


# Collaborative Strategic Reading for Students With Learning Disabilities in Upper Elementary Classrooms

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## Abstract

Sixty fourth- and fifth-grade general education teachers were randomly assigned to teach Collaborative Strategic Reading (CSR; Klingner, Vaughn, Boardman, & Swanson, 2012), a set of reading comprehension strategies, or to a business-as-usual comparison group. Results demonstrate that students with learning disabilities (LD) who received CSR instruction in their general education classrooms—approximately 2 times each week over a 14-week period—made significantly greater gains in reading comprehension than students with LD in comparison classrooms ( $g = .52$ ). Teachers in CSR classrooms were also more likely to provide feedback to students and to use collaborative grouping structures.

Reading to understand, to learn, and to stay connected via technology are essential life skills. Yet for many students with learning disabilities (LD), understanding text remains an elusive goal. Increasingly, general education teachers are responsible for improving reading comprehension for all learners—including those with disabilities. In fact, more than two thirds of students with LD spend most of their day in general education classrooms (National Center for Education Statistics, 2014), whereas only a decade ago less than 50% of students with LD were included to the same extent. In addition, the Individuals With Disabilities Education Act (2006) recommends that students with disabilities are educated in the least restrictive environment and as much as possible with their peers without disabilities. Yet, although the amount of time students with LD spend in general education classrooms has increased steadily over time, their academic achievement continues to be far behind that of their peers without disabilities (Cortiella & Horowitz, 2014).

Further, initiatives such as the Common Core State Standards (CCSS; National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) call for increasing rigor with a particular emphasis on engaging students with challenging expository text. Instructional models supporting struggling readers in general education classrooms are needed to help students increase their reading comprehension outcomes and facilitate access to high-level texts. The current study examined the influence of using a set of reading comprehension strategies, Collaborative Strategic Reading (CSR; Klingner, Vaughn, Boardman, & Swanson, 2012) in fourth- and fifth-grade classrooms compared to a business-as-usual comparison

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group who used their typical instructional strategies. Specifically, we were interested in the influence of CSR on the reading achievement of students with LD who participated in grade-level reading instruction in their general education classrooms. This study extends existing CSR research by increasing the sample size of students and teachers under investigation and by looking closely at grade levels that have had mixed results in other CSR studies, some in favor of students who receive CSR (Klingner, Vaughn, & Schumm, 1998) and others that have shown no differences between CSR and typical instruction (Hitchcock, Dimino, Kurki, Wilkins, & Gersten, 2010). In addition, we use fidelity of implementation measures to look closely at the similarities and differences across conditions to establish how implementation of CSR in authentic classrooms settings compares with instruction in classrooms without CSR.

*Comprehension strategy instruction can provide actionable steps that students learn to apply before, during, and after reading to overcome barriers to understanding and to enhance knowledge related to the text.*

Reading comprehension has been described as “the most critical skill students need to be successful in school” (Watson, Gable, Gear, & Hughes, 2012, p. 80), and conceptual, subject-matter knowledge is enhanced when students are able to access and understand text (Reed & Vaughn, 2012). Yet, for students who have difficulty understanding what they read, focusing on mechanisms for enhancing text-based reading comprehension is essential to improve overall understanding (Kamil et al., 2008; McKeown, Beck, & Blake, 2009). As noted by the RAND Reading Study Group (2002), “because meaning does not exist in text, but rather must be actively constructed, instruction in how to employ strategies is necessary to improve comprehension” (p. 32)

Nearly four decades of research has confirmed that reading comprehension is a cognitively demanding task that requires individuals

to actively construct meaning by self-monitoring and applying tactics to facilitate understanding throughout the reading process (e.g., Duke, Pearson, Strachan, & Billman, 2011; Kendeou, van de Broek, Helder, & Karlsson, 2014). It can be challenging for teachers to teach students who are poor readers to enact the reading comprehension practices that are often used effortlessly by more capable readers. Comprehension strategy instruction can provide actionable steps that students learn to apply before, during, and after reading to overcome barriers to understanding and enhance knowledge related to the text.

### **Effective Reading Comprehension Practices for Students With LD**

A large number of syntheses or meta-analyses report positive outcomes from comprehension interventions for struggling elementary and adolescent readers, including those with and without identified LD (e.g., Butler, Urrutia, Buenger, & Hunt, 2010; Edmonds et al., 2009; Flynn, Zheng, & Swanson, 2012; Gajria, Jitendra, Sood, & Sacks, 2007; Gersten, Fuchs, Williams, & Baker, 2001; Vaughn, Gersten, & Chard, 2000; Wanzek, Wexler, Vaughn, & Ciullo, 2010). A number of these reviews have grouped fourth and fifth graders with those in middle and high school (i.e., Grades 4–12) based on the rationale that those in upper elementary grades face reading demands with more similarities to those of older readers than those of the lower elementary grades (i.e., Grades 1–3) where foundational reading skills are emphasized (e.g., phonemic awareness, phonics, fluency). Consistent with this notion, findings from 82 studies reviewed in a recent analysis of reading interventions (Scammacca, Roberts, Vaughn, & Stuebing, 2015) suggested that fourth- through 12th-grade students benefit similarly.

Wanzek and colleagues (2010) conducted a synthesis of interventions focused exclusively on students in Grades 4 and 5 and found strong evidence to support using direct and explicit comprehension instruction for students with reading difficulties and disabilities. Further, Wanzek et al. (2010) explained that for upper

elementary students, comprehension practices that provide opportunities for students to preview text and connect with their background knowledge, use self-questioning and self-regulating practices while reading, and summarize what they are learning are associated with moderate to high effects. These results are consistent with other research syntheses on reading comprehension outcomes with older students (Edmonds et al., 2009; Scamacca et al., 2007; Solis et al., 2012). The vast majority of interventions in middle grades have utilized instruction related to main idea or summarization (Solis et al., 2012).

Scamacca and her colleagues (2007, 2015) conducted two meta-analyses on older students (Grades 4–12) and confirmed that the research base supports teaching reading strategies to those who struggle with reading. In particular, they reported higher impact (i.e., effect sizes) from multicomponent interventions, which include word-level and text-level instruction. Further, the Flynn et al. (2012) synthesis on struggling readers (Grades 5–9) emphasized a need for future research endeavors that incorporate vocabulary and comprehension instruction to better support the reading challenges faced by older readers.

Additional recommendations include incorporating discussion about text into instruction as a means to increase engagement and comprehension (Lawrence & Snow, 2011; Murphy, Wilkinson, Soter, Hennessey, & Alexander, 2009). Murphy and colleagues (2009) reviewed 40 studies of discourse-focused comprehension models, most conducted with fourth through sixth graders, and found that many approaches increased students' comprehension and were also effective at increasing student talk and decreasing teacher talk. Findings were generally more robust for students reading below average levels than for those at or above grade level. In another review of the influence of discourse on reading comprehension, Lawrence and Snow (2011) found that asking important questions, providing a focus for the discussion, and defining rules for how to interact during discussions increases the quality of student talk about text. Though much of the research on text-based discussions has been

conducted in language arts settings with narrative text, most of the models are not specific to a particular content area or text type. Findings such as these ground the consensus recommendations (Kamil et al., 2008) that many instructional techniques in reading comprehension are widely applicable across teachers and content areas (e.g., explicitly teaching vocabulary, providing comprehension strategy instruction, incorporating text-based discussion).

## **Collaborative Strategic Reading**

CSR (Klingner & Vaughn, 1999; Klingner et al., 2012) is a multicomponent reading comprehension instructional model theoretically grounded in cognitive psychology (Flavell, 1979) with a focus on explicit instruction for struggling learners. Whereas strong readers may “pick up” strategies for reading and apply them automatically, struggling readers can be taught those same strategies explicitly with information about what the strategy is, how to apply it, why it is important, and in what contexts the strategy will be the most useful. In addition, sociocultural theory (Vygotsky, 1978) informs the structure of CSR with an emphasis on scaffolding and peer-mediated learning. In sociocultural theory, cognition occurs through both individual processing and social interaction and is thus increased when individuals can listen to, learn from, and build on each other's ideas. The teacher's role is to create learning contexts that encourage collaboration and that include guidance and supports so that students learn more than they would have been able to learn on their own (Wertsch, 1991). In CSR, collaboration occurs in student-led cooperative groups where each student is given a specific role (e.g., question expert), using the tenets of cooperative learning (Johnson & Johnson, 1989, 2008).

Students use before, during, and after reading strategies during CSR to access challenging text. Before reading, the teacher leads a short preview of the text that includes stating the topic, presenting a few key vocabulary concepts, having students connect to their background knowledge, and setting the pur-

pose for reading (*preview*). During reading, students monitor their understanding while reading the text out loud in small groups. They stop after each short section of text to identify words and ideas they don't understand and to use context clues and morphemic analysis to figure out word meanings (*click and clunk*). Next, students independently generate a brief main idea statement, share with group members, and give one another feedback (*get the gist*). After reading the entire text, students ask and answer each other's questions; write a short review statement; and discuss why their ideas are the most important, using evidence from the text (*wrap up*). Initially, teachers use explicit instruction to introduce each strategy one at a time over about five or six short lessons. Then, teachers move students into small groups of approximately four students, fine-tuning strategy use and promoting collaboration and discussion skills that are needed to manage small group learning. Students utilize a variety of resources to scaffold their use of the reading strategies, including role cue cards (i.e., leader, clunk expert, gist expert, question expert), learning logs to record their ideas, and lists of affixes to support word analysis. Teachers are encouraged to embed CSR into content instruction using curriculum-based expository text.

Several studies have examined the efficacy of CSR in Grades 4 through 8. In one quasi-experimental design (QED) study, researchers provided daily CSR instruction in inclusive classrooms of fourth graders, about 50% of whom were English language learners (ELLs), during an 11-day social studies unit, while a second group of students received their typical instruction without CSR. Relative to students in the comparison condition, students who received CSR instruction made statistically significant gains in reading as measured by the Gates MacGinitie Reading Test (GMRT, fourth edition; MacGinitie, MacGinitie, Maria, & Dreyer, 2000; effect size  $d = .44$ ,  $p < .001$ ; Klingner et al., 1998). In another QED study, fourth-grade students from five culturally and linguistically diverse inclusive classrooms received CSR two to three times each week for 1 month during social studies (Klingner,

Vaughn, Arguelles, Hughes, & Ahwee, 2004). Again, students in CSR made significantly greater gains in reading comprehension on the GMRT when compared to students in comparison classrooms who did not receive CSR ( $d = .19$ ,  $p < .01$ ). Both low-achieving students and students identified as LD made the greatest relative gains ( $d = .25$  for high- and average-achieving students,  $.51$  for low-achieving students, and  $.38$  for students with LD). In an experimental study that randomly assigned 74 fifth-grade classrooms across five school districts to treatment or a control condition, there were no statistically significant differences in reading comprehension outcomes between conditions (Hitchcock et al., 2010). Researchers reported that low fidelity to the full CSR model might have contributed to the results. For example, only one fifth of study teachers were observed using all of the core CSR components. This study also reported a smaller amount of follow-up support than has been provided in other CSR studies.

Several experimental studies have also been conducted on CSR at the middle school level. In one study, using a within-teacher design, four sections with 34 sixth-, seventh-, and eighth-grade students with LD in reading and language arts were randomly assigned to use a computer-adapted version of CSR two times a week for 10 to 12 weeks or to a comparison condition (Kim et al., 2006). Reading growth was statistically significant on a researcher-developed measure of reading comprehension and on a standardized measure, the Woodcock Reading Mastery Test-Revised ( $d = .50$ ,  $p < .05$ ), favoring the students who received computerized CSR (Kim et al., 2006). In another experimental study that also used a within-teacher design, 387 students in seventh- and eighth-grade language arts and reading classrooms were randomly assigned to CSR or to a comparison condition of matched classes without CSR (Vaughn et al., 2011). Students who received CSR instruction approximately once weekly over the school year scored significantly higher on the GMRT than students in a comparison group, with struggling readers making the greatest gains ( $g = .12$  for the overall sample,  $.36$  for struggling readers;

$p < .05$ ). Finally, in a randomized control trial that used a within-teacher design, this time in middle school science and social studies classes, 1,074 students in social studies and science classrooms were assigned to receive CSR instruction weekly in each content area or to a comparison condition with no CSR (Boardman, Klingner, Buckley, Annamma, & Jensen, 2015). Students who received CSR instruction scored higher on the GMRT than their peers in comparison classrooms ( $g = .18, p < .05$ ). The present study investigated further the implementation and outcomes of using CSR in fourth- and fifth-grade classrooms.

## Method

We employed a multisite cluster randomized control trial (RCT) in which teachers were randomly assigned to condition (i.e., the CSR group or the business-as-usual “typical” group). We conducted an intent-to-treat analysis where we analyzed the groups exactly as they existed on randomization. This design controls for observed and unobserved teacher differences because these factors are independent of condition, thus minimizing the risk of teacher-level confounds. The RCT is recommended for this purpose (Coalition for Evidence-Based Policy, 2003).

Because our study took place in upper elementary classes, where teachers provide instruction in different content areas to the same students, we randomly assigned teachers to use the CSR instructional model or to continue with their typical instructional practices. We addressed the following research questions:

1. What is the efficacy of CSR on the reading comprehension of fourth- and fifth-grade students in general education classrooms compared with students in a comparison group?
2. What is the efficacy of CSR taught in general education classrooms for a subgroup of students with learning disabilities?
3. How does fidelity to the CSR model distinguish instruction between CSR and comparison classrooms?

## Setting and Participants

The study took place in 14 elementary schools located in three urban/near urban school districts, two in one state (Site 1) and one in another state (Site 2). Each district served a diverse population of students.

Sixty teachers, 31 randomly assigned to treatment and 29 to control, participated in the study. Selection and consent of both teachers and students followed Institutional Review Board procedures at the participating universities. Due to uneven numbers of teachers by site (31 in Site 1 and 29 in Site 2), randomization resulted in an additional teacher in the treatment condition at each site (16 treatment and 15 control in Site 1 and 15 treatment and 14 control in Site 2). Ninety-five percent of the teachers were female. The majority (65%) were Caucasian, followed by Hispanic (27%), African American (6%), and Asian (2%). Teaching experience ranged from 1 to 30 years, with a mean of 9.23 and a median of 7 years. Roughly 40% of teachers had a master's degree. Nearly half of the teachers (48%) held at least one certification in addition to being elementary certified (e.g., English language arts, bilingual, reading, special education, English as a second language).

There were 1,372 students in the initial sample (686 in treatment and 686 in the comparison condition; see Table 1). The average age was 10.6 for students in CSR treatment and 10.52 for students in comparison. The majority of the student sample was Hispanic, and about half were ELLs. Approximately 10% of the students in the treatment group received special education services compared to about 12% of students in the comparison group. Five percent ( $n = 32$ ) of the CSR students were identified with a learning disability compared to 8% ( $n = 55$ ) of the students in the comparison group. Because teachers were randomly assigned to condition such that in each school some teachers taught CSR and others did not, we are not aware of any systematic differences in the way students with disabilities were distributed across classrooms or in the types or amount of special education services they received. Considering the

**Table 1.** Demographics for Initial Student Sample.

Demographics	CSR <sup>a</sup>		TYP <sup>b</sup>	
	<i>n</i>	%	<i>n</i>	%
Gender				
Male	357	52.0	326	47.5
Female	329	48.0	360	52.5
Race/Ethnicity				
African American	42	6.1	43	6.3
Hispanic	470	68.5	475	69.2
Asian	5	0.7	5	0.7
Pacific Islander	12	1.7	12	1.7
White	331	48.3	331	48.3
Multiracial	4	0.6	1	0.1
English language learner	360	52.5	342	49.9
Special education total	55	8.0	73	10.8
Learning disability (LD)	32	4.7	55	8.0
Special education other than LD	22	3.2	18	2.6

Note. The percentages associated with ethnicity may add up to more than 100 because students were allowed to be categorized to more than one ethnicity. CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); TYP = typical practice.

<sup>a</sup>N = 686. <sup>b</sup>N = 686.

distribution of students with LD across classrooms, classes were similar (e.g., similar ratio of students with LD to students without LD) with the exception that in the CSR condition, only 42% of classrooms had students with LD, whereas 76% of classrooms in the control condition included students with LD. Twenty-two additional students in the CSR group and 18 additional students in the comparison group had a disability other than LD. Categories included deaf, emotional disability, physical disability, speech and language, autism spectrum disorder, significant limited intellectual capacity, and multiple disabilities. Our sample was representative of national percentages of students with LD and other disabilities (Cortiella & Horowitz, 2014).

### **Professional Development and Teacher Support**

Teachers participated in one full day of CSR professional development that included the rationale for implementing strategy instruction, how to teach the CSR strategies, methods for supporting discussion in student-led groups, and how to introduce CSR to students. Professional development included modeling and

opportunities for teachers to practice and to plan how to integrate CSR into existing practices. All teachers received introductory lessons with texts as well as the teacher and student materials (e.g., strategy resource cards) needed to implement CSR. Texts in the introductory lessons ranged in level from Grades 3 to 4. A follow-up 2-hour booster session was provided in each district midway through the study that emphasized using student work to plan CSR instruction and that addressed problems of practice unique to specific districts. Initial professional development and follow-up booster sessions were planned collaboratively by the research team and provided by a lead researcher in each state to ensure consistency of presentation content, materials, and quality. In addition, teachers were offered biweekly coaching sessions by university graduate students who were experienced coaches and experts in CSR. Coaches would typically observe, co-teach, or model and then debrief with teachers, emphasizing what was going well and areas for improvement.

### **Description of Intervention**

Students in both conditions (CSR and business as usual, or *comparison*) were taught in diverse

general education classrooms including ELLs, struggling readers, and students with LD, as well as average and above-average readers. Teachers assigned to the intervention condition were asked to implement CSR two to three sessions each week, for approximately 50 min per session, while reading predominately expository text (either the textbook or supplemental readings matched to the curriculum). To ensure that all students received CSR instruction, we requested that CSR be used during Tier 1 instruction, and coaches supported this request when planning with teachers so that lessons included all or most students in the class. CSR was usually implemented as part of teachers' literacy blocks, although teachers also chose to use CSR in social studies or science, and some teachers varied when they delivered CSR instruction. In complex classroom environments, there is a fair amount of movement in and out of class throughout the day in elementary settings, particularly for students who receive special services. Although there was some movement of students recorded during observations, classrooms were relatively intact during CSR instruction. Both treatment and comparison classes followed the district's fourth- and fifth-grade curriculum and selected readings at their discretion. Teachers in both conditions used a combination of textbook and supplementary resources. In comparison classes, we asked teachers to continue using their typical instructional practices without the weekly segments of CSR. The study took place during the fall semester of 2010 for approximately 14 weeks of instruction between when students were pre- and posttested.

### *Student Outcome Measure*

The student outcome was reading comprehension performance, as measured by the reading comprehension subtest of the Gates-MacGinitie Reading Test (fourth edition; MacGinitie, MacGinitie et al., 2000). The GMRT is a timed paper-and-pencil, group-administered survey that assesses student achievement in reading and was administered by researchers prior to beginning the intervention (August) and prior to winter break (December). The comprehension

subtest is designed to measure students' abilities to read and understand different types of prose from passages in published books and periodicals. Some questions relate to a literal understanding of the passage whereas others require students to make inferences or draw conclusions. In addition, the comprehension subtest is designed to measure students' ability to determine the meaning of words in an authentic text context. Two parallel forms permit pre- and posttesting. Alternate-forms reliability for the GMRT is estimated to range from .90 to .95, and test-retest reliability has been estimated as above .88 (MacGinitie et al., 2000).

### *Implementation Measures*

*Fidelity of implementation* denotes the degree to which a program is implemented as originally planned (O'Donnell, 2008). Fidelity is operationalized in this study in terms of dosage (frequency of implementation), quality (how well CSR instruction was delivered), and program differentiation (the degree to which instructional strategies within each condition can be differentiated). To measure dosage, we used teacher logs, in which teachers in the treatment condition self-reported the number of CSR sessions and minutes they taught throughout the intervention. The Implementation Validity Checklist (IVC; Vaughn et al., 2011, 2013) classroom observation tool was used to assess quality of CSR instruction and program differentiation.

*Teacher Logs.* Researchers collected logs completed by 16 of the 31 CSR teachers to estimate dosage (i.e., the frequency of CSR implementation). Teacher participants in one site did not agree to complete implementation logs. Coaches collaborated closely with teachers throughout the study and were present in all schools on a weekly basis. Though unable to confirm exact implementation at Site 2, researchers reported that the number of sessions, including variation among teachers, appeared to be similar across sites. The mean number of self-reported CSR sessions was 39 ( $SD = 12.7$ ; median = 37 sessions; range, 23–62

sessions), and the mean number of minutes was 1,795 min ( $SD = 580.6$ ; range, 1,065–3,480 min) or approximately 30 hr of CSR instruction (median = 1,673 min) with sessions that were typically around 40 min each. Teachers were asked to implement CSR two to three times each week for about 50 min per session. On average, teachers taught slightly more sessions than expected for a slightly shorter amount of time per session. Dosage, as reported by teachers, was in the acceptable range.

**Implementation Validity Checklist (IVC).** We measured quality of implementation and program differentiation in both sites using the IVC, a classroom observational tool (Vaughn et al., 2011, 2013). The IVC contains items linked to components of CSR as well as core teacher and student behaviors that are needed to implement CSR with high quality but are not unique to CSR (e.g., promoting collaboration and providing feedback). Observers used the IVC rubric to record the extent to which teachers implemented CSR as intended. The instrument has been used to determine the quality and variation in delivery of CSR and to detect similarities in instructional practices that might occur in comparison classrooms (e.g., if a main idea strategy is taught in a comparison classroom). For this study, we collected three preannounced rounds of IVC observations with all 60 teachers (CSR and comparison) approximately once each 4 weeks between October and December.

Divided into three sections, the first part of the IVC measures procedural fidelity, in which teachers are rated on each CSR component (i.e., teacher/student preview, clunks, fix up strategies, get the gist, questions, review). Scores are assigned according to quality and adherence to the intervention, ranging from 0 (*not observed*) to 4 (*highly aligned with CSR strategy*). The second section of the IVC measures six teacher and student behaviors that are essential to high-quality implementation of CSR. Teacher behaviors are scored according to the extent to which the teacher monitors and provides feedback, reinforces learning, and encourages group collaboration. Student items include observations of students helping

each other while working in groups, participating, and using reading strategies proficiently. Responses are rated on a scale of 0 (*not observed*) to 4 (*observed and done well*). The third section of the IVC includes global quality items that are rated on a scale from 1 (*low*) to 7 (*high*), including quality of teacher's instruction and quality of teacher's classroom management.

Observers participated in trainings to ensure that an interrater agreement of 90% on all IVC items was reached. This training process has been followed in other CSR studies that report on fidelity using the IVC (e.g., Boardman et al., 2015; Vaughn et al., 2011).

Another reason to conduct IVC observations in both treatment and comparison classes was to measure program differentiation, or the extent to which instruction similar to CSR was present in comparison classrooms. Describing the counterfactual, or what the intervention is being compared to, helps contextualize results in randomized control trials (Lemons, Fuchs, Gilbert, & Fuchs, 2014).

### Data Analysis Procedures

To analyze outcomes, raw scores for GMRT tests were converted into a standard score with a mean of 100 and standard deviation of 15 to assist with interpretation. Using the software program Hierarchical Linear Modeling 7.0, we ran a multilevel, random intercepts model to estimate the effects of CSR on GMRT posttest scores while controlling for GMRT pretest scores. We also included student-level dummy coded special education status variables because we were interested in this subgroup of students. To model special education status, students who received no special education services served as the reference group. The dummy codes included learning disability (LD; 1 = *yes*, 0 = *no*) and special education other than LD (Sped\_other; 1 = *yes*, 0 = *no*). Students were regarded as nested in teachers who were nested in schools. Condition (1 = *treatment*, 0 = *comparison*) was modeled at Level 2 because that is where the random assignment took place, and LD and Sped\_other were each interacted with condition. The



effect of treatment and the effect of treatment interacted with LD and with a disability other than LD were all modeled as random in estimating main and interaction effects. Pretest GMRT scores were entered into the model as grand mean centered. When running the analyses explained further in the findings section, the effect of condition interacted with Sped\_other was nonsignificant. The LD  $\times$  Condition effect, however, was significant regardless of whether condition was interacted with Sped\_other. Thus, to run the most parsimonious model, we dropped the interaction effect between treatment and Sped\_other but kept the interaction of condition with LD in the model. Thus, using a three-level notation (Raudenbush & Bryk, 2002), the final model took the following form:

#### Level 1

$$\text{PostGMRT}_{ijk} = \pi_{0jk} + \pi_{1jk} \times (\text{PreGMRT}_{ijk}) \\ + \pi_{2jk} \times \text{LD}_{ijk} + \pi_{3jk} \times \\ (\text{Sped\_OTHER}_{ijk}) + e_{ijk}$$

#### Level 2

$$\pi_{0jk} = \beta_{00k} + \beta_{01k} \times (\text{CONDITION}_{jk}) + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k}$$

$$\pi_{2jk} = \beta_{20k} + \beta_{21k} \times (\text{CONDITION}_{jk}) + r_{2jk}$$

$$\pi_{3jk} = \beta_{30k}$$

#### Level 3

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

As shown previously, the model including the interaction term also included controls for the main effects of LD identification and CSR treatment. To test the main effect, GMRT posttest scores were regressed on GMRT pretest scores, special education status dummy-coded variables, and treatment indicator to examine differences in outcomes between students in the treatment and students in the comparison condition. An additional model was fit with an interaction term between LD status and the treatment variable to examine the hypothesis that the CSR treatment might be more effective for students with a learning

disability than for those who received no special education services.

We conducted multiple analyses to investigate implementation. We ran frequencies and descriptives to analyze dosage, as measured by the number of CSR components and the teacher/student behaviors promoting CSR application observed within each round of the fidelity observations. In addition, we conducted an independent-samples *t* test to examine program differentiation between CSR and typical conditions, as measured by the Implementation Validity Checklist. We conducted three separate analyses, one assessing differences between conditions in procedural fidelity, the second assessing differences in teacher/student behaviors, and the third analyzing differences in overall teacher quality. The procedural fidelity score was computed as a composite component score of seven items (i.e., teacher preview, student preview, clunks, fix-up strategies, gist, questions, review) that we averaged within and across the three rounds of observations. Similarly, the teacher/student behaviors score was computed by averaging the sum of the three teacher behavior items and three student behavior items within each round and then across rounds. Global quality included two items, each averaged within and across rounds: overall quality of teacher's instruction and quality of teacher's classroom management.

### Missing Data

Although randomizing teachers to conditions should result in statistically equivalent groups, missing data due to attrition could threaten the initial balance and result in a biased impact estimate. For this study, there were 1,372 students at random assignment (686 in treatment and 686 in control) and 1,303 students in the analytic sample (653 in treatment and 650 in control). Thus, the overall attrition rate was 5.0%, and the differential attrition rate was 0.4%. There were no missing data at either the teacher or school cluster levels. Using a conservative attrition threshold (What Works Clearinghouse, 2014), attrition for this study was low. Missing student data were therefore handled using listwise deletion.

## Results

Maintaining the same standard score on the GMRT from fall to winter represents average growth in reading over that time period (MacGinitie et al., 2002). Our results show that on average, although students with LD scored lower at pretest and at posttest than students without LD, the average gains from pretest to posttest for all students were positive. Further, students with LD in CSR outperformed students with LD in the comparison condition, on average (see Figure 1).

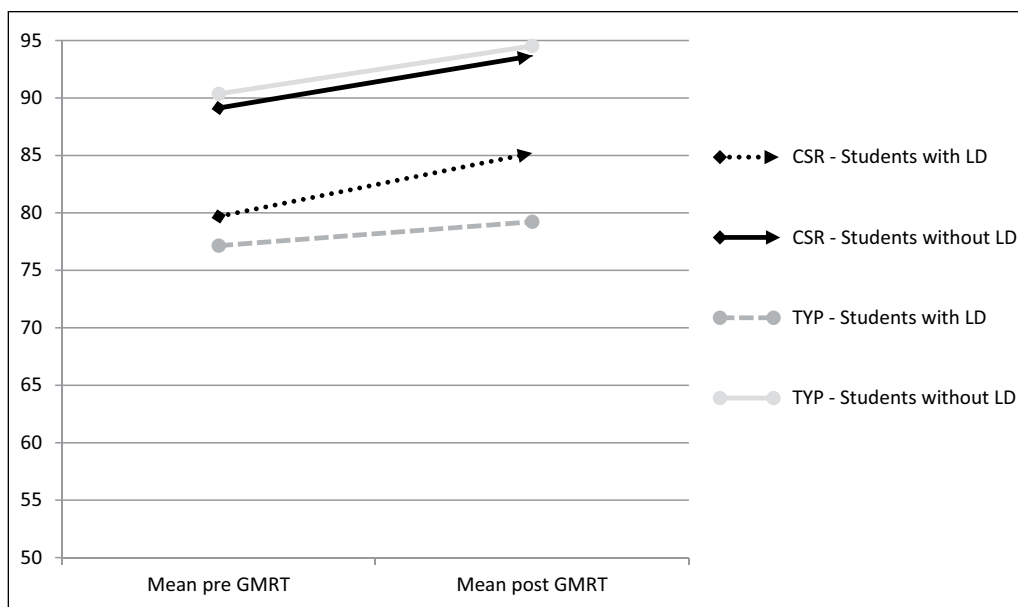
*Although students with LD scored lower at pretest and at posttest than students without LD, the average gains from pretest to posttest for all students were positive.*

The observed values (descriptive statistics) show similar pre- and posttest means and standard deviations for treatment and comparison groups. These findings are presented in Table 2.

There was no significant main effect of CSR on student outcomes, as indicated in the summary of mixed and random effects in Table 3. There was, however, a significant, positive interaction effect between condition and posttest scores for students with LD. The adjusted posttest means were higher for students with LD who received CSR in general education classrooms than for students with LD who did not receive CSR ( $\beta = 4.86$ ,  $p = .03$ ). It is estimated that students with LD score an average of 4.86 points higher on the GMRT when in a class implementing CSR, compared to students with LD who received typical instruction. This difference is equivalent to a Hedges's  $g$  effect size of 0.52.

## Implementation

Implementation results show the percentage of teachers observed implementing each of the CSR components in CSR and comparison classrooms during the third round of IVC data collection (i.e., receiving a score on a CSR component of 1 or above) was 79%



**Figure 1.** The differential influence of condition (CSR or TYP) on GMRT scores.

Note. CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); GMRT = Gates-MacGinitie Reading Test (MacGinitie, MacGinitie, Maria, & Dreyer, 2000); TYP = typical; LD = learning disability.

**Table 2.** Means and Standard Deviations on the GMRT for Study Groups.

	Pretest			Posttest		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
<b>Main effect</b>						
Intervention (CSR)	88.56	13.77	679	93.06	12.35	670
TYP	89.18	14.92	680	93.09	14.11	683
<b>Interaction effect</b>						
Learning disability						
Intervention (CSR)	79.69	10.70	32	85.21	7.89	31
TYP	77.15	9.76	55	79.23	9.95	52
No special education services						
Intervention (CSR)	89.13	13.8	627	93.67	12.53	604
TYP	90.36	14.79	608	94.53	13.73	581

Note. CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); GMRT = Gates-MacGinitie Reading Test (MacGinitie, MacGinitie, Maria, & Dreyer, 2000); TYP = typical.

(CSR) and 87% (comparison) for teacher preview, 84% (CSR) and 55% (comparison) for student preview, 100% (CSR) and 34% (comparison) for identify clunks, 100% (CSR) and 28% (comparison) for use fix-up strategies, 97% (CSR) and 31% (comparison) for get the gist, 58% (CSR) and 41% (comparison) for ask and answer questions, and 45% (CSR) and 31% (comparison) for review. Thus, inasmuch as using the full CSR model was emphasized in professional development and coaching, teachers in CSR classrooms frequently did not complete the model (through questions and review) within each observation session. Although some teachers reported covering all the strategies over 2 days of instruction, many students were probably exposed to only the first three or four of the expected five CSR strategies on a regular basis.

Table 4 shows means and standard deviations for procedural fidelity (i.e., each component of the CSR model) as well as teacher and student behaviors promoted in the CSR model, indicating the extent of the alignment of teachers' instruction with the CSR model. The data are provided by condition for each of the three rounds of IVC observations.

As presented in Table 5, there was a significant difference in the procedural fidelity scores in CSR ( $M = 2.2$ ,  $SD = 0.7$ ) and typical ( $M = .7$ ,  $SD = 0.3$ ) conditions;  $t(58) = 7.7$ ,  $p = .008$ . Despite a fair amount of reading comprehension

strategy use in typical classrooms (as measured by procedural fidelity items on the IVC), teachers in the CSR condition implemented CSR-aligned reading comprehension strategies to a greater degree than teachers in the comparison condition, thus providing adequate distinction between the two study conditions. The curricula in the study school districts included some amount of reading strategy instruction, and this was observed in many classrooms. For example, more than 80% of both CSR and typical teachers were engaging students in previewing activities prior to reading across observation rounds. Previewing the text is part of CSR but is also common in typical instruction in upper elementary classrooms. There was also a significant difference in teacher/student behavior scores between CSR ( $M = 2.9$ ,  $SD = .6$ ) and typical ( $M = 2.3$ ,  $SD = .6$ ) teachers;  $t(58) = 4.5$ ,  $p = .000$ . Results from the teacher/student behaviors scale in the IVC indicate that in CSR classrooms, teachers provided more feedback on the quality of students' strategy use and there was more student-led collaborative group work. There was not a significant difference in overall teacher quality or classroom management rating scores for teachers in CSR and comparison conditions.

## Discussion

We were interested in the extent to which a multicomponent reading strategy model (i.e.,

**Table 3.** Fixed and Random Effects of Condition, Demographics, and Pretest Scores on Posttest Scores.

Fixed effects				
Predictor	Estimate (SE)	t Ratio <sup>a</sup>	p Value	Hedges's g
Intercept, $\beta_0$	95.53 (0.70)	138.37	<.001	
Condition, $\gamma_{010}$	-0.41 (0.79)	-0.75	.606	-0.03
GMRT pretest, $\beta_{10}$	0.63 (0.02)	26.54	<.001	
LD <sup>b</sup> , $\beta_{20}$	-7.15 (1.30)	-4.71	<.001	
Condition, $\gamma_{210}$	4.86 (2.11)	2.00	.026	.52
SPED_Other <sup>b</sup> , $\beta_{30}$	-1.68 (1.44)	-1.54	.243	
Random effects				
	Variance (SD)	t Ratio <sup>a</sup>	p Value	% of total variation
Level 1 (individual)	62.22 (7.89)	2.433	<.001	88.52
Level 2 (teacher)	5.92 (2.43)	2.43	.005	8.42
Level 3 (school)	2.15 (1.47)	1.47		3.06

Note. LD = learning disability; SPED\_Other = special education status other than LD; GMRT = Gates-MacGinitie Reading Test (MacGinitie, MacGinitie, Maria, & Dreyer, 2000); CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); condition (CSR = 1, comparison = 0).

<sup>a</sup>The t ratio for fixed effects was determined by dividing the estimate by its standard error; for random effects, the t ratio was determined by dividing the variance component by its standard deviation. <sup>b</sup>Reference group is students that receive no special education services.

CSR; Klingner et al., 2012), that incorporates features of effective instruction for students with comprehension difficulties would positively influence the reading comprehension of students with LD in general education classrooms. Overall, students without LD in both conditions made gains in a short period of time with no statistical difference between treatment and comparison groups. This demonstrates that students without LD appeared to benefit from the instruction they were receiving in their classrooms, regardless of whether or not CSR was used. However, students with LD who received CSR delivered by their general education teacher as part of their grade-level reading instruction approximately two times each week for 14 weeks made significantly greater gains in reading comprehension than students with LD who did not receive CSR instruction. These results are promising for several reasons. First, these gains were achieved despite a good deal of similar instruction across conditions. Instruction in most comparison classrooms in this

study included some form of reading strategies and other instructional moves likely to promote reading comprehension such as peer-mediated discussions about text. In addition, the overall quality of instruction was rated as equivalent in CSR and non-CSR classrooms, and overall, instruction in both conditions was above average. In this study, students without LD were exposed to adequate or better reading instruction in both conditions and made strong gains in reading comprehension, indicating that the specific nature of reading instruction was not important to their reading growth. Thus, the use of CSR strategies did not add or detract from the reading gains of students without LD; however, for students with LD, CSR was particularly beneficial ( $g = .52$ ).

Second, although we did not interview teachers in this study, in previous studies teachers have reported that CSR supports all learners with a particular benefit to students who read below grade level (e.g., Klingner, Boardman, Boele, & Annamma, 2010;

**Table 4.** Implementation Validity Checklist Observation Results.

	CSR			TYP		
	R1	R2	R3	R1	R2	R3
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Procedural fidelity						
Teacher preview	1.3 (1.3)	2.5 (1.4)	2.9 (1.4)	1.8 (1.2)	1.6 (1.2)	1.7 (1.3)
Student preview	2.0 (1.4)	2.3 (1.5)	2.7 (1.4)	1.0 (1.0)	0.9 (1.2)	1.0 (1.1)
Clunks	2.7 (1.2)	3.0 (1.4)	3.3 (0.9)	0.8 (0.9)	0.4 (0.6)	0.4 (0.6)
Fix-up strategies	2.1 (1.2)	2.6 (1.1)	2.9 (0.9)	0.6 (0.6)	0.4 (0.7)	0.3 (0.6)
Get the gist	2.1 (1.3)	2.3 (1.3)	2.9 (1.0)	0.5 (0.8)	0.8 (1.1)	0.4 (0.7)
Questions	1.7 (1.3)	2.0 (1.5)	1.8 (1.7)	0.6 (0.9)	0.8 (1.0)	0.7 (1.0)
Review	0.6 (1.0)	1.0 (1.3)	1.1 (1.3)	0.6 (0.8)	0.6 (0.9)	0.5 (0.7)
Teacher behaviors						
Monitors and provides feedback	2.8 (0.8)	3.0 (0.8)	3.3 (0.9)	1.8 (0.8)	1.9 (1.2)	1.8 (1.1)
Reinforces learning	2.6 (0.9)	2.8 (1.0)	2.9 (1.0)	2.6 (1.0)	2.9 (1.0)	3.0 (1.0)
Promotes collaboration in groups	2.8 (0.9)	3.1 (1.0)	3.3 (0.9)	2.4 (1.1)	2.7 (1.1)	2.7 (1.1)
Student behaviors						
Help each other while in groups	2.8 (0.9)	2.9 (0.9)	3.1 (0.9)	2.1 (1.1)	1.8 (1.1)	2.0 (1.2)
All participate in their groups	2.9 (0.8)	3.0 (0.9)	3.3 (0.8)	2.8 (0.8)	2.7 (1.2)	3.2 (0.9)
Proficiency in strategy use	2.3 (0.6)	2.7 (0.8)	2.9 (0.9)	1.7 (0.8)	1.3 (0.8)	1.4 (.07)

Note. CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); TYP = typical practice; R1 = Round 1; R2 = Round 2; R3 = Round 3; procedural fidelity scores (low = 1 to high = 4); not observed = 0; Teacher and student behaviors scores (low = 1 to high = 4).

**Table 5.** Group Differences for Implementation Fidelity Between CSR and Typical Classes.

Implementation Fidelity Measure	CSR		TYP		<i>t</i> (58)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Procedural fidelity	2.23	0.67	0.79	0.32	10.54	.008	2.743
Teacher and student behaviors	2.91	0.56	2.26	0.56	4.52	.000	1.16
Global rating	5.17	1.11	5.23	1.07	−0.196	.846	−0.055

Note. Procedural fidelity includes seven items (scale 0–4). Teacher and student behaviors include six items (scale 0–4). Global quality is based on one item (scale 1–7). All items are averaged across observation rounds. CSR = Collaborative Strategic Reading (Klingner, Vaughn, Boardman, & Swanson, 2012); TYP = typical practice; IVC = Implementation Validity Checklist (Vaughn et al., 2011, 2013).

Klingner et al., 2004). For example, in an earlier study conducted during the same project reported here, 15 of 17 teachers reported that CSR supported struggling readers the most and also commonly noted the benefits to all learners. “It [CSR] gets kids thinking about how you read successfully, and what the process is and they practice it together, and they’re learning from each other in the cooperative groups” (Klingner et al., 2010, p. 25). In the

present study, the majority of teachers were responsive to coaching, were active participants in the professional development and the follow-up support sessions, and most reported that they would continue using CSR with their entire class after the study ended. Despite the lack of significant effects for students without LD, teachers appeared to see benefits for a variety of learners of using CSR as an instructional tool to promote reading comprehension.

Finally, providing instruction that is aligned to the CSR model, as measured by the IVC observation protocol, appears to benefit students with LD. The strategies observed in CSR classrooms were taught explicitly to students and then applied in small student-led groups in a reading routine that was repeated over the course of the semester. Explicit instruction is a key aspect of CSR and is known to support struggling readers to become more effective readers (Kamil et al., 2008). Teachers used a variety of texts while teaching CSR from basal readers and content area textbooks to supplemental readings that were selected because they aligned with the content or because they would be of high interest to students. It may be that the intentional structures of CSR increased opportunities for students with LD to read and interact with text. Although we did not collect data on the reading levels of teacher-selected texts, it may also be that because text selection was addressed during the professional development session and by coaches during individual planning sessions that CSR teachers selected texts that were more accessible to students with LD than those used in classes without CSR.

*Students with LD who received CSR delivered by their general education teacher as part of their grade-level reading instruction . . . made significantly greater gains in reading comprehension than students with LD who did not receive CSR instruction.*

Further, in CSR, students are assigned to heterogeneous small groups, and students in this study were observed working in small groups more often in CSR classrooms than in comparison classrooms. Within those groups, students are given multiple resources and use expert roles to guide the group through the reading process. For students with LD, this provides a process that they can apply with built-in scaffolds that include both material resources (e.g., a list of fix-up strategies to identify unknown

words or concepts) and human resources that are employed when students share, discuss, and help each other make meaning from text. In addition, the structures also increase accountability for participation by having each student complete his or her own learning log that is a record of his or her thinking and ideas and a way for teachers to monitor progress and provide feedback. Students then use the ideas generated on the learning log to guide their discussion. The expectations in CSR are that everyone in the group shares ideas and the role expert cue cards guide the group to include all students. Cooperative learning that incorporates individual accountability is the most effective at improving achievement for students with LD (McMaster & Fuchs, 2002). Research has consistently shown that students with LD participate less than students without LD in general education classrooms (e.g., Newman, 2006) and usually receive reading instruction in large group settings (Swanson, 2008). Intentionally structuring discussions to value all students is an important aspect of increasing participation (Berry, 2006). Using structures that equalize participation through roles, accountability, and grouping structures may also be critical to increasing access to new learning for students with LD (Lawrence & Snow, 2011). In addition, our results indicate that when teachers implement CSR, they provide more feedback to students on the quality of their work than in comparison classrooms. Feedback is an essential component of instruction for all students but may be particularly important for students with LD (Hattie & Timperley, 2007). Gersten and colleagues (2001) also found that peer interactions accompanied with explicit feedback from the teacher support reading comprehension for students with LD. In CSR, teachers facilitate learning throughout the lesson by listening in on group discussions and providing verbal feedback to individuals and to groups to support strategy use and content learning. Teachers may also provide written feedback on learning logs and use that data to guide the content of future lessons.

When implementing CSR strategies in this study, the quality of instruction was generally acceptable. However, when considering fidelity

to the full CSR model (i.e., all five strategies), the majority of teachers were observed teaching consistently only three of the five CSR components (i.e., preview, click and clunk, get the gist). Other intervention studies that included investigations of implementation factors have also demonstrated low fidelity to parts of the intervention's model even when there is an overall positive effect of the intervention (e.g., May et al., 2015). In addition, other studies of CSR have found that teachers most often do not complete the full CSR model (Boardman et al., 2015, in press; Hitchcock et al., 2010). This finding may simply reflect expectations that are unrealistic or too constraining given the demands placed on teachers' time to teach, plan, collaborate and still accommodate all the federal-, state-, district-, and school-level testing requirements. Though the implications for not completing the CSR model are not yet clear, it is possible that the lack of significant gains by students without learning disabilities may be attributed in part to students not regularly applying the full suite of CSR reading comprehension strategies. In other words, the change in their strategy use may not be robust enough to yield substantial growth. For example, "asking and answering questions," a strategy associated with improved reading comprehension (Rosenshine, Meister, & Chapman, 1996), is one of the often omitted components.

Educating students with diverse learning needs within general education classrooms is essential. CSR supports teachers and students in inclusive classrooms to use reading strategies with structured cooperative learning supports that promote student engagement, peer interactions, and reading comprehension. The findings from this study demonstrate that students with LD in inclusive fourth- and fifth-grade classrooms benefit from CSR instruction when compared to students with LD who do not receive CSR instruction.

### *Limitations*

Although we used multiple data sources to determine how CSR was taken up by teachers and the extent to which students might have benefited from instruction, there is always the

possibility that additional data collection such as interview data would have provided greater explanatory power. Further, because we collected implementation logs for only half of our sample, we were limited in our ability to estimate overall dosage. We also did not have access to students' individualized education program information or the services that students received outside of the general education classroom. Still, researchers were in close contact with teachers and regularly visited classrooms. This presence allowed us to use observation and field note data to make determinations about how CSR instruction was delivered and to whom.

Another key limitation of this study is that the findings showed no main effect whereas an interaction effect was detected. In the absence of a main effect, more credence is typically given to positive subgroup findings when the estimated full sample effect is positive and statistically significant. When conducting applied research studies, however, Bloom and Michalopoulos (2013) noted that often there is interest not only in the overall average effect of an intervention but also the effects for different subgroups of the overall sample of participants. The authors suggested several criteria for determining when an effect for a specific subgroup provides strong evidence of an intervention's effectiveness, including whether a research design is used that supports valid inferences, if findings are consistent with prior empirical findings and existing theory, whether results are statistically significant, and if the magnitude in differences is large enough to be important. The present study include all of these criteria.

### *Implications for Practice and for Future Research*

Over the past 10 years, individuals with disabilities have made inadequate progress in reading despite the incremental gains of students without disabilities (Vaughn & Wanzek, 2014). Although the reasons for these limited gains in reading comprehension for students with disabilities are not clear, it is likely that with the increasing time students with disabilities spend in general education classrooms

(National Center for Education Statistics, 2014), these settings may not be providing enough instruction that specifically benefits students with disabilities. Identifying instructional practices that positively influence all learners is a high priority for improving classroom instruction. Although CSR did not differentially benefit typical learners, it was associated with the same gains that typical learners get in classrooms not using CSR. Thus, the differential benefit for students with disabilities in CSR classrooms warrants consideration by teachers as they aim to provide beneficial instruction in reading comprehension for all students.

There are many implications for future research, including studies that systematically examine which elements of CSR are most beneficial and whether there are elements of CSR that can be enhanced in ways to demonstrate greater impact for all students. For example, team-based learning has been examined in social studies classes as a means of enhancing outcomes and might be a valuable way of adjusting CSR (Wanzek et al., 2014). Addressing the influence of teachers' text selection within reading comprehension strategies instruction could also provide useful information to educators. Although the students with LD in the present study made gains in the general education classroom using CSR, these gains were still incremental. In our study, CSR was implemented up to three times each week in approximately 40-min sessions. For students with LD to move closer to meeting grade-level expectations, we think it would be interesting to determine the effects of a supplemental intervention paired with CSR for students with disabilities. Similarly, further coordination of instruction across settings could offer opportunities for broader application and transfer of reading strategy use. Future research may also consider the level of gains that can be realistically expected when reading interventions are provided in general education settings.

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