This type of feedback causes less anxiety for the student and provides the student with information with which to master the mathematics ideas and procedures he/she will need to succeed in the figure.

Sixth, intensive intervention teachers must be knowledgeable about progress monitoring. This includes knowledge about the variety of available progress-monitoring tools, their administration and scoring, and how to interpret and make good use of data. Teachers should use formal and informal data to understand when intensification is necessary and when the intensification is leading to improved mathematics performance and understanding.

Research (Marston, 2005; Stecker et al., 2008) indicates that intensive intervention, when implemented with enough intensity and duration and with systematic reliance on data-based individualization, improves the mathematics performance of most students. Ongoing, systematic progress monitoring is, however, essential. Such progress monitoring helps teachers to quickly identify when students are unresponsive to the present intensive intervention program. In these cases, teachers should be prepared to make substantively meaningful adjustments to that program. This can include adding intervention components; decreasing the focus on material that is mastered, even as systematic review of previously mastered content is included; and infusing motivational support and self-regulation strategies to encourage students to work harder. It also includes relying on a variety of teaching strategies (rather than re-teaching material over and over in the same way). It also includes attending deliberately to the foundational skills necessary to achieve grade-level expectations. The scope and sequence may need to be periodically adjusted or redesigned to achieve the right mix of foundational and grade-level content. Because many students with MD who require intensive intervention already perform several grade levels below expected, intensive intervention is absolutely necessary to help students achieve success with mathematics.

ACKNOWLEDGMENTS

This research was supported in part by Grant R324A150078 from the Institute of Education Sciences in the U.S. Department of Education to the University of Texas at Austin and by Grant R324D130003 from the Institute of Education Sciences in the U.S. Department of Education to Vanderbilt University The content is solely the responsibility of the authors and does not necessarily represent the official views of the Institute of Education Sciences or the U.S. Department of Education.

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