INTENSIVE INTERVENTIONS FOR STUDENTS STRUGGLING IN READING AND MATHEMATICS

A Practice Guide

CENTER ON INSTRUCTION

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CENTER ON INSTRUCTION

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PREFACE

Teachers, administrators, and policy-makers across the country need materials that address today's problems and initiatives. COI and its authors select topics and promote practices that have direct relevance to the urgent concerns and priorities of contemporary educators. For example, states seeking more rigorous college and career-ready standards such as those in the Common Core State Standards need guidance for implementation, including specific strategies and interventions to support English language learners and students with special needs. Schools implementing School Improvement Grants (SIGs) look for guidance on meeting the needs of diverse learners and using data to inform instructional decisions. Schools extending learning time need guidance on maximizing the use of instructional time.

This publication on intensive interventions can inform the design, delivery, and use of evidence-based interventions with students, including those with disabilities and those who struggle with mastering today's rigorous reading, literacy, and mathematics standards. It can also promote the continuous use of student data to differentiate instruction—an essential practice for meeting each student's individual needs and raising the academic performance of a school.

The authors invite you to consider and implement these practices, both for their value in meeting the goals of current initiatives such as SIG and Common Core State Standards and for the long-term strength of your educational programs.

OVERVIEW

This publication provides research-based guidance for intensifying instruction in reading and mathematics for students with significant learning difficulties, including students with disabilities, in kindergarten through grade 12. The guide gives technical assistance providers and states information reflecting "best practices" for implementing intensive interventions to improve education practices for struggling students, including those who receive special education. It can also be used as a resource for instructional specialists and special education teachers who are searching for broad guidelines on the design and delivery of intensive interventions.

With those goals in mind, we present a brief review of the research on intensifying instruction for struggling students. Specifically, we discuss:

- integrating strategies that support cognitive processes (e.g., self-regulation and memory) with academic instruction and aligning this instruction with learner needs,
- differentiating instructional delivery by making it more explicit and systematic and by increasing opportunities for feedback,
- increasing instructional time, and
- reducing group size.

The guide includes the following resources:

- practice guidelines (in the form of questions and answers) that can inform the design and delivery of intensive interventions,
- example lessons (see the Appendix) that illustrate the intensification of key areas of instructional delivery (i.e., making lessons more explicit and systematic and increasing the opportunities for student response and feedback), and
- a list of resources for further reading and extended learning.

Although this guide is not a comprehensive review of the literature, it does offer guidelines for instructional decision-makers on adapting and modifying instructional practices to deliver appropriate, responsive instruction for students with learning difficulties.

INTRODUCTION

Educators often encounter challenges when delivering effective instruction to students with significant learning difficulties. Typically, we address the learning needs of such students in two fundamental ways:

- we examine ways to provide systematic and differentiated instruction within core reading and mathematics, and
- we provide intensive interventions to ensure that these students receive the targeted instruction needed to accelerate their reading and mathematics accomplishments.

The purpose of this guide is to discuss considerations for providing intensive intervention to students with significant learning difficulties, including those with learning disabilities, in reading and math.

Intensifying instruction

Educators must weigh several considerations when providing an intensive instructional program for students with significant learning difficulties, and in this guide, we discuss four such considerations. First, and perhaps most important, educators must consider whether instruction is responsive to the cognitive processing difficulties of each student. Many students with significant learning difficulties in reading and mathematics have executive function or self-regulation problems that interfere with their success. Promising research suggests that *integrating strategies that support cognitive processing through academic instruction* may accelerate academic progress.

Second, educators must consider whether they are sufficiently differentiating *instructional delivery* to meet the learning needs of students who typically require more explicit and systematic instruction.

Third, educators must consider whether they are providing students with *adequate instructional time*. Many students with significant learning difficulties require additional time with appropriate instruction, practice, and feedback.

Fourth, educators must consider the extent to which the learning environment promotes opportunities to respond to and align instruction with students' learning needs. *Smaller learning groups* and one-on-one instruction can foster this type of learning environment.

This guide addresses each of these four considerations with suggestions for improving intensive interventions for students with significant learning difficulties, including students with disabilities, in reading and mathematics.

SUPPORTING COGNITIVE PROCESSING

Students whose academic performance is significantly lower than their grade-level peers require intensive intervention. One explanation for this disparity is that some students come to school unprepared for reading- and mathematics-related learning. For example, they may not have the necessary language proficiency, background knowledge, or education-related experiences to readily learn expected content. Often, these students start school already behind their peers and struggle to compensate for their low language skills and lack of school-related background knowledge. They may receive appropriate, research-based, culturally-responsive instruction and make adequate gains during the school year but fall further behind during the summer. Another explanation is that students who come to school ready to learn are not given effective instruction during the school year, and steadily fall behind.

Within both of these groups, some students demonstrate difficulties with *cognitive processing* that negatively influence their reading and mathematics performance. These include difficulties with executive functioning, self-regulation, and an array of cognitive processes that affect and influence memory; attention; and the generation, selection, monitoring, and implementation of learning strategies. One can conceptualize these as the "control processes" that manage goal direction for learning and overlap with other cognitive and behavioral processes, such as language, short-term memory, processing speed, and nonverbal reasoning. In this guide, we concentrate our discussion of cognitive processing difficulties on executive functions and self-regulation.[1]

Research on learners with cognitive processing difficulties

Before extending the discussion of executive functions and self-regulation and their influence on students' cognitive processes and outcomes, it is important

[1]A growing research base associates executive functions with learning in reading (Booth, Boyle, & Kelly, 2010; Cutting, Materek, Cole, Levine, & Mahone, 2009; Locascio, Mahone, Eason, & Cutting, 2010; Souvignier & Mokhlesgerami, 2006; Swanson & Howell, 2001; Was & Woltz, 2007), mathematics (Bull, Espy, & Wiebe, 2008; Bull & Scerif, 2001; Cirino, 2011; Cirino, Ewing-Cobbs, Barnes, Fuchs, & Fletcher, 2007; Cirino, Morris, & Morris, 2002; Fuchs et al., 2010; Geary, 2004; van der Sluis, de Jong, & van der Leij, 2007), and writing (Altemeier, Abbott, & Berninger, 2008; Hooper, Swartz, Wakely, & de Kruif, 2006; Hooper, Swartz, Wakely, de Kruif, & Montgomery, 2002; Santangelo, Harris, & Graham, 2007). Research also suggests that executive functions influence general academic outcomes (Barnett et al., 2008; Blair, 2002; Blair & Razza, 2007; Diamond, Barnett, Thomas, & Munro, 2007).

to discuss how current interpretation of the research on executive functioning and self-regulation differs from work decades ago that examined processing problems in students with learning difficulties (Johnson & Myklebust, 1967; Kirk & Kirk, 1971). Early work in developing treatments for students with significant learning disabilities focused on the neurological models of learning based on individuals with brain injuries. One assumption was that students with significant learning problems had cognitive processing problems much like individuals who suffered brain trauma. A second assumption was that treating these underlying cognitive processes was both possible and necessary prior to academic learning.

Although some students with significant learning difficulties have underlying neurological or information-processing disorders, research does *not* support the notion that practitioners can identify these disorders (e.g., auditory processing disorders) and then treat them in isolation (e.g., training a child in auditory processing apart from his or her academic learning; Lyon, 1985; Mann, 1979). This finding does not suggest that these cognitive processes are unimportant or irrelevant to learning; rather, *identifying* these processes reliably has been challenging. Moreover, treatments provided independently of academic learning have not improved academic outcomes in reading and mathematics. As a result, in the last two decades, educators have put considerable emphasis on providing effective, systematic, and explicit instruction to identify and address weak or missing academic skills. For example, students who have difficulty with word problems receive systematic instruction in the key elements of word problem resolution (Fuchs et al., 2009). These instructional routines in reading and mathematics have been productive, particularly for students in kindergarten through second grade. (For more information on systematic and explicit instruction, see the *Intensifying Instructional Delivery* section of this guide).

Current research on cognitive processing such as executive functions and self-regulation has advanced our understanding of learning in two fundamental ways. First, our understanding of executive functions and self-regulation is based on theoretical frameworks with a robust empirical base (e.g., Pintrich, 1995; Zimmerman, 1989). Second, these conceptualizations of executive functions and self-regulation have been integrated into academic instruction and not remedied separately as a precursor to academic learning.

How do cognitive processing difficulties impede academic success?
Most teachers are aware that many students who struggle academically also have poor memory. For example, students with poor short-term memory often

have difficulty recalling a sentence they just read, the names and descriptions of characters in text, and previous learning that relates to what they are currently reading (Swanson, Zheng, & Jerman, 2009). Of course, struggling to remember what was read in the short term makes reading for understanding difficult, particularly because readers must remember meaning across multiple sentences and paragraphs. Imagine trying to write the main idea of two paragraphs you just read but not being able to recall anything about the last sentence you read.

In addition to poor short-term memory, many students with significant reading difficulties demonstrate poor working memory, which interferes with understanding the sentences they read—in particular, integrating the meaning of sentences with the meaning of previous and subsequent sentences (Swanson & O'Connor, 2009). Other researchers (Cain & Oakhill, 2006; Cain, Oakhill, & Bryant, 2004) found that working memory, inference making, and comprehension monitoring were predictive of reading comprehension. Additionally, Pike, Barnes, and Barron (2010) reported that working memory predicts a reader's ability to make inferences from short and long chunks of text. But they further reported that working memory and inference making both make unique contributions to reading comprehension. Students with reading difficulties have disadvantages in all memory tasks, and these disadvantages are associated with poor performance in the foundations of reading (i.e., phonological awareness, word reading), as well as in reading comprehension (Swanson et al., 2009).

Students' difficulties with cognitive processing are consistent with poor executive functioning and self-regulation abilities: setting learning goals, monitoring success in meeting these goals, using language to self-talk through difficult elements of completing tasks, and regulating language and memory to facilitate learning.

Evidence suggests that executive functions exert considerable influence on success in reading for understanding. For example, students who struggle to regulate their thinking and behavior consistently demonstrate lower academic learning and cognitive and motivational processes (Dembo & Eaton, 2000; Krouse & Krouse, 1981). Further, students who acquire self-regulatory skills experience improved academic achievement and increased self-efficacy (Zimmerman, 1989; Zimmerman & Bandura, 1994; Zimmerman, Bonner, & Kovach, 1996; Zimmerman & Risemberg, 1997).

How can teachers integrate these findings into their teaching? Self-regulation instruction can be better integrated within academic learning (e.g., reading or mathematics) and within cognitive and motivational processes (Boekaerts & Cascallar, 2006). For example, two meta-analyses of effective instructional practices (Hattie, Biggs, & Purdie, 1996; Rosenshine, Meister, & Chapman, 1996) showed that learning skills training was effective when students were metacognitively aware and used self-regulation strategies to support their learning. Hattie and Timperley (2007) reported that although the average effect of feedback was high, they found great variability within and across 12 meta-analyses: average effects ranged from 0.12 for an analysis of research on teacher praise to 1.24 for an analysis of research on the effects of feedback for special education students. Table 1 lists the 12 meta-analyses that served as the database for the Hattie and Timperley analysis, their context, and the average effect sizes.

Table 1. Summary of effect sizes from 12 meta-analyses assessing the influence of feedback.

Study	Context	Number of effects	Effect size
Skiba, Casey, and Center (1985–1986)	For special education students	35	1.24
Lysakowski and Walberg (1982)	Cues, corrective feedback	54	1.13
Walberg (1982)	Cues, motivational influences, and reinforcement	19	0.81
Tenenbaum and Goldring (1989)	Cues, participation, reinforcement, feedback and correctives	15	0.74
Rummel and Feinberg (1988)	Extrinsic feedback rewards	45	0.60
Yeany and Miller (1983)	Diagnostic feedback in science	49	0.52
Kluger and DeNisi (1996)	Feedback	470	0.38
L'Hommedieu, Menges, and Brinko (1990)	From student ratings	28	0.34
Moin (1986)	Feedback	NR	0.29
Bangert-Drowns, Kulik, Kulik, and Morgan (1991)	From testing	40	0.28
Kulik and Kulik (1988)	Immediate versus delayed	53	0.28
Getsie, Langer, and Glass (1985)	Rewards and punishment	89	0.14
Wilkinson (1981)	Teacher praise	14	0.12

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A second example relevant to self-regulation is attribution—a person's beliefs about the causes of his or her academic failures and successes. Students with maladaptive attribution may think that failure is due to stable, internal causes that cannot be changed, and that success is due to unstable causes such as luck. Accurate attribution is associated with small to moderate improvements in outcomes for students with learning difficulties (Robertson, 2000; 20 studies reviewed). In studies designed to improve reading comprehension, training

students to attribute learning outcomes to their effort has reported small benefits (Berkeley, Mastropieri, & Scruggs, 2011; Borkowski, Weyhing, & Carr, 1988; Carr & Borkowski, 1989; Chan, 1996; Miranda, Villaescusa, & Vidal-Abarca, 1997). Integrating attributional training with interventions for students with significant learning difficulties seems promising because these students are prone to a maladaptive attribution style. Lastly, without attributional training aligned to instructional practices, students may experience low motivation to perform well academically (Fulk & Mastropieri, 1990; Pearl, 1982).

IN THE CLASSROOM

Integrating executive functions and self-regulation into academic teaching for struggling students

How can I teach my students self-regulation strategies and how to use them in reading, writing, and mathematics?

First, make your thinking "visible" to students. Use "think-alouds" to demonstrate how you approach problems, reflect on text, answer questions, or give yourself feedback. Say, for example, "Before I read this text, I see that it will be difficult to understand. First, I look for key words. I see three words in bold that I don't know, so I write them down to see if I can figure out what they mean when I read the text. Second, I look at the title, the headings, and the questions at the end of the text. I think about what this text is going to be about, and I try to make connections while I'm reading. Third, while I read, I stop to see whether I have learned any information to help me answer the questions at the end of the text."

How can I support my students as they use self-regulation strategies independently?

Regularly monitor students after teaching them to use self-regulation strategies independently. If you notice students struggling, determine what strategies they are using to solve problems or understand text. Model problem resolution or text reading while implementing effective strategies. For example, ask a student to read aloud to you. When the student misses a word, wait until he or she finishes reading and then ask the student to tell you the words he or she missed. If the student does not know, point out the missed words. In either case, ask the student, "What do you do when you don't know how to read a word?" After the student responds, show him or her effective strategies for reading the missed word (e.g., teach the student the phonics elements needed to read the word).

What are some examples of strategies that help students monitor their own learning?

Teach students to be metacognitive and to identify "breakdowns" in their understanding. One way to integrate self-monitoring into academic learning is by teaching students to ask themselves questions to determine if they are working well and making progress. For example, when reading, ask students to stop and think about whether there were any words or ideas they did not understand. Then ask students to reread and figure out how to "repair" their problems. Similarly, when solving word problems, students should ask themselves whether they understood the problem. If not, show them how to paraphrase it—put it into their own words—underlining important parts of the problem, and visualizing or drawing a diagram that represents relationships among all important problem parts.

Making inferences when reading sentences, paragraphs, and multi-paragraph texts can also enhance self-monitoring. Ask students to read the text aloud and think about what the author is saying. If students have trouble figuring out the author's intention, ask them questions about previous or subsequent text and show them how to put ideas together to make an inference. You can do much of this work through questioning and think-alouds.

In a third strategy, students learn how to monitor their own academic gains. They keep track of how many times they respond appropriately, such as charting the number of mathematics problems they answer correctly in two-minutes, or keeping a log of the number of assignments they submit on time.

What are some practices that help students strengthen their memory while engaged in academic learning?

Students are familiar with many memory-enhancement techniques: taking notes, rehearsing what they need to remember out loud (e.g., "I can learn to count by 2s, 3s, 4s, etc., to help me with addition and multiplication"), developing a mnemonic device to remember information, and using graphic organizers and other text organizers to remember what they read or learn. Struggling students need to be taught these strategies explicitly, even though they may seem like "second nature" to others. For

example, show students how to identify and quickly record important concepts in their lecture notes (Boyle, 2010) or how to label parts of a story web with key ideas (Kim, Vaughn, Wanzek, & Wei, 2004).

How can I provide feedback to my students as they use self-regulation strategies to support their academic learning?

Rather than providing person-directed feedback (e.g., "You are a good writer."), offer feedback specific to the task or the process (e.g., "You organized your written response well with that advanced organizer in the beginning. That was helpful to me as I read your report."). This kind of feedback reduces student-focused praise (such as "good work") and highlights the behaviors that lead to improved work (such as, "You spent a lot of time organizing and thinking about this, and your assignment is complete in addressing each of the key points requested."). Feedback like this helps students attribute successes accurately.

Similarly, teachers can help students link their behavior to outcomes. Say, for example, "You spent 30 minutes reading and rereading the text with the questions in mind. Did you notice how well you answered the questions?"

ADDITIONAL RESOURCES ABOUT SELF-REGULATION AND COGNITIVE STRATEGY INSTRUCTION

- Cognitive Strategy Instruction website www.unl.edu/csi/index.shtml
- Star Legacy Modules from The IRIS Center for Training Enhancements
  - SRSD: Using Learning Strategies to Enhance Student Learning http://iris.peabody.vanderbilt.edu/srs/chalcycle.htm
  - SOS: Helping Students Become Independent Learners http://iris.peabody.vanderbilt.edu/sr/chalcycle.htm
- Project Write website www.kc.vanderbilt.edu/projectwrite

INTENSIFYING INSTRUCTIONAL DELIVERY

In addition to teaching students strategies that support cognitive processing and integrating these strategies with academic learning (discussed earlier in this guide), changes in instructional delivery can intensify instruction. Swanson, Hoskyn, and Lee (1999) found that, across content and grade levels, interventions delivered through direct instruction plus strategy instruction produced the highest effects. Such interventions include these key components:

- explicit instruction,
- systematic instruction, and
- opportunities for student response and feedback.

Explicit instruction

Explicit instruction means overtly teaching the steps or processes needed to understand a construct, apply a strategy, and/or complete a task. Explicit instruction includes teacher presentation of new material, teacher modeling, and step-by-step instruction to demonstrate what is expected so that students can accomplish a learning task. Research has associated interventions incorporating explicit instruction with improved outcomes for students with learning difficulties for both basic skills and higher-level concepts (Baker, Gersten, & Lee, 2002; Biancarosa & Snow, 2004; Gersten et al., 2009; National Reading Panel, 2000; Swanson, 2000; Vaughn, Gersten, & Chard, 2000). For example, a synthesis of research on mathematics interventions for low-achieving students noted that explicitly teaching math concepts and procedures improved students' math achievement (Baker et al., 2002). Explicit instruction is warranted during initial instruction of new content and when teaching students to generalize known content to new situations (Fuchs et al., 2003).

Educators can blend self-regulation strategies with explicit instruction of new content. For example, when introducing the use of graphic organizers to facilitate learning and understanding of content in a social studies text, a teacher will:

- develop students' background knowledge, such as introducing the vocabulary necessary for understanding the text,

- discuss the importance of the graphic organizer strategy and how it will help increase what students remember,
- model how to use the graphic organizer and include self-instruction techniques so that students can talk themselves through the task,
- help students memorize the steps for completing the graphic organizer and monitoring their completion progress,
- support students as they practice using the graphic organizer while applying the self-instruction and self-monitoring techniques, and
- allow students to use the graphic organizer and self-regulation strategies independently. *(The IRIS Center for Training Enhancements, 2005).*

Systematic instruction

Systematic instruction means breaking down complex skills into smaller, manageable "chunks" of learning and carefully considering how to best teach these discrete pieces to achieve the overall learning goal. Systematic instruction also includes sequencing learning chunks from easier to more difficult and providing scaffolding, or temporary supports, to control the level of difficulty throughout the learning process. Teachers break down a complex task, like solving a math problem, into multiple steps or processes with manageable learning chunks and teach each chunk to mastery before bringing together the entire process. Research has associated interventions that systematically organize instruction with improved outcomes for students with learning difficulties (Coyne, Kame'enui, & Simmons, 2001; Swanson, 2000; Torgesen, 2002). For example, based on 38 studies, the National Reading Panel (2000) found that systematic phonics instruction that progressed from smaller to larger units and sequenced from easier to more difficult sounds and word types was more effective in increasing word reading than less systematic instruction. Across content areas, interventions with the highest outcomes for students provide explicit and systematic instruction together (Fletcher, Lyon, Fuchs, & Barnes, 2007; Swanson et al., 1999).

Opportunities for student response and feedback

Students with learning difficulties need frequent opportunities to respond and practice with teacher feedback throughout lessons to accelerate learning.

These practices can also increase engagement during instruction and improve student outcomes (Brophy & Good, 1989; Swanson et al., 1999). Frequent student response can assist the teacher in monitoring student understanding, and teacher feedback during student practice can be a powerful tool for refining and mastering new skills (Hattie & Timperley, 2007; Vaughn et al., 2000). Feedback prompts students to continue successful attempts during practice or to remedy errors before they become entrenched. Hattie's 1999 synthesis of more than 500 meta-analyses of student achievement reported that feedback was one of the top three influences on student outcomes. Feedback is most effective when it relates to student goals and provides information on how to complete tasks more effectively (Hattie & Timperley, 2007). Researchers have noted lower effects for feedback that involves only praise, rewards, or punishment (Kluger & DeNisi, 1996). Using explicit and systematic instruction, educators keep tasks at the appropriate levels for effective feedback.

For examples of explicit instruction, systematic instruction, and instruction that incorporates sufficient opportunities for student response and feedback, see the Appendix.

IN THE CLASSROOM

Intensifying instructional delivery for struggling students

How can I intensify instructional delivery?

Even during initial learning, organize your instruction to allow for high levels of student success. If a student demonstrates a high error rate and struggles to learn new content, provide more explicit or systematic instruction with ample opportunities for practice and feedback.

Instruction can be made more explicit or more systematic with:

- more modeling with clearer and more detailed explanations;
- more concrete learning opportunities with the use of pictures, graphics, manipulatives, or think-alouds;
- tasks broken down into smaller steps;
- instruction broken down into simpler segments;
- step-by-step strategies; and/or
- temporary support gradually reduced over time.

When lessons are delivered explicitly and systematically, learning efficiency increases because instruction is at an appropriate level (i.e., neither too easy nor too challenging) for student mastery.

You can also intensify instruction by providing more opportunities for response, practice, and feedback. Students with learning difficulties need their own practice opportunities rather than watching other students provide answers. Monitor the amount of practice and feedback you provide each student and adjust the amount as necessary.

What is the most effective type of feedback?

Effective feedback on student responses is clear and precise, communicating specifically which aspects of the task students performed correctly or incorrectly; this type of feedback is known as process-directed feedback. Specificity

is the key for students to determine what they did correctly and how they might better complete the task. Simply providing praise ("good job"), rewards, or statements of incorrect responses is not associated with improved academic outcomes. Tie your feedback directly to the student's actions and the learning goals. For more information on process-directed feedback, see the *Supporting Cognitive Processing* section of this guide.

When is the best time to offer feedback?

Feedback is more effective when given during or immediately after a task is completed. Provide feedback immediately for discrete tasks (e.g., solving a mathematics fact, spelling a word) and after a short delay for more complex tasks (e.g., writing a paragraph) to allow students to think through the process first. However, delaying feedback beyond the instructional session is less valuable for students. For example, providing feedback right after a student answers a question or completes a task is more likely to yield future correct responses for a student with significant learning difficulties than waiting until after the lesson. When there is a significant delay between the student's response and your feedback, the student may not be able to associate the feedback with the response or thought process, and he or she may have already practiced the task incorrectly several times. Use timely feedback to prevent inaccurate practice, increase the rate of student mastery, and ensure successful, efficient learning.

When should independent work take place in an intervention?

Independent practice is an essential part of intervention but is not a substitute for explicit and systematic instruction and guided practice. Incorporate independent work after students begin to demonstrate mastery of the new skills or content, providing an opportunity for students to demonstrate their ability to complete a task without your guidance. Usually, when a teacher provides effective instruction and introduces independent work at the appropriate time, student success in the independent activities is very high. But when you ask a student to complete a task for which he or she has not yet mastered the requisite skills, you slow his or her learning through incorrect practice without immediate feedback.

INCREASING LEARNING TIME

Increasing learning time is one of the most important ways to intensify academic interventions in areas such as reading (Torgesen, 2000). Of course, time is a precious commodity in schools, so deciding how to best increase intervention time is essential. Educators can increase intervention time in several ways.

First, one can increase the *frequency of intervention*. For example, an intervention provided five days a week may be more intensive than an intervention provided three days a week. Educators can also increase the frequency of intervention by providing more than one session of intervention per day (e.g., Torgesen et al., 2001; Wanzek & Vaughn, 2008). For example, with younger students (kindergarten, first grade), shorter–duration interventions, several times a day, can better capitalize on young students' attention and interest.

Second, one can increase the *length of the instructional sessions*. If a student currently receives 20 minutes of instruction per intervention session, providing 40 minutes may intensify the intervention if student engagement remains high. Increasing both the frequency of intervention and/or the length of the instructional sessions allows struggling students to receive additional, targeted instruction and increased opportunities for practice with feedback.

Only a few studies have examined the effects of increasing the amount of time in intervention on student outcomes, and most of these studies focus on reading at the elementary level. For example, Denton, Fletcher, Anthony, and Francis (2006) found positive gains in word reading, fluency, and comprehension when first- to third-grade students with significant reading difficulties received 1–2 hours of daily intervention over 8–16 weeks. Torgesen et al. (2001) demonstrated that many third to fifth grade students with learning disabilities who received an intensive intervention during two 50-minute sessions per day for eight weeks improved their reading outcomes to grade-level expectations and maintained the gains two years later. Increased instructional time—coupled with carefully designed, effective instruction—can benefit students with learning difficulties.

Although increasing the frequency or length of intervention can improve outcomes for students with learning difficulties, evidence also suggests that some students need interventions over an extended period of time. A third way to increase time in intervention is to increase the *duration of the intervention*. Some students with learning difficulties may require additional weeks or months of an intervention, particularly when the goal is to increase cognitively complex tasks like reading comprehension that are not likely to be remedied quickly. For instance, research studies providing "extensive" interventions of 100 sessions or more (Wanzek & Vaughn, 2007) have noted positive outcomes for students with reading difficulties. Additionally, research in early reading (kindergarten through second grade) suggests that students who demonstrate severe academic difficulties may need a longer intervention to accelerate learning (Vaughn, Linan-Thompson, Kouzekanani, et al., 2003).

Of course, the important question is "How much intervention is enough?" To begin to answer this question, one study examined reading outcomes for second-grade students with reading difficulties who participated in a reading intervention for 10-30 weeks depending on student progress in the intervention (Vaughn, Linan-Thompson, & Hickman, 2003). Students exited the intervention once they achieved consistent fluency rates of 50-55 words correct per minute. Although some students were able to exit the intervention after 10 weeks of instruction, some students required 20 weeks of intervention to exit. All 10 of the students who exited after 10 weeks of instruction and 10 of the 12 students who exited after 20 weeks continued to make gains in reading fluency with classroom reading instruction only. This finding indicates a longer intervention assisted additional students in reaching an adequate reading level and maintaining progress in core reading instruction.

In a separate study, Elbaum, Vaughn, Hughes, and Moody (2000) synthesized the elementary reading literature and considered the effects of interventions provided for 20 weeks or less versus those provided for longer than 20 weeks. Interventions of 20 weeks or less yielded higher effects, suggesting that students may make the highest gains in the first five months of intervention. Wanzek and Vaughn (2007) found that the effects were similar for students given an intervention for five months and for students given the intervention for more than five months. These studies provide evidence that interventions of up to 20 weeks may be sufficient to allow many early elementary students to make substantial gains in their reading outcomes, an important finding, given the limited resources of schools. However, these findings have been noted only for early elementary students, whose reading or

mathematics difficulties may be more readily remediated than students in grade 4 and higher.

As noted previously, most of the research on time in intervention has been conducted at the elementary level. Recently, Vaughn et al. (2011) conducted a three-year, longitudinal study of middle school students with reading difficulties. Although gains in years 1 and 2 were small (Vaughn, Cirino et al., 2010; Vaughn et al., 2011), by year 3, very low responders outperformed comparisons on a standardized reading comprehension measure by more than one standard deviation. Although more research is needed for older students, these findings suggest that students who continue to struggle with reading into the secondary grades may need substantially more time in intervention than students with reading difficulties in the elementary grades. It is also important to note that the large impact noted in the Vaughn et al. (2011) study could be attributed to a decline on the part of the comparison students as well as improvement on the part of the treatment students.

IN THE CLASSROOM

Increasing instructional time for struggling learners

What are the suggested length and frequency of intensive interventions?

For students who have not responded sufficiently to previous interventions, longer and/or more frequent instructional intervention sessions might accelerate learning. Make decisions about learning time based on each student's circumstances:

- how far the student's achievement level is below grade-level expectations,
- the length and frequency of the previous interventions, and
- the complexity of the learning tasks at hand (for example, letter naming in kindergarten is less cognitively complex than comprehension of a third grade science textbook).

Intensive interventions vary in time (30 to 120 minutes) and frequency (three times per week to two times per day). If scheduling or student engagement is a concern, a teacher might increase intervention time with two shorter sessions per day rather than one long session.

What is the suggested duration of intensive interventions?

Determining the duration of an intervention depends on many factors, some student-related and some school-related. Student factors include the achievement gap that needs to be closed in the target academic areas, the student's grade level, and the progress he or she is making on progress-monitoring checks. School-related factors include the degree to which the intervention provider has been trained. Research suggests that students in kindergarten through second grade can achieve positive outcomes when participating in interventions up to 20 weeks long. However,

some students, particularly students in the upper grades who are several grades behind, may require much longer interventions.

What should I keep in mind when increasing the duration of an intervention?

Carefully monitor students throughout the intervention to be certain that the instruction you're providing is accelerating learning. You may need to increase the frequency or length of the sessions to provide the most efficient intervention with the best opportunity for improving each student's performance.

How should I use the additional time in intervention?

Intervention time is increased to accelerate learning and allow for more instruction, rather than the same amount of instruction in a longer period of time. When increasing the frequency, length of sessions, and/or duration of intervention, use the additional instructional time to accelerate student learning by:

- teaching additional skills and strategies;
- providing additional practice opportunities with feedback;
- delivering more explicit, systematic, (step-by-step) instruction; and
- monitoring student progress in the interventions to ensure that the additional learning time increases student mastery of skills.

(See the *Supporting Cognitive Processing* and *Intensifying Instructional Delivery* sections of this guide for more information on effectively using increased instructional time.)

REDUCING INSTRUCTIONAL GROUP SIZE

Although increasing instructional time helps some struggling students make academic gains, one of the most practical methods for intensifying intervention for highly at-risk students is providing small-group instruction (Foorman & Torgesen, 2001). Instruction in smaller groups can improve student outcomes (Elbaum, Vaughn, Hughes, & Moody, 1999; Vaughn, Linan-Thompson, Kouzekanani, et al., 2003). However, small group instruction raises logistical concerns for schools, such as securing adequate resources (e.g., interventionists, instructional specialists, space, materials), so being mindful of the most efficient and cost-effective ways to implement small-group instruction is of the utmost importance.

Previous research has indicated elementary students receiving instruction in small groups of three to four students outperform students receiving instruction in larger groups of 8-10 students (Lou et al., 1996; Vaughn, Linan-Thompson, Kouzekanani, et al., 2003). In addition, Vaughn et al., (2003) reported students receiving one-on-one instruction also made considerably larger gains on several reading measures than students receiving the same instruction in groups of 10 students. However, students receiving one-on-one instruction made similar gains to students who received the instruction in groups of three, indicating that it may not be necessary to provide one-on-one instruction to improve student outcomes.

There are mixed findings related to the value of one-on-one instruction at the elementary level. Although a meta-analysis of one-on-one tutoring interventions for elementary students with reading difficulties found that one-on-one instruction yielded no different outcomes from small-group interventions (Elbaum et al., 2000), a synthesis of extensive (more than 100 sessions) interventions (Wanzek & Vaughn, 2007) noted higher effects from one-on-one instruction than small-group instruction. However, many of these small groups included five or more students. Thus, very small groups (two to four students) or one-on-one instruction may be appropriate for accelerating the learning of students with significant learning difficulties in the elementary grades.

One study of reading intervention at the middle school level found no differences in outcomes for students receiving an intervention in small groups of three to five versus students in groups of 10–15 (Vaughn, Wanzek, et al.,

2010). However, the general trend of scores favored students in the smaller groups. Because fewer intervention studies on adolescents with significant academic difficulties are available than studies on younger students, additional research is needed in grade 4 and higher to more systematically define effective grouping practices for intervention.

IN THE CLASSROOM

Reducing group size for struggling students

What is the ideal group size for providing intervention instruction?

Research has not found one ideal intervention group size that increases outcomes for all or most students. The literature suggests that small groups of two to four students or one-on-one instruction may provide the most intensive intervention and that some students make sufficient progress in larger groups.

Smaller group size can be expensive. When students succeed in a large instructional group, it makes sense to continue the intervention in that manner for cost considerations. However, in larger-group settings where student performance is clearly not improving, reducing group size might generate better results. Carefully monitor your students' progress when changing group size to determine whether the change increases student outcomes.

How does decreasing instructional group size relate to student outcomes?

As with increasing intervention time, couple smaller group size with carefully designed, effective instruction. When you decrease group size, you can divide your attention among fewer students and increase the potential for individualized instruction, more student response and practice, and timely teacher feedback. For more information on increased student response and feedback, see the *Intensifying Instructional Delivery* section of this guide.

The Center on Instruction has developed *Using Student Center Activities to Differentiate Reading Instruction: A Guide for Teachers* to assist educators with the logistics of reducing instructional group size and targeting specific academic skills. This free resource can be downloaded at www.centeroninstruction.org.

CONCLUSION

This resource provides research-based guidance on ways to intensify instruction for students with significant learning difficulties and students with disabilities. It reviews and summarizes the evidence for integrating strategies that support cognitive processes with academic instruction, intensifying instructional delivery, increasing instructional time, and reducing group size. These practices, thoughtfully blended, can complement each other. For instance, when the group size is reduced, students' opportunities to respond increase. We hope that readers will see how these practices fit together to intensify instruction by integrating the information from all four sections, rather than through one isolated method.

We emphasize as well that this guide does not represent a comprehensive review of all research literature on intensive interventions. These guidelines constitute a general framework for instructional decision-makers for adapting and modifying instructional practices that respond to the complex needs of students with learning difficulties. Many other resources exist to broaden your options for intensifying instruction, such as self-regulation strategies that help students monitor their own learning. We have provided comprehensive lists of helpful resources throughout this guide and on the following pages. We encourage our readers to seek out this information and further expand their understanding of the complexities inherent in delivering relevant, intensive, individualized instruction to their students who need it.

RECOMMENDATIONS FOR FURTHER READING

Resources from the Center on Instruction

- *Effective Instruction for Adolescent Struggling Readers—Second Edition*
  www.centeroninstruction.org/effective-instruction-for-adolescent-struggling-readers---second-edition
- *Extensive Reading Interventions in Grades K–3: From Research to Practice*
  www.centeroninstruction.org/extensive-reading-interventions-in-grades-k-3-from-research-to-practice
- *Intensive Reading Interventions for Struggling Readers in Early Elementary School: A Principal's Guide*
  www.centeroninstruction.org/intensive-reading-interventions-for-struggling-readers-in-early-elementary-school-a-principals-guide
- *Mathematics Instruction for Students with Learning Disabilities or Difficulty Learning Mathematics: A Guide for Teachers*
  http://centeroninstruction.org/mathematics-instruction-for-students-with-learning-disabilities-or-difficulty-learning-mathematics-a-guide-for-teachers
- The Synopsis Series
  - *Synopsis of "Improving Comprehension of Expository Text in Students with Learning Disabilities: A Research Synthesis"*
    www.centeroninstruction.org/synopsis-of-improving-comprehension-of-expository-text-in-students-with-learning-disabilities-a-research-synthesis
  - *A Synopsis of "The Power of Feedback"*
    www.centeroninstruction.org/a-synopsis-of-the-power-of-feedback
  - *A Synopsis of "A Synthesis of Empirical Research on Teaching Mathematics to Low-Achieving Students"*
    http://centeroninstruction.org/a-synopsis-of-a-synthesis-of-empirical-research-on-teaching-mathematics-to-low-achieving-students
  - *Synopsis of "Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High School"*
    www.centeroninstruction.org/synopsis-of-writing-next-effective-strategies-to-improve-writing-of-adolescents-in-middle--high-schools

Resources from other organizations

- Doing What Works website
  http://dww.ed.gov
- Star Legacy Modules from The IRIS Center for Training Enhancements
  - *RTI (Part 5): A Closer Look at Tier 3*
    http://iris.peabody.vanderbilt.edu/rti05_tier3/chalcycle.htm
  - *CSR: A Reading Comprehension Strategy*
    http://iris.peabody.vanderbilt.edu/csr/chalcycle.htm
- *Organizing Instruction and Study to Improve Student Learning*
  http://ies.ed.gov/ncee/wwc/pdf/practiceguides/20072004.pdf
- *Principles of Effective Instruction and Intervention*
  www.fcrr.org/interventions/recreading.shtm
- *Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High School*
  www.all4ed.org/files/WritingNext.pdf

REFERENCES

Altemeier, L. E., Abbott, R. D., & Berninger, V. W. (2008). Executive functions for reading and writing in typical literacy development and dyslexia. *Journal of Clinical and Experimental Neuropsychology, 30*(5), 588–606.

Baker, S., Gersten, R., & Lee, D. (2002). A synthesis of empirical research on teaching mathematics to low-achieving students. *The Elementary School Journal, 103*, 51–73.

Barnett, W. S., Jung, K., Yarosz, D. J., Thomas, J., Hornbeck, A., Stechuk, R., & Burns, S. (2008). Educational effects of the Tools of the Mind curriculum: A randomized trial. *Early Childhood Research Quarterly, 23*, 299–313.

Berkeley, S., Mastropieri, M. A., & Scruggs, T. E. (2011). Reading comprehension strategy instruction and attribution retraining for secondary students with learning and other mild disabilities. *Journal of Learning Disabilities, 44*(1), 18–32.

Biancarosa, G., & Snow, C. E. (2004). *Reading next—A vision for action and research in middle and high school literacy: A report to Carnegie Corporation of New York.* Washington, DC: Alliance for Excellence in Education.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist, 57*, 111–127. doi:10.1037//0003-066X.57.2.111

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*, 647–663.

Boekaerts, M., & Cascallar, E. (2006). How far have we moved toward the integration of theory and practice in self-regulation? *Educational Psychology Review, 18*(3), 199–210.

Booth, J. N., Boyle, J. M., & Kelly, S. W. (2010). Do tasks make a difference? Accounting for heterogeneity of performance of children with reading difficulties on tasks of executive function: Findings from a meta-analysis. *British Journal of Developmental Psychology, 28*(1), 133–176.

Borkowski, J. G., Weyhing, R. S., & Carr, M. (1988). Effects of attributional retraining on strategy-based reading comprehension in learning-disabled students. *Journal of Educational Psychology, 80*(1), 46–53.

Boyle, J. R. (2010). Strategic note-taking for middle-school students with learning disabilities in science classes. *Learning Disability Quarterly, 33*(2), 93–109.

Brophy, J., & Good, T. (1989). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching*. New York, NY: Macmillan.

Bull, R., Espy, K. A., & Wiebe, S. A. (2008). Short-term memory, working memory, and executive functioning in preschoolers: Longitudinal predictors of mathematical achievement at age 7 years. *Developmental Neuropsychology, 33*, 205–228.

Bull, R., & Scerif, G. (2001). Executive functioning as a predictor of children's mathematics ability: Inhibition, switching, and working memory. *Developmental Neuropsychology, 19*, 273–293.

Cain, K., & Oakhill, J. (2006). Profiles of children with specific reading comprehension difficulties. *British Journal of Educational Psychology, 76*(4), 683–696.

Cain, K., Oakhill, J., & Bryant, P. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability and component skills. *Journal of Educational Psychology, 96*, 31–42.

Carr, M., & Borkowski, J. G. (1989). Attributional training and the generalization of reading strategies with underachieving children. *Learning and Individual Differences, 1*, 327–341.

Center on Instruction (2008). *Synopsis of "The Power of Feedback."* Portsmouth, NH: RMC Research Corporation: Author.

Chan, L. S. (1996). Combined strategy and attributional training for seventh grade average and poor readers. *Journal of Research in Reading, 19*(2), 111–127.

Cirino, P. T. (2011). The interrelationships of mathematical precursors in kindergarten. *Journal of Experimental Child Psychology, 108*, 713–733.

Cirino, P. T., Ewing-Cobbs, L., Barnes, M. A., Fuchs, L. S. & Fletcher, J. M. (2007). Cognitive arithmetic differences in learning disabled groups and the role of behavioral inattention. *Learning Disabilities Research & Practice, 22*(1), 25–35.

Cirino, P. T., Morris, M., & Morris, R. (2002). Neuropsychological concomitants of calculation skills in college students referred for learning difficulties. *Developmental Neuropsychology, 21*(2), 201–218.

Coyne, M. D., Kame'enui, E. J., & Simmons, D. C. (2001). Prevention and intervention in beginning reading: Two complex systems. *Learning Disabilities Research and Practice, 16*, 62–73.

Cutting, L. E., Materek, A., Cole, C. A. S., Levine, T. M., & Mahone, E. M. (2009). Effects of fluency, oral language, and executive function on reading comprehension performance. *Annals of Dyslexia, 59*(1), 34–54.

Dembo, M. H., & Eaton, M. J. (2000). Self-regulation of academic learning in middle-level schools. *Elementary School Journal, 100*(5), 473–490.

Denton, C. A., Fletcher, J. M., Anthony, J. L., & Francis, D. J. (2006). An evaluation of intensive intervention for students with persistent reading difficulties. *Journal of Learning Disabilities, 39*, 447–466.

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science, 318*, 1387–1388.

Elbaum, B., Vaughn, S., Hughes, M. T., & Moody, S. W. (1999). Grouping practices and reading outcomes for students with disabilities. *Exceptional Children, 65*, 399–415.

Elbaum, B., Vaughn, S., Hughes, M. T., & Moody, S. W. (2000). How effective are one-to-one tutoring programs in reading for elementary students at risk for reading failure? *Journal of Educational Psychology, 92*, 605–619.

Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2007). *Learning disabilities: From identification to intervention*. New York, NY: Guilford Press.

Foorman, B. R. & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. *Learning Disabilities and Practice, 16*(4), 203-212.

Fuchs, L. S., Fuchs, D., Prentice, K. Burch, M., Hamlett, C. L., Owen, R.,…Jancek, D. (2003). Explicitly teaching for transfer: Effects on third-grade students' mathematical problem solving. *Journal of Educational Psychology, 95*, 293–304.

Fuchs, L., Geary, D. C., Compton, D. L., Fuchs, D., Hamlett, C. L., Seethaler, P. M.,…Schatschneider, C. (2010). Do different types of school mathematics development depend on different constellations of numerical versus general cognitive abilities? *Developmental Psychology, 46*, 1731–1746.

Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D.,…Zumeta, R. O. (2009). Remediating number combination and word problem deficits among students with mathematics difficulties: A randomized control trial. *Journal of Educational Psychology, 101*(3), 561–576.

Fulk, B., & Mastropieri, M. A. (1990). Training positive attitudes: "I tried hard and did well!" *Intervention in School and Clinic, 26*(2), 79–83.

Geary, D. C. (2004). Mathematics and learning disabilities. *Journal of Learning Disabilities, 37*, 4–15.

Gersten, R., Chard, D., Jayanthi, M., Baker, S., Morphy, P., & Flojo, J. (2009). *A meta-analysis of mathematics instructional interventions for students with learning disabilities: A technical report.* Los Alamitos, CA: Instructional Research Group.

Hattie, J. A. (June, 1999). *Influences on student learning*. Inaugural professorial address, University of Auckland, New Zealand. Retrieved from http://www.arts.auckland.ac.nz/staff/index.cfm?P=8650

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research, 66*(2), 99–136.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*, 81–112.

Hooper, S. R., Swartz, C. W., Wakely, M. B., & de Kruif, R. E. L. (2006). One intervention-multiple subtypes revisited: Application of a metacognitive intervention to subtypes of written expression in elementary school students. *Developmental Neuropsychology, 29*, 217–241.

Hooper, S. R., Swartz, C. W., Wakely, M. B., de Kruif, R. E. L., & Montgomery, J. W. (2002). Executive functions in elementary school children with and without problems in written expression. *Journal of Learning Disabilities, 35*, 37–68.

The IRIS Center for Training Enhancements. (2005). *SRSD: Using learning strategies to enhance student learning*. Vanderbilt University, Nashville, TN. Retrieved from http://iris.peabody.vanderbilt.edu/srs/chalcycle.htm on February 29, 2012.

Johnson, D. J., & Myklebust, H. R. (1967). *Learning disabilities: Educational principles and practice*. New York, NY: Grune and Stratton.

Kim, A., Vaughn, S., Wanzek, J., & Wei, S. (2004). Graphic organizers and their effect on the reading comprehension of students: A synthesis of research. *Journal of Learning Disabilities, 37*, 105–118.

Kirk, S. A., & Kirk, W. D. (1971). *Psycholinguistic learning disabilities: Diagnosis and remediation*. Urbana, IL: University of Illinois Press.

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*, 254–284.

Krouse, J. H., & Krouse, H. J. (1981). Toward a multimodal theory of academic achievement. *Educational Psychologist, 16*, 151–164.

Locascio, G., Mahone, E. M., Eason, S. H., & Cutting, L. E. (2010). Executive dysfunction among children with reading comprehension deficits. *Journal of Learning Disabilities, 43*(5), 441–454.

Lou, Y., Abrami, P. C., Spence, J. C., Poulsen, C., Chambers, B., & d'Apollonia, S. (1996). Within-class grouping: A meta-analysis. *Review of Educational Research, 66*, 423–458.

Lyon, G. R. (1985). Neuropsychology and learning disabilities. *Neurology and Neurosurgery, 5*, 1–8.

Mann, L. (1979). *On the trail of process*. New York, NY: Grune & Stratton.

Miranda, A., Villaescusa, M., & Vidal-Abarca, E. (1997). Is attribution retraining necessary? Use of self-regulation procedures for enhancing the reading comprehension strategies of children with learning disabilities. *Journal of Learning Disabilities, 30*(5), 503–512.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Washington, DC: National Institute of Child Health and Human Development.

Pearl, R. (1982). Learning disabled children's attributions for success and failure: A replication with a labeled learning disabled sample. *Learning Disability Quarterly, 5*, 173–176.

Pike, M. M., Barnes, M. A., & Barron, R. W. (2010). The role of illustrations in children's inferential comprehension. *Journal of Experimental Child Psychology, 105*(3), 243–255.

Pintrich, P. R. (1995). Understanding self-regulated learning. *New Directions for Teaching and Learning, 63*, 3–12.

Robertson, J. S. (2000). Is attribution theory a worthwhile classroom intervention for K–12 students with learning difficulties? *Educational Psychology Review, 12*(1), 111–134.

Rosenshine, B., Meister, C., & Chapman, S. (1996). Teaching students to generate questions: A review of the intervention studies. *Review of Educational Research, 66*(2), 181–221.

Santangelo, T., Harris, K. R., & Graham, S. (2007). Self-regulated strategy development: A validated model to support students who struggle with writing. *Learning Disabilities: A Contemporary Journal, 5*(1), 1–20.

Sesma, H. W., Mahone, E. M., Levine, T., Eason, S., & Cutting, L. (2009). The contribution of executive skills to reading comprehension. *Child Neuropsychology, 15*, 232–246.

Souvignier, E., & Mokhlesgerami, J. (2006). Using self-regulation as a framework for implementing strategy instruction to foster reading comprehension. *Learning and Instruction, 16*, 57–71.

Swanson, H. L. (2000). What instruction works for students with learning disabilities? Summarizing the results from a meta-analysis of intervention studies. In R. M. Gersten, E. P. Schiller, & S. Vaughn (Eds.), *Contemporary special education research: Syntheses of the knowledge base on critical instructional issues* (pp. 1–30). Mahwah, NJ: Erlbaum.

Swanson, H. L., Hoskyn, M., & Lee, C. (1999). *Intervention for students with learning disabilities: A meta-analysis of treatment outcomes*. New York, NY: Guilford Press.

Swanson, H. L., & Howell, M. (2001). Working memory, short-term memory, and speech rate as predictors of children's reading performance at different ages. *Journal of Educational Psychology, 93*, 720–734.

Swanson, H., & O'Connor, R. (2009). The role of working memory and fluency practice on the reading comprehension of students who are dysfluent readers. *Journal of Learning Disabilities, 42*(6), 548–575.

Swanson, H., Zheng, X., & Jerman, O. (2009). Working memory, short-term memory, and reading disabilities: A selective meta-analysis of the literature. *Journal of Learning Disabilities, 42*(3), 260–287.

Torgesen, J. K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning Disabilities Research & Practice, 15*, 55–64. doi:10.1207/SLDRP1501_6

Torgesen, J. K. (2002). The prevention of reading difficulties. *Journal of School Psychology, 40*, 7–26.

Torgesen, J., Alexander, A. W., Wagner, R. K., Rashotte, C. A., Voeller, K. K. S., & Conway, T. (2001). Intensive remedial instruction for children with severe reading disabilities: Immediate and long-term outcomes from two instructional approaches. *Journal of Learning Disabilities, 34*, 33–58. doi:10.1177/002221940103400104

van der Sluis, S., de Jong, P. F., & van der Leij, A. (2007). Executive functioning in children, and its relations with reasoning, reading, and arithmetic. *Intelligence, 35*, 427–449.

Vaughn, S., Cirino, P. T., Wanzek, J., Wexler, J., Fletcher, J. M., Denton, C. D., & ... Francis, D. J. (2010). Response to intervention for middle school students with reading difficulties: Effects of a primary and secondary intervention. *School Psychology Review, 39*(1), 3–21.

Vaughn, S., Gersten, R., & Chard, D. J. (2000). The underlying message in LD intervention research: Findings from research syntheses. *Exceptional Children, 67*, 99–114.

Vaughn, S., Linan-Thompson, S., & Hickman, P. (2003). Response to instruction as a means of identifying students with reading/learning disabilities. *Exceptional Children, 69*(4), 391–409.

Vaughn, S., Linan-Thompson, S., Kouzekanani, K., Bryant, D. P., Dickson, S., & Blozis, S. A. (2003). Grouping for reading instruction for students with reading difficulties. *Remedial and Special Education, 24*, 301–315.

Vaughn, S., Wanzek, J., Wexler, J., Barth, A., Cirino, P. T., Fletcher, J. M., Romain, M., Denton, C., Roberts, G., & Francis, D. J. (2010). The relative effects of group size on reading progress of older students with reading difficulties. *Reading and Writing: An Interdisciplinary Journal, 23*, 931-956.

Vaughn, S., Wexler, J., Leroux, A., Roberts, G., Denton, C. A., Barth, A. E., & Fletcher, J. M. (2011). Effects of intensive reading intervention for eighth-grade students with persistently inadequate response to intervention. *Journal of Learning Disabilities*. Advance online publication. doi:10.1177/0022219411402692

Wanzek, J., & Vaughn, S. (2007). Research-based implications from extensive early reading interventions. *School Psychology Review, 36*, 541–561.

Wanzek, J., & Vaughn, S. (2008). Response to varying amounts of time in reading intervention for students demonstrating insufficient response to intervention. *Journal of Learning Disabilities, 41*, 126–142.

Was, C. A., & Woltz, D. J. (2007). Re-examining the relationship between working memory and comprehension: The role of available long-term memory. *Journal of Memory and Language, 56*, 86–102.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329–339.

Zimmerman, B. J., & Bandura, A. (1994). Impact of self-regulatory influences on writing course attainment. *American Educational Research Journal, 31*(4), 845–862.

Zimmerman, B. J., Bonner, S., & Kovach, R. (1996). *Developing self-regulated learners: Beyond achievement to self-efficacy*. Washington, DC: American Psychological Association.

Zimmerman, B. J., & Risemberg R. (1997). Self-regulatory dimensions of academic learning and motivation. In G. D. Phye (Ed.), *Handbook of academic learning: Construction of knowledge* (pp. 105–125). San Diego, CA: Academic Press.

APPENDIX

EXAMPLE LESSONS

These example (and non-example) lessons highlight the differences between instructional delivery that is less intense and delivery that is more intense and designed for significantly struggling students. Each pair of lessons focuses on the same feature of effective instruction but includes a less intense version (i.e., non-example) followed by a version adapted to be more intense. These examples do not describe everything a teacher should address in a lesson or intervention session; instead they are "snapshots" that exemplify making instruction more explicit and systematic and incorporating more opportunities for student response and feedback. In addition, some of the examples include strategies that support cognitive processes (e.g., self-regulation). Instructional practices that make the more intense version of a lesson especially effective are highlighted in boxes to the side.

Extended support through professional development is necessary to help teachers work through the challenges of adapting instruction to support the unique learning needs of struggling students and students who receive special education. Teachers particularly need professional development for the higher grade levels, when coursework becomes more complex and places greater demands on students to read and comprehend difficult text and acquire content-specific vocabulary and technical terms. Teachers may need expert guidance in and support for selecting and adapting lessons to help students meet specific reading and mathematical demands. Therefore, technical assistance providers may find it useful to incorporate these lesson examples, and non-examples, into their own professional development to build teachers' capacity to intensify lessons.

Example lesson 1: Less explicit vs. more explicit instruction

Instructional focus: Generating questions about text

Less explicit instruction

1. Tell students that asking questions about the passage during and after reading will help them check their understanding of what they read.
2. Tell students that they will read a passage and generate questions after each section.
3. Have students read the first section of the passage.
4. Ask each student to write a question that can be answered by reading the passage.
5. Have students share their questions and let others in the instructional group provide the answers.

Lesson adapted to be more explicit

1. Tell students that asking questions about a passage during and after reading will help them check their understanding of what they read.
2. Read the first section of the passage together.
3. Model creating a question that can be answered by using information found "right there" in the passage:

   a. Identify information from the text and turn it into a question. For example, say: "There is a lot of information about Cam finding the gold ring. I think that might be important. I'll make a 'right there' question. The text tells right there where the gold ring was found, so I'll make a question about that to be sure I can remember. Making a question is difficult for me. I have to remember that I'm starting with the answer or the important information and then consider what question would have that answer. I can do this.

Provide a model to make the steps for generating a question explicit for students. In addition, introduce one type of question at a time (e.g., "right there" questions first) to allow students to practice and understand the explicit steps for generating different types of questions.

A think-aloud provides explicit instruction for students regarding what they should think about when completing the task.

A model of self-talk reminds students to use this self-regulation technique when they work through the task.

My question is: 'Where did Cam find the gold ring?' I used one of our question words, *where*, to begin my question. Now, I need to check the text to be sure I made a 'right there' question."

b. Have students find the answer in the text. Point out that the question can be answered by using only information from the text.

Engage students in the model and instruction. Here, students have to identify the answer in the text to make explicit the key feature of a "right there" question.

4. Continue with other sections of the text, modeling several questions for students.

Provide several models to help students understand how to complete the new task.

5. Have students work in partner groups to select one section of text and generate one "right there" question.
6. Have partners share their question with the group and allow other students in the group to answer the question. Have students determine whether the question is truly a "right there" question and state why. Provide feedback as necessary.

Provide immediate feedback during initial practice attempts to explicitly emphasize the key features of completing the task.

Example lesson 2: Less systematic vs. more systematic instruction

Instructional focus: Measuring to the nearest inch

Less systematic instruction

1. Tell students that they will learn to measure things to the nearest inch. Pass out a ruler to each student.
2. Explain to students that if they measure something that ends between two numbers on the ruler, they will use the closest number (nearest inch). Draw a horizontal line on the board that is less than 12 inches long. Tell students that you will use the ruler to measure the line. Point to the end of the line and tell students the nearest inch. Write the number of inches on the board.
3. Demonstrate measuring a different line and ask students to state the measurement to the nearest inch.
4. Provide each student with a sheet of paper with three lines of different lengths drawn on it.
5. Ask students to measure each line to the nearest inch and write the measurement. Check and provide feedback.
6. Ask students to put a writing utensil of their choice on the desk and measure it to the nearest inch. Check and provide feedback.

Lesson adapted to be more systematic

1. Tell students that they will learn to measure things to the nearest inch. Pass out a ruler to each student.

2. Draw a large ruler on the board (or show a large classroom ruler). Point to the lines between the numbers on the ruler. Explain to students that if they measure something that ends between two numbers, they will use the closest number. Point to the longest line between 2 and 3 inches, the 2.5-inch mark. Have students find that line on their rulers. Tell students that if they point before that line, the closest number is 2 and that if they point after that line, the closest number is 3.

Provide instruction in a prerequisite skill for measuring to the nearest inch.

3. Repeat the model of the .5-inch line between 6 and 7 and again between 10 and 11. Each time, have students find the .5 inch line between those numbers on their rulers.
4. Point to a spot between two numbers on the ruler (e.g., between 5 and 6 but closest to 5). Ask students which number/inch is closest. Remind students that because you pointed to a spot before the long line (halfway mark), the number 5 is closest. So, the nearest inch is 5 inches.
5. Point to different points on the ruler between numbers. Have students point to the same spot on their rulers and tell their partner which number is closest. Call on a student to share with the group.

Provide students with opportunities to practice the prerequisite skill to ensure understanding before moving to the next step in the process.

6. Draw a line on the board that is less than 12 inches long. Tell students that you will use the ruler to measure the line. Do the following to measure and determine the nearest inch:
   a. Line up the end of the ruler with the end of the line.
   b. Trace your finger along the ruler until you get to the end of the line.
   c. Determine which number is closest.
   d. Record the length of the object to the nearest inch.

Provide students with a step-by-step process for measuring to the nearest inch. Breaking the process into steps can make the process more manageable by providing a scaffold for completing the task.

7. Demonstrate measuring a different line and ask students to tell you whether the ruler lines up with the end of the object. Have students count the numbers with you as you follow along the ruler to the end of the line. Have students tell you which inch is closest.

Include the step-by-step process in the model.

8. Demonstrate again, this time measuring a small object instead of a line on the board.
9. Provide students with a sheet of paper with three lines of different lengths, two spaces to place objects to measure, and the steps for measuring to the nearest inch written on it.
10. Ask students to tell you the first step of measuring to the nearest inch (line up the ruler). Tell students to complete this step for the first line. Check and provide feedback.
11. Ask students to tell you the second step of measuring to the nearest inch (follow along the ruler to the end of the line and find the closest number). Tell students to complete the second step, counting as they trace their finger along the ruler. Tell students to put their finger on the number that is closest. Check and provide feedback.
12. Ask students to tell you the third step of measuring to the nearest inch (record the length to the nearest inch). Tell students to record the number next to the line. Remind students that the number needs a label. Ask students which label they should use (inches). Tell students to write "inches" next to the number.
13. Repeat steps 10–12 with the second and third lines. Check and provide feedback, prompting when necessary.
14. Tell students they will now measure an object by themselves, just like you showed them earlier. Have students place a writing utensil of their choice on the desk. Ask students to state the first step, second step, and third step of measuring to the nearest inch and then to work independently and record their answer. Remind students to assess whether they completed each step of measuring to the nearest inch and to write a checkmark next to each step they complete. Check and provide feedback. Ask some students to demonstrate how they measured their writing utensil.

Model the measurement of both lines and objects because students will be expected to measure both at the end of the lesson.

Provide scaffolding during initial practice to assist students in remembering the step-by-step process for measuring to the nearest inch.

Slowly fade scaffolding to allow students to take on more of the process independently.

Incorporate self-monitoring to assist students in evaluating their task completion.

Example lesson 3: Fewer opportunities vs. more opportunities for response and feedback

Instructional focus: Multiplication

Fewer opportunities for response and feedback

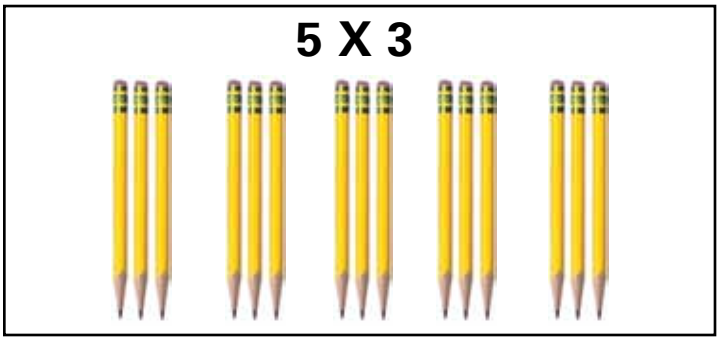
1. Write a single-digit multiplication problem on the board (5 x 3) and call on a student to draw a pictorial representation of the problem (5 groups of 3).
2. Provide feedback to the student and explain to the instructional group how the picture represents the multiplication problem.
3. Repeat steps 1 and 2 with several different single-digit multiplication problems, calling on different students each time to draw the pictorial representation on the board.

Lesson adapted to provide more opportunities for response and feedback

1. Provide each student with a small dry-erase board and marker (or manipulatives).
2. Remind students of the goal they set of learning single-digit multiplication and to monitor their progress toward that goal in today's lesson (have students record their progress at the end of the lesson).
3. Write a single-digit multiplication problem on the board (5 x 3) and ask each student to draw a pictorial representation of the problem (5 groups of 3) on their own dry-erase board. Check students' representations as they work and provide feedback.

Incorporate goal setting and self-monitoring of progress toward the goal to increase student attention, motivation, and effort.

Using personal dry erase boards allows all students in the instructional group to practice multiple problems.



4. Ask students to show their picture to their partner and to explain to their partner how their picture represents the multiplication problem. Check the representations and explanations as students work with their partner.
5 Repeat steps 3 and 4 with several different single-digit multiplication problems.
6. Ask a student to write one of the multiplication problems and to draw a picture to represent the problem on the class board. Provide feedback.
7. Ask another student to explain how the picture on the board represents the multiplication problem.

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