

Designing an Intervention in Reading and Self-Regulation for Students With Significant Reading Difficulties, Including Dyslexia

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Abstract

The purpose of this feasibility study was to inform the development of an intervention to support reading and self-regulation for students with significant reading difficulties and disabilities (RDs), including dyslexia. Participants were 21 special educators, dyslexia specialists, and reading interventionists and 48 students in Grades 2 to 4. Student outcomes were compared using a quasi-experimental design; some teachers provided the research intervention (Idea Detectives [ID] group), whereas others provided the reading interventions typically offered in their schools (business-as-usual [BAU] group). Nearly 90% of BAU students received alternate evidence-based interventions. Results showed that student outcomes did not differ between the ID and BAU groups. Observational data indicated that revisions were needed to improve the intervention's feasibility, and qualitative teacher data identified barriers to consistent implementation, as well as strengths and shortcomings of the intervention. Teacher data suggested strong support for the inclusion of self-regulation instruction with reading intervention. This study illustrates the importance of teacher–researcher collaborations for the development of instructional interventions.

Keywords

reading, instructional strategies

Even when provided with quality early reading interventions, many students in Grades 2 to 4 have significant reading difficulties and disabilities (RDs). Students with significant RDs, including students with dyslexia, require intensive reading interventions (Vaughn et al., 2010; Vaughn & Wanzek, 2014). The intensity of an intervention can be increased by providing instruction in smaller groups, providing longer daily lessons, providing intervention for an extended period of time, and modifying characteristics of the intervention itself, such as increasing students' opportunities for engaged practice with feedback (Vaughn et al., 2010).

In addition to their reading difficulties, students with significant RDs tend to have impaired self-regulation (Cutting et al., 2009), which can be defined as the ability to modify cognition, emotions, and behaviors in pursuit of goals (Edossa et al., 2018). Reading proficiency has been related to the ability to regulate one's emotions (Daley et al., 2014) and thoughts (Cartwright et al., 2017). Thus, the effectiveness of intensive interventions for students with significant RDs might be increased by integrating instruction designed to support self-regulation. This article describes a feasibility study conducted to guide the development of an intensive

intervention called Idea Detectives (ID), designed to provide integrated instruction in reading and self-regulation for students in Grades 2 to 4 with significant RDs. The aim of this study was to collect preliminary data about the effects of the intervention on reading outcomes, as well as teacher input and feedback to guide further development activities.

Reading Interventions for Students With Significant RDs

There is converging evidence of the positive effects of supplemental intervention for struggling readers in the elementary grades (e.g., Benner et al., 2010; Wanzek et al., 2010, 2013, 2018). Wanzek et al. (2018) conducted a meta-analysis of intensive reading interventions for

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students with RDs in Grades 1 to 3. They concluded that providing standardized, explicit interventions in foundational reading skills has a positive effect for these students; however, they also noted a need for additional studies of intensive interventions for students in Grades 2 and 3. In addition to interventions in foundational reading skills, students with RDs benefit from instruction in reading comprehension (Gajria et al., 2007), including instruction targeting inference generation (Elleman, 2017).

Many students with significant RDs have word-reading difficulties (WRDs), including dyslexia. Dyslexia is characterized primarily by difficulties with reading and spelling words, particularly when presented out of context (i.e., in lists; Fletcher et al., 2019). Fletcher et al. (2019) reviewed research on interventions for students with WRDs, including dyslexia, concluding that effective interventions for these students include direct, explicit instruction in phonics, integrated with instruction in word recognition, spelling, reading fluency, and comprehension (Fletcher et al., 2019). Effective interventions for students with WRDs, including dyslexia, are systematic and structured, with easier skills taught before more complex skills (Spear-Swerling, 2019), and they use multiple response modalities to support learning and retention (Fletcher et al., 2019; Spear-Swerling, 2019). For example, word learning is supported when students with WRDs have the opportunity to “see the word, say the word, write the word, [and] use the word in text” (Fletcher et al., 2019, p. 190). In effective interventions, students have the opportunity to apply the reading skills and strategies they are learning while reading connected text with teacher feedback and support. In addition, effective teachers monitor students’ progress so that instructional adjustments can be made to address students’ needs (Fletcher et al., 2019).

Self-Regulation Interventions

Self-regulated learning requires students to actively manage their thoughts, emotions, and actions based on a desired outcome (Pintrich, 2000). Self-regulation training has been associated with improved use of self-regulation strategies as well as enhanced reading fluency and comprehension outcomes (Cirino et al., 2017; Miranda et al., 1997; Souvignier & Mokhsgerami, 2006).

Some types of self-regulation interventions that have been linked to enhanced literacy outcomes emphasized the following: (a) emotional self-awareness and rehearsal of positive self-statements, (b) beliefs about the malleability of intelligence, and (c) goal-setting and self-monitoring. When students become frustrated and lack the ability to self-regulate their thoughts or emotions, they can be susceptible to negative, self-defeating thoughts, leading to negative behaviors. Emotional knowledge and awareness can contribute to academic performance (Gumora & Arsenio,

2002; Trentacosta & Izard, 2007) and can be improved by intervention for elementary students (Kumschick et al., 2014). Learning to recognize negative thoughts and rehearse positive self-statements can benefit students emotionally and academically (Burnett, 1999; Kamann & Wong, 1993). The limited research on positive self-talk during literacy tasks in elementary students suggests the possibility of longer-lasting gains in reading than interventions without self-talk training (Berkeley et al., 2011). Students’ academic performance may also be linked to their beliefs about the nature of intelligence and academic potential. Students may believe that their intelligence and academic potential are fixed, commonly known as a fixed mind-set, or they may believe that those qualities are malleable and related to persistence and effort—a growth mind-set (Dweck et al., 1995; Yeager & Dweck, 2012). A growth mind-set is positively related to improved decoding and comprehension in fourth grade students (Petscher et al., 2017) and can be trained through explicit instruction (Blackwell et al., 2007) and purposeful feedback and praise that link effort and strategy use to outcomes (Mueller & Dweck, 1998). Growth mind-set has also been linked to self-regulatory processes, including goal-setting and self-monitoring (Burnette et al., 2013). Goal-setting interventions have led to improved reading comprehension in struggling fourth and fifth grade readers (Schunk & Rice, 1989, 1991). In addition, self-monitoring that requires students to track their own behavior, such as strategy use and progress toward goals, can improve the use of reading comprehension strategies and academic outcomes (Graves & Levin, 1989).

Interventions combining instruction in self-regulation and reading comprehension have been shown to enhance student reading outcomes (Antonioni & Souvignier, 2007; Berkeley & Larsen, 2018; Dignath et al., 2008; Jitendra et al., 2000). Combined interventions can be more powerful than either self-regulation or reading instructional components alone (Malone & Mastropieri, 1991; Reed & Lynn, 2016; Schünemann et al., 2013; Spörer & Schünemann, 2014). This growing body of research suggests the potential of self-regulation training for the enhancement, generalization, and maintenance of reading performance.

Purpose and Research Questions

In this project, the research team collaborated with a group of special education and reading intervention teachers, engaging in an iterative process over a 2-year period to develop the ID intervention. We received input from teachers and developed portions of the intervention, and teachers used the materials with their students. Based on their feedback and student data, we refined the intervention. This article describes a feasibility study conducted as part of this process. The study’s purpose was to obtain information about the feasibility of the intervention and its potential

effects on student reading outcomes to guide further revisions. This study was not designed to determine whether this intervention or similar interventions are effective. The research questions were as follows:

Research Question 1: Is the intervention associated with stronger effects on reading outcomes than the interventions currently provided to students with RDs in the participating schools?

Research Question 2: Can teachers implement the intervention as designed?

Research Question 3: What are the barriers to consistent implementation and to student progress in the intervention?

Research Question 4: What are teachers' perceptions of the self-regulation component of the intervention? and

Research Question 5: What parts of the intervention should be maintained as they are and how should the intervention be revised?

Method

Context

This study was conducted during the 2017-2018 academic year in eight schools located in two school districts in Texas. Both districts were historically rural but had characteristics of suburbs. According to the state education agency, on average, 31% of students who attended the participating schools were economically disadvantaged ($SD = 23\%$). All schools met minimum state academic standards in the 2016–2017 school year.

Participants and Design

The study had a quasi-experimental design. Special education teachers, dyslexia specialists, and reading interventionists, along with small groups of their students, were randomly assigned to teach the ID intervention (ID group) or to continue to deliver their typical school-provided reading interventions (business-as-usual [BAU] comparison group). However, randomization was compromised by changes in teachers and class configurations throughout the study, as described below.

Teachers. In total, 16 teachers were originally randomly assigned, blocked by schools, to the ID group ($N = 9$), or to the BAU group ($N = 7$); however, a total of 21 teachers participated in the study at some point of its implementation. Two of the nine teachers assigned to the ID group withdrew from the study (with their students) after randomization but before the onset of intervention because they were assigned to teach in a content mastery model in which their role was to support students with disabilities who

received their services in a general education setting. These teachers were replaced by one teacher from the same school (with a different group of students). Three more ID group teachers left the study over the course of the school year: two left their schools and one withdrew from the study. The school replaced one of these with an instructional aide, who provided the ID intervention to one group of study participants for the rest of the school year. To retain in the study the students of the other two ID teachers who left the study, ID was provided to these students by a certified teacher who was part of the research team. Thus, a total of 10 teachers provided intervention to students in the ID group at some point in the study, although only four of these were part of the originally randomized group. All seven teachers assigned to the BAU group participated throughout the study. In addition, four more teachers joined the study later in the school year when they began to teach BAU group students who were moved into their classrooms. This resulted in a total of 11 participating teachers who provided instruction to students in the BAU group at some point.

The 10 teachers in the ID group were 90% female; 70% were Caucasian, 20% Hispanic, and 10% African American; 60% were special education teachers, 30% were reading interventionists, and 10% were instructional aides. They had an average of 14 years of teaching experience ($SD = 8$ years). All ID teachers were certified teachers except for the one instructional aide who provided the ID intervention as a substitute for a teacher who left the school. Most were certified to teach special education (70%) or elementary education (90%). The 11 teachers in the BAU group were all female; 91% were Caucasian and 9% were African American; 27% were special education teachers, 55% were reading interventionists, and 18% were uncertified instructional aides. They had an average of 12 years of teaching experience ($SD = 8$ years). In the BAU group, 36% of teachers were certified in special education and 82% in elementary education.

Students. Based on teacher recommendation and a pre-screening word list, 89 students of the participating teachers were screened for eligibility using the Test of Word Reading Efficiency, Second Edition (TOWRE-2; Torgesen et al., 2012). Students were included if they scored below the 25th percentile on either TOWRE-2 subtest. English learners were included if they received reading instruction in English. Students with learning disabilities and other mild-to-moderate disabilities were included. Students were excluded if they had severe disabilities (e.g., severe intellectual disabilities or severe autism). In total, 48 students qualified for the study and had parent consent (26 ID, 22 BAU). Five left their schools during the study (3 ID, 2 BAU). One ID student was moved into a non-study class and received little ID intervention; this student was post-tested and retained in the analysis. Thus, the final analysis sample consisted of 43 students (23 ID, 20 BAU).

Table 1. Student Demographic and Clinical Characteristics (Percentages).

Characteristics	Idea Detectives <i>N</i> = 26	BAU comparison <i>N</i> = 22	Fisher Exact test <i>p</i> value
Male	61.54	54.55	0.77
Race/Ethnicity			
Caucasian	38.46	68.18	0.05
African American	23.08	4.55	0.11
Hispanic	23.08	18.18	0.74
Asian	3.85	0.00	1.00
Other	11.53	9.09	
Grade			
2	19.23	0.00	0.09
3	53.85	59.09	
4	26.92	40.91	
Identified with dyslexia	30.77	22.73	0.75
Limited English proficiency	11.54	0.00	0.24
Served by special education	65.38	72.73	0.76
Disabilities			
Learning disability	53.85	36.36	0.26
Speech/language impairment	23.08	40.91	0.22
Autism and related conditions	3.85	9.09	0.59
Intellectual disability	11.54	0.00	0.24
Other health impairment	15.38	13.64	1.00

Note. BAU = business-as-usual comparison group.

The average age of the students was 8.99 years in the ID group ($SD = 0.93$ years) and 9.15 years in the BAU group ($SD = 0.82$ years). Other demographic characteristics are found in Table 1. Although the groups did not differ significantly on any demographic variable, the ID group was generally more ethnically and racially diverse than the BAU group. In addition, the ID group included students in Grade 2, whereas the BAU group did not. The ID group also included a small proportion of students with limited English proficiency, whereas the BAU group did not. As for disabilities, the ID group tended to include more students with learning disabilities, whereas the BAU group tended to include more with speech and language impairments. The ID group included a small number of students with intellectual disabilities, whereas the BAU group did not.

Measures

Student measures. At pretest and posttest, word recognition, decoding, and reading comprehension were measured with the Woodcock-Johnson IV Tests of Achievement (WJIV; Schrank et al., 2014) Letter-Word Identification, Word Attack, and Passage Comprehension subtests. Letter-Word Identification assesses untimed word reading, whereas Word Attack examines the ability to read nonsense words as a measure of the student's ability to decode unfamiliar words. In Passage Comprehension the student reads a phrase, sentence, or short passage and fills in missing words. Reliability of these subtests ranges from .89 to .96 at

the age range of interest (McGrew et al., 2014). The TOWRE-2 Sight Word Efficiency (SWE) and Phonemic Decoding Efficiency (PDE) subtests were administered to measure word reading fluency and decoding fluency. The child is presented a list of increasingly challenging real words (SWE) or nonsense words (PDE); the number from each list read correctly within 45 s is recorded. Test-retest reliability ranges from .83 to .92 (Torgesen et al., 2012). Oral text reading fluency was measured with the Oral Reading Fluency (ORF) subtest of the Dynamic Indicators of Basic Early Literacy Skills Next (DIBELS; Good et al., 2013). The score is the number of correctly read words per minute. At pretest and posttest, all students in the study were tested using second grade DIBELS ORF passages so that the passages would be accessible to all students. Reliability for DIBELS ORF exceeds .80 (Goffreda & DiPerna, 2010).

Teacher measures. We collected an observational measure of fidelity and quality of implementation of the ID intervention. Lessons were video recorded and coded by two individuals after attaining inter-rater reliability exceeding 90% agreement. Each instructional activity was coded on a 3-point Likert-type scale for implementation as described in the teacher's manual, provision of appropriate scaffolding and feedback, and accuracy of the teacher's modeling and instruction. Quality ratings evaluated the teachers' pacing and use of instructional time, organization of lesson materials, and students' on-task behavior. For both fidelity and

Table 2. Idea Detectives Intervention Across Two Phases of Instruction.

Component	Phase 1	Phase 2
Word study	Phonemic awareness; basic letter-sound correspondences; decoding one- and two-syllable words; grapho-phonemic analysis; high-frequency word identification	More advanced sound-spelling patterns; reading and spelling more advanced words, including multisyllable words; fluent high-frequency word identification
Text reading	Reading decodable text with teacher feedback	More advanced decodable text; generalization to non-decodable text; oral reading fluency emphasis
Comprehension	Pre-reading focus on a guiding question for each student book with post-reading discussion	Structured comprehension strategy lessons; student practice through oral response to student text
Self-regulation	General focus on experiencing reading success through practice	Structured lessons addressing growth mind-set, emotional responses to reading, and self-regulated use of reading strategies

quality of implementation, a score was computed for each observation as a percentage of the highest possible rating for that lesson. We set *a priori* criteria for “adequate” fidelity for each teacher of a mean $\geq 80\%$ fidelity across all of that teacher’s observations. The ID teachers also participated in two focus groups to provide feedback about the feasibility and usability of the ID intervention.

Teachers in both the ID and BAU groups were observed to compare characteristics of the interventions received by students in the two groups, using the Non-Evaluative Snapshot of Literacy Instruction (NESLI), adapted from the Instructional Content Emphasis Instrument-Revised (Edmonds & Briggs, 2003). The NESLI provides a record of the proportions of time in a literacy class spent addressing various literacy domains, the extent of explicit teacher modeling or instruction and explicit student practice, time devoted to text reading, and the instructional materials used in a lesson.

Description of the Intervention

The ID intervention consisted of four components, addressing word study, text reading, reading comprehension, and self-regulation. Intervention was delivered across two phases. In Phase 1, the primary focus was on foundational reading skills, whereas Phase 2 addressed more advanced word study and added comprehension strategy instruction and self-regulation lessons. Table 2 illustrates the nature of instruction across the phases.

Word study. The word study component, implemented in both phases, provided structured, explicit instruction in phonemic awareness, phonemic decoding, word recognition, and spelling. Students learned letter sounds and sound-spelling patterns and how to blend sounds to read words (i.e., a synthetic phonics approach). Unlike some phonics programs that teach students a variety of phonics rules and have students code words using the rules, in the ID intervention, students learned only a few basic rules (e.g., silent

e rule) but practiced the recognition of phonemic and orthographic patterns in words. Spelling instruction emphasized mapping sounds to print using Elkonin (1973) sound boxes to isolate sounds and associate them with sound-spelling patterns. Students received direct instruction and modeling from teachers, and they practiced word reading and spelling skills in a variety of formats, including reading, writing, and the manipulation of magnetic letters and letter tiles.

The word study component was an extension of an intervention previously developed for use with first grade students at-risk for RDs (Solari et al., 2018). For the current study, we extended the first grade word study curriculum to address more advanced phonics skills, making it appropriate for students with RD in Grades 2 to 4. In this study, teachers had access to the full range of the word study program, including the first grade levels. Students were placed in the program based on a test of word-reading skills proximal to the curriculum. Teachers monitored student progress in the program using mastery tests, curriculum-embedded assessments of student proficiency in the instructed skills. Teachers were provided with guidelines for using the results of the mastery tests to guide the pacing of instruction, sometimes re-teaching lessons and sometimes skipping units if the mastery test data indicated that students had already mastered the skills taught in those units.

Text reading. In both Phases 1 and 2, students read attractive, motivating decodable text that followed the order of introduction of sound-spelling correspondences and high-frequency words. In Phase 2, to promote generalization, students also applied the reading skills and strategies they were learning in non-decodable text. Students learned one three-part strategy for reading unknown single-syllable words: (a) look for parts you know in the word (orthographic patterns, letter combinations), (b) sound it out smoothly (without breaking between the sounds), and (c) check it to be sure it makes sense in the sentence. The strategy was expanded for multisyllable words to include locating the vowels in the word as a way to identify pronounceable

word parts. During text reading, teachers provided prompting and feedback to support students' use of the reading strategies. Phase 1 text was primarily narrative, whereas Phase 2 included about an equal mixture of narrative and informational text.

Comprehension. Phase 1 did not include formal comprehension instruction, but before reading, students were given a guiding question to focus their reading. Questions were developed to support literal recall, activation of background knowledge, self-monitoring of meaning, question generation, retelling (in narratives), identifying main ideas, and making inferences. Students and teachers discussed the question after reading each book.

In Phase 2, students received structured lessons in the strategies of paraphrasing, identifying main ideas, visualizing, self-monitoring, linking and integrating ideas across a text, and generating inferences. Instruction consisted of a combination of teacher modeling and student practice through text-based think-alouds, adapted from Denton et al. (2017). Teachers modeled each comprehension strategy through structured text-based think-alouds. Next, students practiced "thinking aloud" as they read, stopping after reading sections of the text to apply the strategy and talk about their thoughts. For example, in the first unit on paraphrasing, students learned to read a section of text, close the book, and ask themselves, "What did I learn in this part?" and answer the question by telling what they learned in their own words (not verbatim from the text). Next, students learned to talk about the most important idea they learned in each section. In a unit on explanatory inference generation, students told why events happened in a narrative text or explained phenomena in informational texts (e.g., Why do groups of elephants travel from place to place?). Besides this text-embedded practice, students engaged in game-like practice activities. For example, to practice visualization, the teacher read a detailed description of an object (e.g., an empty can full of colorful wild flowers) while students listened and created mental images of the object; then, the teacher showed the students three pictures of similar objects, and the students selected the correct one based on their mental images.

Self-regulation. The ID self-regulation component consisted of instruction and activities designed to support a growth mind-set, emotional self-regulation, and self-regulated strategy use, and it included training in the use of positive self-talk, goal-setting, and self-monitoring. In initial lessons designed to support a growth mind-set, students learned about the brain and how it makes connections that can be strengthened through practice. They were taught that, although they might not be able to read proficiently *yet*, they could improve their reading through practice using the strategies they were learning. Because students with

significant RDs often experience failure associated with reading activities, the self-regulation component taught students to become aware of feelings of anxiety or frustration they might experience while reading. Students learned strategies to regulate these emotional states, including positive self-talk and a simple breathing technique. The use of positive self-talk was modeled by the teacher and supported by selected texts read aloud to the students, as well as pre- and post-reading activities. Finally, students learned to set goals related to the use of the strategies they were learning and to self-monitor their use of the strategies. Students completed a checklist during and after text reading in which they monitored their application of the strategies that had been taught in the intervention. For example, one checklist included the following items: (a) "Look for parts you know. Sound it out. Check it." (word-reading strategy), (b) "Say it in your own words." (paraphrasing strategy), (c) "Make a picture in your mind." (visualization strategy), (d) "Tell yourself good things." (positive self-talk), and (e) "Work hard! Grow your brain!" (growth mind-set).

Implementation. Intervention was provided in small groups of two to four students, primarily by teachers who were regular school district employees. ID teachers were asked to implement the program at least 4 days per week over 26 weeks. ID teachers received 5 days of professional development across the school year, and they received ongoing on-site coaching from experienced master teachers who were part of the research team. ID teachers were observed and rated for fidelity and quality of implementation of the word study and text reading components (Phases 1 and 2) from one to three times; they were observed during the Phase 2 self-regulation and comprehension components from zero to two times. Teachers who taught the program for only part of the study had fewer observations. Two teachers did not teach any Phase 2 lessons because they left the study prior to Phase 2.

BAU Interventions

Overall, 86% of the students in the BAU typical school instruction group received supplemental reading interventions outside their regular classrooms provided by reading interventionists, dyslexia specialists, special educators, or paraprofessionals. BAU students who received supplemental interventions received them on an average of 81 days ($SD = 37$ days), primarily in small groups, but sometimes individually. Ten of these students (53%), including the BAU students with dyslexia, received instruction using systematic, structured phonics programs. All of the BAU students with dyslexia received a structured dyslexia program based on a synthetic phonics approach. Six BAU students (32%) participated in an evidence-based, computerized intervention addressing word reading, fluency, and comprehension. Five BAU students (26%) received a

Table 3. Non-Evaluative Snapshot of Literacy Instruction (NESLI) Group Comparisons.

Component observed	Idea Detectives, <i>N</i> = 23 observations, <i>M</i> (<i>SD</i>) in %	BAU interventions, <i>N</i> = 27 observations, <i>M</i> (<i>SD</i>) in %
Instructional emphasis		
Word study	65 (23)	56 (36)
Comprehension	44 (24)	35 (33)
Vocabulary	20 (23)	28 (34)
Fluency	23 (16)	31 (29)
Oral language	12 (19)	4 (11)
Writing	0 (0)	9 (15)*
Teacher read-aloud	4 (12)	2 (6)
Student text reading	18 (13)	21 (24)
Explicit modeling and instruction	92 (6)**	70 (35)
Explicit practice	94 (6)*	78 (34)
Instructional materials		
Books	42 (19)**	21 (32)
Student writing materials	13 (14)	65 (32)**
Student manipulatives	13 (19)	22 (30)
Visual aids	57 (13)*	38 (36)

Note. Values are the proportions of lesson time that activities included each element. BAU = business-as-usual comparison group.

* $p < .05$. ** $p < .01$.

fluency program incorporating repeated reading of instructional-level text with feedback. Some BAU students received more than one of these interventions.

Characteristics of the ID Intervention and BAU Interventions

The results of the NESLI observations conducted in both the ID and BAU groups are found in Table 3. The groups did not differ significantly in the proportions of lesson time devoted to instruction in word study, comprehension, vocabulary, or fluency. Teachers in the BAU group provided writing instruction for a small portion of the observed lessons, whereas those in the ID group did not. The groups did not differ in the proportion of time devoted to text reading. Explicit instruction (i.e., modeling or clear explanation, practice with monitoring and feedback) was observed for a significantly greater proportion of time in the ID lessons than in the BAU instruction. As for instructional materials, teachers in the ID group used visual aids (e.g., posters, pictures, white boards) and books in their instruction significantly more than did BAU teachers, whereas students in the BAU group used student writing materials (e.g., paper, worksheets, journals) significantly more than those in the ID group.

Approach to Analysis

Quantitative analysis. To examine the promise of the intervention to support student outcomes (Research Question 1), we conducted analyses of covariance (ANCOVAs) with

posttest score as the dependent variable and pretest score as a covariate (and grade level when appropriate) to test whether the intervention was associated with greater effects on literacy outcomes than typical instruction. When possible, we used multilevel models with child nested within teacher. However, due to small sample sizes, this resulted in a non-positive definite *g*-matrix for the TOWRE-2 Composite Standard Score, WJIV Word Attack, and WJIV Passage Comprehension outcomes. The ICCs were small: 0.05 to 0.12 for TOWRE-2 and Word Attack. For Passage Comprehension, the classroom variability was moderate, 0.43, $p < .05$. When intervention was added as a predictor, the classroom variance was no longer significant, $p = .09$. Given that classroom variability was not significant, or dropped to nonsignificance when treatment was in the model, we moved to and report single-level model results for these outcomes. For WJIV Letter-Word Identification and DIBELS ORF, although teacher was included as a random effect, there were no significant differences among teachers ($ps > .05$). We calculated Cohen's *d* effect sizes based on the differences between posttest means adjusted for pretest, with negative values indicating differences favoring the comparison group.

Qualitative analysis. We conducted two focus groups with teachers in the ID group. Some teachers who could not attend were interviewed individually or provided a written response. Six teachers participated. Recordings of the focus groups and interviews were transcribed, and two researchers coded each transcript and written response using NVivo 12 Pro; all disagreements were discussed and coded by

Table 4. Descriptive Statistics, Group Comparisons, and Effect Sizes for the Full Sample.

Score Type	Pretest			Posttest			Effect size	
	Idea Detectives <i>N</i> = 26	Comparison <i>N</i> = 22	<i>t</i>	Idea Detectives <i>N</i> = 23	Comparison <i>N</i> = 20	<i>f</i>	<i>d</i>	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Woodcock-Johnson Tests of Achievement IV: Letter-Word Identification								
WS	445.88 (20.47)	462.77 (21.03)	2.81*	457.78 (22.97)	476.35 (21.16)	0.51	-0.22	
SS	78.04 (15.05)	85.82 (15.53)		79.65 (16.38)	88.40 (15.32)			
Woodcock-Johnson Tests of Achievement IV: Word Attack								
WS	466.88 (13.99)	472.91 (13.50)	1.51	477.30 (9.35)	481.80 (12.53)	0.03	-0.05	
SS	79.77 (15.45)	84.27 (12.92)		85.61 (10.64)	88.20 (13.02)			
Woodcock-Johnson Tests of Achievement IV: Passage Comprehension								
WS	458.00 (15.68)	470.32 (12.29)	2.99*	463.30 (12.09)	475.80 (13.26)	2.12	-0.46	
SS	77.72 (13.54)	83.55 (12.44)		76.09 (11.30)	84.63 (10.61)			
Test of Word Reading Efficiency-2: Composite								
SS	70.04 (11.21)	75.73 (9.77)	1.86	73.30 (12.07)	76.60 (9.76)	0.08	0.09	
Dynamic Indicators of Basic Early Literacy Skills—Next: Oral Reading Fluency								
RS	47.44 (27.09)	64.16 (25.08)	2.20*	63.11 (32.48)	82.08 (24.36)	3.35	-0.57	

Note. WS = *W* score; SS = standard score; RS = raw score (on Grade 2 text); *t* value = *t* tests to evaluate pretest differences; *f* value = ANCOVAs with pretest (and grade when appropriate) as covariates.

**p* < .05.

consensus. Data were analyzed thematically. Themes addressed barriers to implementation, needed improvements of the intervention, and strengths of the intervention, as well as perceptions of the self-regulation intervention component. Utterances that included specific references to teacher-administered student assessments were sub-coded as data-based responses.

Results

Research Question 1: Effects of the Intervention on Student Reading Outcomes

Preliminary data analysis and baseline equivalence. Descriptive statistics are presented in Table 4. For WJ IV subtests, *W* scores were used in the analyses; however, standard scores are also provided for ease of interpretability and comparison to other studies. As seen in Table 4, pretest scores on all variables were higher in the BAU comparison condition compared with the ID condition; these pretest differences were statistically significant for WJIV Letter-Word Identification, WJIV Passage Comprehension, and DIBELS ORF (*p* < .05). We also tested whether or not groups differed by observed background variables at pretest. Fishers' Exact test was used for binary and categorical variables as it works well with small sample sizes. *t* tests were used with continuous variables. There were no significant group differences on the child background variables of age, race, ethnicity, gender, EL status, or disability status.

Group differences at posttest. Final model results and effect sizes are in Table 4. There were no significant group differences for any measures at posttest. Effect sizes were negligible for WJIV Word Attack and TOWRE-2. Moderate effects favored the BAU comparison group for WJIV Passage Comprehension (-0.46) and DIBELS ORF (-0.57).

To further explore the promise of the ID intervention for students with dyslexia, we calculated descriptive statistics and effect sizes for the subgroups of students with dyslexia in the ID and BAU groups on four variables especially pertinent to dyslexia: WJIV Letter-Word Identification and Word Attack, and TOWRE-2 PDE and SWE (Table 5). Results for students with dyslexia largely paralleled those for the full sample, except that, for TOWRE-2 SWE a moderate effect size (0.60) favored the ID group over the BAU group.

Research Question 2: Fidelity and Quality of Implementation

ID group teachers were observed to document fidelity and quality of implementation. Ratings are a percentage of a possible perfect score. The mean word study and text reading fidelity rating (across teachers and observations) was 88% (*SD* = 10%), and the mean quality rating for those components was 92% (*SD* = 9%). Eight of the nine teachers who provided the word study and text reading components had mean fidelity ratings greater than 80% (i.e., the pre-established benchmark for acceptable fidelity). The mean comprehension and self-regulation fidelity rating was

Table 5. Descriptive Statistics and Effect Sizes for Students with Dyslexia.

Score Type	Pretest		Posttest		Effect size <i>d</i>
	Idea Detectives <i>N</i> = 8	Comparison <i>N</i> = 5	Idea Detectives <i>N</i> = 8	Comparison <i>N</i> = 5	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Woodcock-Johnson Tests of Achievement IV: Letter-Word Identification					
WS	438.50 (19.40)	457.40 (17.34)	452.80 (19.75)	472.40 (20.34)	-0.18
SS	72.38 (15.68)	80.00 (12.88)	75.13 (15.07)	84.60 (14.17)	
Woodcock-Johnson Tests of Achievement IV: Word Attack					
WS	467.40 (10.93)	472.80 (14.38)	475.60 (8.09)	481.40 (10.04)	-0.38
SS	79.38 (15.39)	82.00 (14.37)	83.38 (10.03)	86.40 (10.64)	
Test of Word Reading Efficiency-2					
SWE SS	69.13 (12.11)	68.80 (7.16)	72.38 (11.70)	70.60 (9.66)	0.60
PDE SS	68.25 (7.29)	72.20 (11.90)	74.13 (11.89)	78.00 (11.90)	-0.06

Note. Effect sizes were calculated with covariate-adjusted scores. WS = W score; SS = standard score; SWE = Sight Word Efficiency; PDE = Phonemic Decoding Efficiency.

81% ($SD = 11\%$), and the mean quality rating for that component was 94% ($SD = 6\%$). Four of the seven teachers who provided the comprehension and self-regulation component had mean fidelity ratings above 80%.

Research Question 3: Barriers to Implementation and Student Progress

In focus groups and interviews, teachers identified barriers to implementation of the ID intervention stemming from school contexts (26 references). These were primarily related to scheduling, limited school resources, limited instructional and planning time, and logistics related to providing the intervention at two different schools in the same day. Teachers also identified barriers to implementation and student progress related to student characteristics (30 references). These included students' frequent frustration with literacy tasks, lack of confidence and inconsistent focus, as well as students' serious reading impairments. Several teachers also cited concerns about behavior management.

Research Question 4: Perceptions of the Self-Regulation Component

Teachers were highly supportive of the self-regulation component of the intervention and considered it important. Several described their students' need for this kind of intervention; in particular, teachers described in detail how their students' negative self-concepts as readers had interfered with students' reading progress. Teachers cited the positive effects of the emphasis on growth mind-set on students' confidence and self-esteem. Similarly, teachers noted benefits of teaching students to recognize their negative self-statements and substitute positive self-statements. One teacher recounted students' reactions when they were asked to look at a picture

of a boy who was clearly frustrated while trying to do his schoolwork and talk about what the boy in the picture was feeling and what messages he was probably giving himself. The teacher recalled that it was easy for her students to provide negative self-statements associated with this picture, observing, "They've been there!" The teacher then recounted feeling tearful when the students generated positive self-statements they could use in place of these negative statements. Two teachers noted that students "would always chime in with positive messages" during the lessons. Most teachers also had positive feedback about the self-monitoring activities, although some admitted they often forgot to complete the self-monitoring checklist after reading. Most teachers felt that their students were able to honestly self-monitor their use of reading strategies. One teacher recalled, "They . . . remembered the parts of the lesson . . . where we did each of those strategies, and they were honest about what they did, so I do think it's a really valuable piece . . . They're evaluating themselves."

Research Question 5: Guidance for Revision of the Intervention

Teachers provided valuable feedback for further intervention development, describing issues with the intervention (53 references) and providing suggestions for improvement (68 references). The most prominent themes were (a) challenges related to organizing and managing the manipulatives and other materials, (b) parts of the program that had too much time devoted to teacher talk when students were expected to sit and listen, (c) difficulty coordinating lesson pacing between the word study/text reading components and the comprehension/self-regulation components in Phase 2, (d) the need for a stronger fluency component, and (e) the potential of incorporating technology into the intervention.

Some teachers also described how they had modified the program or its implementation to make it more feasible to implement and more appropriate for their students (76 references). Some shared approaches for organizing lesson materials. Others stressed the importance of daily lesson preparation. Some teachers described how they supported student engagement through actions such as using student-generated words in activities and having students sign a commitment to use positive self-talk when that self-regulation strategy was taught. Several incorporated additional time for student text reading and fluency instruction. Other teachers adapted word study practice activities using technology applications available in their schools.

In addition to their suggestions for improvement of ID, teachers noted many strengths of the intervention (117 references). Teachers' responses reflected three main themes: curriculum design and content, material resources, and student engagement. Teachers particularly praised the variety of word study activities, the incorporation of non-decodable text in addition to decodable text in Phase 2, and the use of mastery tests to monitor progress in word study skills. Teachers were positive about the quality of the materials, and several described the usefulness of the teacher's manuals' scripting and scaffolding aids, especially for new reading teachers. Teachers noted generally high student engagement during ID lessons, mentioning that their students liked the fast-paced word study activities that often included manipulatives. Teachers said their students also had generally positive responses to the comprehension activities. Finally, teachers noted that their students liked the decodable texts and that students were motivated by the opportunities to read challenging and interesting non-decodable texts with teacher support provided when needed.

Teachers noted several intervention benefits for their students (44 references), particularly in word study skills and strategies for decoding and spelling. Several teachers referred to data from the ID intervention's mastery tests and additional teacher-administered tests to support their observations of student gains. Some teachers reported that students were successful at generalizing strategies taught in the comprehension component, especially strategies for monitoring meaning and visualization. Regarding the self-regulation activities, some noted students' ability to use positive self-talk and to self-monitor their use of strategies during reading. Several teachers also noted student gains in personal confidence for reading.

Discussion

The purpose of this feasibility study was to obtain formative data to inform the development of an intervention to support reading and self-regulation for students in Grades 2 to 4 with significant RDs, including dyslexia. Results

indicated that the word study and text reading components of the intervention could be implemented feasibly by teachers in typical school settings; however, the comprehension and self-regulation components were more challenging to implement with fidelity. The intervention was not associated with significantly better reading outcomes than other interventions provided to students with significant RDs in the participating schools. Teachers were positive about the intervention and cited several benefits for their students, and they provided valuable feedback to inform its next iteration.

Student Reading Outcomes

There were no significant differences between gains made by students who received the ID intervention and students in the BAU group, most of whom received other evidence-based reading interventions provided in the schools. After accounting for pretest and for grade level where appropriate, small to moderate effect sizes favored the BAU comparison group in word reading, comprehension, and fluency. Thus, we do not have evidence from this study that, in its current iteration, the ID intervention holds promise for being more effective than other evidence-based interventions for supporting the reading growth of students with significant RDs. These results were likely related to three factors. First, changes are needed in the ID intervention to increase its feasibility and effectiveness. The qualitative data collected in this study will guide the revisions of the intervention. Second, the lack of group differences may have been related to the study's small sample size and the fact that the BAU group had significantly higher pretest scores in word reading, comprehension, and fluency than the ID group (the same three outcomes on which effect sizes favored the BAU group at posttest). Although the statistical analyses accounted for pretest differences, the ID group may have included students whose severe reading difficulties were more resistant to remediation. Finally, almost 90% of the students in the BAU group received evidence-based interventions provided in small groups or individually: several received structured, explicit phonics programs. Thus, the comparison was to alternate interventions rather than to a "no-treatment" control group.

When we examined the data separately for students with dyslexia, we found that the results largely paralleled those for the sample as a whole, with one difference. Although not statistically significant, students with dyslexia tended to make greater gains in word reading fluency in the ID group than in the BAU group. All students with dyslexia in the BAU group received a structured dyslexia program from trained dyslexia specialists. That program emphasized the application of phonics rules to decode unknown words, whereas the word study component of ID emphasized the recognition of phonetic and orthographic patterns in words

and the application of word recognition skills and strategies in connected text. Word reading fluency may have been better supported with this approach. However, the subsample of students with dyslexia in this study was quite small, so any conclusions would be premature.

Although, on average, the ID intervention was not more effective than other interventions provided in the schools, ID teachers noted that many individual students demonstrated noticeable reading improvement in ID. Some ID teachers described specific ways their students had generalized the word study, comprehension, and self-regulation skills and strategies they had learned. Teachers frequently cited data from ID word study mastery tests or other teacher-administered assessments to support these observations. Previous studies of Tier 3 reading interventions have found that gains made by individual students varied widely, with some making large reading gains and others actually declining over time, even when provided with highly intensive interventions (Fletcher et al., 2019, p. 98). Teachers of students with significant RDs, including students with dyslexia, likely need access to more than one evidence-based reading program to meet the needs of all their students, who have varied patterns of strengths and needs and may respond differently to different approaches. For example, some students with dyslexia benefit from a rule-based approach to phonics instruction typical of many published dyslexia programs, whereas others may benefit from an approach that emphasizes the recognition of sound-spelling patterns and larger orthographic patterns, characteristic of the ID intervention. Similarly, some students with dyslexia and other significant RDs likely benefit from comprehension and self-regulation instruction, whereas others may need a more exclusive focus on decoding, word recognition, and fluency. Future research should address approaches to dyslexia intervention that are effective for students with different characteristics.

Teacher Perceptions, Feasibility, and Needed Revisions

Teacher focus group and interview data indicated that they believed the intervention was feasible to implement and beneficial for their students, but that it could be improved. They considered all components of the intervention valuable, particularly citing the fast-paced, hands-on word study activities, which kept their students actively involved, and the inclusion of both decodable and non-decodable text. Teachers also considered the self-regulation component helpful and important for their students. As for needed revisions, teachers stressed the need for better organizational strategies for the intervention materials, more active student involvement during comprehension instruction, and greater emphasis on fluency instruction.

The fidelity of implementation data indicated that the word study and text reading components of ID were feasible

for teachers to implement in authentic school settings; however, the comprehension and self-regulation components proved more challenging. This signals a need to revise these components. In addition, the NESLI observation comparison of the ID and BAU interventions revealed that students in the BAU interventions made greater use of writing materials than did the ID students. Although the comprehension component of ID emphasized oral response to text, it did not include written response to text. An increased incorporation of student written products may improve outcomes.

Limitations

Caution should be used in generalizing the findings of this study because it was not designed to evaluate the efficacy of the intervention. The study was limited by its small sample size and by the fact that randomization to treatment was compromised. Finally, the results of this study should be interpreted in light of the fact that most BAU students received evidence-based interventions provided by their schools, often with high intensity.

Implications for Practice

Teachers' insights indicated that there is a need for an intervention like ID for students with significant RDs and that there is value in the incorporation of self-regulation instruction into reading interventions for these students. However, this study illustrated that the development of effective and practical interventions for students with significant RDs is challenging. Too often, teachers are asked to invent intervention program themselves, utilizing a variety of materials. This approach likely does a disservice to both teachers and students. If we are to meet the goal of teaching all students to read adequately, the hard work of developing teacher-friendly, intensive literacy interventions must be prioritized. Finally, this study confirmed the critical importance of teacher-researcher collaborations in the development of educational interventions. Even when interventions have sound theoretical and empirical bases, they will fail to support student outcomes if they are not feasible for teachers to implement. Engaging in an iterative development process in which teacher and student data inform each step of development is the only strategy that is likely to result in interventions that are effective for students with dyslexia and other significant RDs.

Authors' Note

Carolyn A. Denton is now at Oregon Research Institute.

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