Writing Informational Text using Provided Information and Text Structures: An Intervention for Upper Elementary Struggling Writers

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Abstract

Informational text writing is a complex task requiring multiple literacy skills, such as reading and comprehending source material, identifying important information, and transforming ideas to meet the goals for the new writing task. The *Structures Writing* intervention was developed to improve the informational text writing skills of 4th and 5th grade struggling writers by reducing the cognitive load associated with reading source text and teaching students to organize information using text structures. In the current study, sixty-one 4th and 5th grade struggling writers were randomly assigned to receive the *Structures Writing* intervention. Students in the *Structures Writing* intervention were provided with information in "frames" and taught to write informational passages using three text structures (i.e., simple description, compare/contrast, sequence). To do so, the students were taught a strategy for picking the topic and structure of their writing, organizing facts for the text structure, and writing the facts in paragraph form. They were also taught to include text structure features, including signal words, transition words, grouping similarities and differences, etc. At post-test, students who received the *Structures Writing* intervention statistically significantly outperformed the control group on researcher-created measures of simple description writing (d = 0.66), compare/contrast writing (d = 0.61), and sequence writing (d = 0.94). Results also indicate students in *Structures Writing* intervention condition statistically significantly outperformed the math-writing group on a measure of identifying text structures in reading passages (d = 0.94). No other statistically significant differences were found between the groups. The implications and future directions for the development of the *Structures Writing* intervention are discussed.

Informational text writing is a complex cognitive task, requiring the use of multiple literacy skills. It is unlikely that struggling writers have the requisite skills to write informational text effectively. In the most recent writing results for 4th grade on the National Assessment of Educational Progress (NAEP) in 2002, 72 percent of 4th grade students scored below the proficient level (Persky, Daane, & Jin, 2003). The percentages of student scoring below proficient levels in 8th and 12th grades were 69 percent and 76 percent, respectively. Although more recent NAEP data is not available for 4th grade, 73 percent of both 8th grade and 12th grade students were below the proficient level on the 2011 NAEP writing assessment (National Center for Education Statistics, 2012), suggesting little improvement across the grade levels.

Students are likely to be even less proficient at writing informational text, which is not a genre tested on the NAEP. Eighty-three percent of 3rd and 4th grade teachers report being minimally prepared or unprepared to teach informational text writing (Brindle, Graham, Harris, & Hebert, 2015), and teachers in two different national surveys of upper elementary school teachers report teaching students how to write to inform infrequently (Brindle et al. 2015; Gilbert & Graham, 2010). However, we know that informational text writing skills are not likely to be learned without instruction specific to this genre, as students' informational text writing scores have only small to moderate correlations (.30 to .58) with writing in other genres (Graham, Hebert, Sandbank, & Harris, 2016). Moreover, informational text writing may also be more complex than other types of writing due to additional constraints on cognitive resources.

Informational Text Writing is a Complex Task

Writing is a complex skill in general. Flower and Hayes (1981) described a cognitive model of writing involving the interaction between task environment (the rhetorical problem, topic, audience, and text produced so far), writing processes (i.e., planning, generating ideas, organizing, goal setting, translating, reviewing, and monitoring), and the writer's long-term memory (knowledge of the topic, audience, and writing plans). While already complex, Hayes (1996) updated the model to include working memory, and he introduced the concept of "reading as a central process in writing" (pp. 18). This included reading and incorporating information from source texts, often a critical component of writing informational text. To do this, writers need to decode the text, comprehend new concepts and vocabulary, critically analyze it to understand how it is organized, identify important information for the current writing task, and connect the ideas with what they already know (Graham, in press; Hayes, 1996). In many cases, this also involves taking notes, paraphrasing information from the source text, and assimilating and transforming the ideas to meet the writer's goals for the task. In other words, informational text writing may be difficult because it requires writing from source material, which, in turn, requires a greater reliance on reading skills and working memory.

These tasks may be especially difficult for struggling writers, many of whom are also struggling readers (Costa, Edwards, & Hooper, 2016). The students may have difficulty decoding text, identifying critical information, taking notes, and writing information in their own words (Trabasso, T., & Bouchard, 2002). As students read text containing unfamiliar content and vocabulary, it may also be difficult for them to think about different ways of writing the information, how to connect it with what they already know, or how to organize it to meet their own writing goals.

Organizing content is especially difficult in informational text, as authors are likely to use multiple text structures depending on their intent (Duke & Pearson, 2002; Gersten, Fuchs, Williams, & Baker, 2001; Author, 2016; Meyer, 1975, 1985; Williams, 2005; Williams & Pao, 2011). While stories predictably have features such as characters, settings, problems, and solutions, informational text is often organized using one of five text structures identified by Meyer (1975, 1985). These include *description*, *compare/contrast*, *sequence*, *cause/effect*, and *problem solution*. This is likely to be a complicating factor for students in both the reading and writing components of using source material to write informational text.

Despite these challenges, it seems to be common practice for teachers and researchers to teach informational text writing skills by teaching students to read to gather facts and information prior to writing (e.g., Kim et al., 2011; Klein & Kirkpatrick, 2010; Reynolds & Perrin, 2009). For example, Reynolds & Perin (2009) taught students to read text, identify main ideas and details, take notes, organize notes, and then write summaries. Such approaches recognize students' need for having accurate information to write about, but also require multiple steps before writing can occur. This can be arduous and time consuming, and may not provide novice or struggling writers with enough writing practice. In essence, it requires students to learn a complex skill all at once, before becoming proficient in less complex skills. This conflicts with principles of explicit instruction, which suggest breaking down complex skills into smaller skills (Archer & Hughes, 2011).

Approaching Informational Text from a Simpler Perspective

The simple view of writing model indicates the production of text (e.g., words, sentences) is dependent on mechanics (e.g., handwriting, spelling) and executive functions (conscious attention, planning, reviewing, self-regulation strategies), with the entire process constrained by working memory (Berninger et al., 2002). That is, mechanics and executive functions act as the bottom vertices of a triangle, providing a foundation for the production of text at the top of the triangle (see Berninger & Amtmann, 2003). Berninger and Amtmann (2003) further postulate that executive functions are scaffolded for younger students by teachers and adults until the students develop the skills.

It stands to reason, then, that students' writing skills could potentially improve faster with instruction in those executive functions for writing. Indeed, one of the most effective writing interventions for struggling writers, Self-Regulated Strategy Development (SRSD; Graham & Harris, 2003), places a strong emphasis on the development of executive functions (e.g., planning, organizing, self-regulation). In doing so, SRSD increases these executive functions, leading to gains in text production and writing quality.

However, reading and integrating source texts, which are necessary components of informational text writing, is complex even when using SRSD. For example, an informational text writing strategy, TWA + PLANS, requires students to:

- **T**hink before they read,
- think **W**hile they Read, and
- think **A**fter they read (which includes note-taking)

and then:

- **P**ick goals,
- **L**ist ways to meet goals,
- **A**nd
- make **N**otes,
- and **S**equence notes

and then, finally, writing more and testing their goals (e.g., Mason, Snyder, Sukhram, & Kedem, 2006). Although this strategy was found to be effective (Mason et al, 2006), the task is quite complex, and requires multiple literacy skills. Thus, a less complex approach to teaching informational text writing may be useful. Based on the successes of SRSD, an effective informational text writing intervention is likely to be aimed at improving executive function skills. However, such an intervention would also need to further reduce the instructional complexities of writing from source text.

Further Simplifying Informational Writing (The Structures Writing Intervention)

The first three authors developed the *Structures Writing* intervention to provide struggling writers with instructional supports aimed at improving executive function skills for writing informational text. The intervention was designed to reduce the complexities of informational text writing instruction in two ways: 1) temporarily bypassing the use of source text (in order to reduce cognitive load and increase writing opportunities), and 2) teaching students how to use informational text structures to organize their text.

By-passing source text by providing information. One potential way to break down the complex task of informational text writing is to reduce reading demands until students can become proficient at planning, organizing, and writing informational passages. Then, the students can be taught to combine this skill with reading and writing from sources in a more sophisticated application of their skills. The *Structures Writing* intervention was developed to offer this partial bypass of reading by providing information for students to write about. The information is provided in note-form in "information frames" (see Figure 1). Although students must read the provided notes, the demands placed on reading skills are significantly reduced. Students do not have to read or understand extraneous text, make decisions about which information to include in their writing, or take their own notes. By providing students with information, the program reduces the cognitive load for text production (by providing content words and phrases) and transcription skills (by providing spelling of difficult vocabulary), thereby reducing the demands on working memory. Essentially, the intervention scaffolds text production and transcription skills to provide a base for training executive functions specific to informational text writing, while also ensuring the information the students use in their writing will be factual and accurate.

Organizing information using text structures. As previously noted, informational text is often organized by one of five text structures (i.e., description, compare/contrast, sequence, problem/solution, cause/effect). Thus, the *Structures Writing* intervention specifically focusses on the executive functions for planning and organizing text around these structures. Students are taught to write informational text using text structures (introduced one at a time). They read notes with ideas related to the text structures. Then, they choose an order for the ideas that makes sense for the text structure. At the same time, they think about how to relate ideas to one another within paragraphs, which often requires using transition words and signal words for the text structure they are using.

Teaching students to write informational text using text structures has been previously shown to be effective for improving writing quality outcomes (e.g., Reynolds & Perin, 2009), although only one text structure (sequence of events) was taught and information was not provided to students in the manner developed in the *Structures Writing* intervention. Much of the other work involving text structures and writing have examined reading comprehension outcomes (see Author, 2016). Therefore, there is only minimal prior research to build from. However, the current approach should be effective for reasons similar to those posed by Saddler and Preschern (2007) for sentence combining. First, the instruction and practice will give students numerous experiences with syntactic and organizational choices available to them when writing informational text. Second, the intervention is designed to free up cognitive resources to attend to improving planning and organizational skills, and to provide students more writing experiences while promoting higher level thinking and understanding.

Purpose of the Current Study

The purposes of the current study were to a) test the promise of an informational text writing intervention (*Structures Writing*) for improving the informational text writing skills of students at-risk for reading and writing disabilities in an underpowered study, and b) test the potential impacts of the intervention on reading comprehension outcomes. As a test of the usability of the intervention, we also examined whether pre-service teachers could implement the intervention with fidelity.

Students learned to write informational text using three expository text structures (i.e., simple description, compare/contrast, and sequence). Only three of the five text structures were examined in this intervention, as the focus was on the promise for effectiveness and time was limited by the study context. A standard-protocol format was used to implement the intervention, with semi-scripted lessons which included interactive Power Point presentations, a program manual, and student workbooks for writing. Preservice teachers were provided with training in the use of intervention material prior to the start of the study.

To control for writing time and ensure a writing comparison, *Structures Writing* was compared to a mathematics-writing control group. An alternative treatment was needed for recruitment purposes, as parents were unlikely to include their children in the study if they did not receive some type of instruction. Mathematics-writing was chosen because the content is non-fiction, similar to the treatment. It is also not a type of writing students are likely to receive extensive instruction for in schools, despite being measured often (Powell, Hebert, Cohen, Casa, & Firmender, 2017), and therefore provided an educationally relevant alternative to treatment.

Thus, a norm-referenced measure of general writing ability was also included as a distal measure. Because writing instruction has previously been shown to improve reading outcomes (Graham & Hebert, 2010, 2011), intervention impacts on reading outcomes were possible. Therefore, reading outcomes were also included as distal measures in the study.

The two research questions were:

1. What are the effects of the *Structures Writing* instruction on proximal measures of text structure writing (i.e., simple description, compare/contrast, and sequence passages) compared to an alternative writing condition (e.g., mathematics writing)?
2. What are the effects of text structure identification and discrimination on distal measures?
   a. What are the effects on a norm-referenced measure of writing ability?
   b. What are the effects on informational text reading outcomes (i.e., identification of text structures, oral retell, and multiple-choice questions)?

Method

A randomized-control trial was used to examine the effectiveness of the *Structures Writing* intervention, which was compared to a *Mathematics Writing* control condition. Both treatment conditions are described later in the method section. The study was conducted at a university reading center using two cohorts. The first cohort of students completed the study during the summer, while school was not in session, and the second cohort of students completed the study after school in the fall. Study procedures and instruction were otherwise the same for both cohorts.

Participants

Participants were 4th and 5th grade struggling readers recruited from students who attended the reading center. There were two inclusion criteria:

a. Students had to be eligible for instruction at the reading center. The reading center screens potential candidates, working with students who are at-least one grade-level behind their peers in one or more of the following literacy skills: phonological awareness, word identification, word attack, passage comprehension, or reading efficiency.
b. Students had to be able to attend the reading center during the summer or fall sessions.

The screening measures included subtests of the Woodcock Reading Mastery Test, third edition (WRMT-III) and the Test of Silent Reading Efficiency and Comprehension (TOSREC). Reading Center personnel screened potential participants and informed them of informational meetings for the study. At the meetings, the first and second author provided parents with information about the length of the study, purposes of the research, the two instructional conditions, and random assignment procedures.

Sixty-six students were eligible for participation in the study. The first and second author randomly assigned participants to one of two conditions: 1) *Structures Writing* (treatment), or 2) *Mathematics Writing* (control). Following random assignment and scheduling, but prior to the intervention, families of five students (7.5%) pulled their children out of the study citing scheduling conflicts with summer vacations. All five students were in the control condition. Because tutors and students were already assigned to condition and the schedule was in place, it was not feasible to re-conduct the randomization procedures.

Sixty-one 4th and 5th grade students participated in this study (38 fourth- and 23 fifth-grade students). Student demographics are listed in Table 1. Following attrition, the first author compared the treatment and control groups on several variables. There was a significant difference between the treatment and control groups on the TOSREC standard score ($t = 2.61$, $p = .01$), but no statistically significant differences on the WRMT-III Basic Skills ($t = 1.64$, $p =$

.11) or WRMT-III Passage Comprehension (t = 1.05, p = .30). A chi-square test revealed males and females were not distributed proportionally among the treatment and control groups ($\chi^2_{(1)}$ = 5.11, p = .02). However, no statistically significant differences were found between the treatment and control groups across free/reduced lunch status ($\chi^2_{(1)}$ = 0.04, p = .85), IEP status ($\chi^2_{(1)}$ = 2.59, p = .11), or ethnicity ($\chi^2_{(4)}$ = 3.02, p = .55). Based on the differences found between treatment and control groups on gender and the TOSREC, we controlled for those variables in the statistical analyses of the results.

Materials

Due to the nature of the experiment comparing two interventions outside of a school setting, the study included materials and instruction for both the treatment and control groups.

Structures Writing materials. Intervention teachers used interactive PowerPoint lessons, a Program Manual, and a Student Response Book to provide instruction. The authors developed the materials using an explicit instruction framework and specifically linked the materials to provide instructors self-contained content and support. Excerpts from the PowerPoint lessons, Program Manual, and Student workbook for lesson 2 are provided in Appendix A.

The PowerPoint lessons included a step-by-step framework for modeling the writing procedures. The steps of the writing procedure occurred in a clickable format, allowing teachers to adjust the pace of instruction according to students' needs. The Program Manual was designed with text boxes corresponding to each slide (or click) to provide the instructors with a "soft script" and tips for instruction. As teachers clicked through the slides during the modeling and practice portions of the lessons, the steps of the writing strategy were checked off, and writing that appeared to be written on paper was shown on the screen. Having the writing mimicked on the screen allowed teachers to spend more time providing think-alouds and engaging students in the modeling and guided practice exercises, rather than having their attention divided by producing the written text during modeling.

The Student Response Book was similarly linked with the PowerPoint lessons and Program Manual. The Student Workbook included pages with definitions and examples of each text structure, cloze exercises to be used during modeling, and guided and independent writing exercises to be used flexibly by the teachers.

The lessons included science and social studies passages across a variety of topics. The lessons were specifically designed with this variety to emphasize that informational text structures and strategies are content free. Content was provided in "information frames," which provided information on the topic, text structure, and information related to the features of the text structure. By providing content for the writing passages, the program allowed teachers and students to focus on the organization, structure, and features of informational text writing, rather than on idea generation.

Mathematics-writing materials. To control for time and intensity in writing, the control group wrote about mathematics. Materials included mathematics exercises for the students to write about each day. The students completed two writing exercises per day, for a total of 24 writing exercises.

Procedures

Following the pretest assessments, participants were randomly assigned to conditions. In both conditions, students were taught one-on-one or in small groups of two, based primarily on scheduling. Students in both conditions received instruction in twelve, 30-minute lessons, controlling for instructional time across groups.

Structures Writing treatment. Students assigned to the *Structures Writing* condition were taught to write informational text using three text structures: 1) Simple description, 2) Compare/Contrast, and 3) Sequence of events. Table 2 shows the lesson sequence.

In lesson 1, instructors provided an overview of the three text structures, including a definition for each structure and example passages. In lesson 2, students were taught a variation of the POW writing strategy (e.g., Harris, Graham, & Mason, 2006) designed specifically for this intervention. Each letter of the mnemonic POW represented a step in the writing procedure:

P – Pick your idea (Pick the topic, Pick the Structure)

O – Organize your notes (Put the information in an order that makes sense)

W – Write (Write the topic sentence, Write the information in the order you chose, and Review to make sure the passages includes all of the information and makes sense)

The instructor modeled how to write a Simple Description passage (i.e., Pill Bugs) using the POW strategy. During modeling, the instructors provided a think-aloud to show students how to introduce the topic by combining the topic with an important fact, using transition words to introduce new facts, combining related facts into a single sentence, and crossing off information as it was used. To maintain student engagement, the teachers coached the students to (a) follow along by checking off parts of the strategy checklist in their workbook when the teacher did, (b) fill in a cloze passage as the teacher showed how to write the sentences, (c) cross off information in their own checklist as it was crossed off on the PowerPoint presentation, and (d) read the completed passage with the teacher. In lessons 2 – 5, the instructors transitioned from modeling to guided practices, gradually fading support to move students toward independent performance.

Similar instructional sequences were used to teach students to write C/C and SQ passages in lessons 6-8 and 9-11, respectively. The students always completed the steps with the teacher during modeling, filling in cloze passages when writing was shown on the screen. During guided and independent practice exercises, the students completed all steps, including writing full passages (with appropriate support when necessary). The program included a total of 23 passage writing exercises.

Mathematics writing control group. Because this was an after-school study, there was no business-as-usual condition to use as a comparison. However, we felt it was important to provide some type of instruction to (a) ensure that the time invested by parents and students in the control group had an important instructional purpose, and (b) provide a meaningful counterfactual for the writing treatment. To this end, students assigned to the *Structures Writing* condition were asked to write explanations of mathematics problem-solving procedures. This comparison was important to control for writing time, but with sufficiently different content and purpose than the *Structures Writing* treatment condition. The participants wrote explanations for how to help pseudo students who made mistakes in their mathematics, and then solved their own mathematics problems and wrote explanations for how they solved them. Research assistants provided support for the students in both mathematics and writing. The control group received a similar number of writing exercises as the treatment condition, with a similar level of teacher support and for a similar amount of time.

Teacher training. Six preservice teachers provided instruction, and one retired teacher substituted when necessary and assisted in collecting fidelity data when not instructing. The first and second author trained the RAs to teach both treatments during a two-hour training session prior to the study, with a one-hour booster session just before instruction began. The RAs were also paid to review the lesson materials for specific lessons prior to teaching each day. The first and second author then randomly assigned RAs to teach students in both the treatment and control group. The authors informed the research assistants that both writing treatment conditions were expected to improve student writing. The RAs were blind to the specific research questions. Due to distinct differences in the writing of treatment and control students, systematic instructional procedures, treatment diffusion was unlikely.

Measures

The study included three categories of measures: 1) Screeners, 2) Proximal Measures of Writing, and 3) Distal measures of writing and reading performance. Research assistants administered the measures to students in both conditions, in many cases blind to which study treatment the students received, although this was not specifically controlled. The first and second author trained the RAs to administer all measures. Because several of the measures were created by the researchers, we correlated the measures with standardized measures included in the study for validity purposes (see Results). However, this should be treated with caution, as the population used for this study represents a constricted sample, and struggling writers are often inconsistent in their performance on writing measures.

Woodcock Reading Mastery Test, 3rd edition (screener). Prior to instruction, RAs administered the Word Identification, Word Attack, and Passage Comprehension subtests of the WRMT-III. These tests were used to test for potential differences in reading ability across the groups and as covariates in the statistical models, if necessary. The Word Identification subtest requires students to read real words that increase in difficulty. The Word Attack measure requires students to decode nonsense words within 3-second. The Passage comprehension measure requires students to read a cloze passage with one word missing and provide the word that would help the passage make sense. The publishers report the internal consistency for the

Word Identification, Word Attack, and Passage Comprehension subtests as .94, .94, and .87, respectively for 4th grade, and .91, .92, and .86 respectively for 5th grade.

Test of Silent Reading Efficiency and Comprehension (Screener). The TOSREC was used as a pretest measure of reading ability for examining differences between groups at pre-test. Students are asked to read sentences and determine if the sentence is true or not true by circling yes or no. Students read silently and complete as many examples as possible in 3-minutes. The overall raw score reflects subtracting the total number of incorrect answers from the total number of correct answers. The publishers report the alternate form reliability of the assessment for grade four (r = .86) and for grade five (r = .89).

Wechsler Individualized Achievement Test, 3rd edition (WIAT-III) Essay Composition Subtest (Screener and distal outcome). The WIAT-III Essay Composition, a norm-referenced writing measure, was administered at pretest (to examine potential differences in writing skill between the groups) and posttest (to measure potential distal effects of the intervention). We chose this assessment because the content and organization required in the responses was closer to the nonfiction responses taught in the interventions than other norm-referenced measures involving picture prompts.

The examiner read the prompt aloud, and then students had 10 minutes to write about their favorite game and provide at least three reasons why the game is their favorite. We scored Essay Composition utilizing a rubric of theme development and text organization provided by the WIAT-III. Students earn up to 2 points for a thesis statement in the introduction, up to 2 points for a conclusion statement, and 0 to 5 points for the number of paragraphs. A paragraph was defined as having at least two punctuation marks and being separated using line spacing or indentation. Students also earned 0 to 5 points for each novel transition expression following punctuation (e.g., another, second, finally). Students earned 0 to 3 points for each reason of why they like a game and an additional 0 to 3 points for an elaboration for each reason. Maximum score was 20. Following WIAT-III instructions, we also counted the total number of separate words written. Internal consistency reliability, as reported by Breaux (2010), is .86 for 4^{th} grade and .87 for 5^{th} grade.

Structures Passage Writing assessments (Proximal measure). Students took three Structures Passage Writing measures at pretest and posttest. The authors designed these proximal measures of the impacts of the *Structures Writing* intervention to match the three structures taught in the intervention (i.e., simple description, compare/contrast, and sequence). Each assessment included a frame with information for students to include in their writing passage. Test administrators read the instructions aloud to student for each assessment, instructed students that they could use the blank space below the frame to plan their writing, showed them the lined paper for writing their passage, and answered clarification questions. The instructions prompted students to use the information in the frame to write a passage using a specific text structure. No time limit was given, but students were expected to need approximately 10-15 minutes for each exercise. An example prompt is provided in Appendix B.

The two first authors scored all three of the measures using a holistic scoring rubric designed for each structure. Each structure was scored on a 0-7 scale, but included slightly different criteria, based on the text structure. For example, the compare contrast rubric reminded scorers to logically group similarities and differences, which was not necessary for the other text structures. The rubric for the sequence text structure reminded scorers to consider the order of events. Because the assessments provided content for the students, the rubrics were designed to emphasize the organization and completeness of the writing. An example of the scoring rubric used for Simple Descriptions if shown in Appendix C. The first and second author scored 10 passages together during training and used anchor papers to assist in scoring. The rubric was used as a guide, rather than as exact measure description required for each score. The researchers scored the assessments in a random order, blind to condition.

Interrater reliability was calculated using the consensus approach, correlating the scores between the two raters. Correlations were .95 for simple description, .87 for compare/contrast, and .90 for sequence texts. Disagreements were resolved through discussion.

Structure Identification measure (Distal outcome). Students' ability to identify expository text structures was assessed with a researcher-created distal measure (i.e., Structure Identification), to determine whether the writing instruction impacted students' ability to identify text structures when reading. The Structure Identification measure was an untimed, group-administered, multiple-choice measure designed to assess the ability of students to identify the five expository text structures taught in the program. The Structure Identification measure was composed of 15 passages (i.e., three passages representing each of the five text structures). The sequence of passages was distributed randomly across the five types of text structures. The passages ranged in length from 46 to 88 words and Lexile levels from 410L to 940L. The Lexile range on the assessment was slightly higher than that of the range used during the intervention to avoid potential ceiling effects. A list of the five expository text structures followed each passage. Students read a passage then chose the text structure that best fit the passage. Items were scored as correct or incorrect. Thus, the total score ranged from 0 to 15.

We used a standard administration for the Structure Identification measure. First, the research assistants asked students to read and review child-friendly definitions for the structures. Second, the research assistants read the directions for completing the assessment and provided students an opportunity to ask questions regarding how to complete the Structure Identification measure. Students then completed the assessment with no help from the test administrators. Time for students to complete the Structure Identification ranged from approximately ten to twenty minutes.

Two alternative forms of the Structure Identification measure were developed for administration at the pre- and post-test periods (Forms A and B). We counterbalanced the forms across experimental groups and pre- and post-test periods. Pretest occurred one week prior to the intervention. Posttest occurred within five days following the intervention. Cronbach's alpha calculations indicated internal consistencies of .75 and .77 for Form A and Form B, respectively.

Reading comprehension measures (Distal outcomes). Expository text comprehension was assessed using two researcher-created reading comprehension measures to determine whether increases in informational text writing skills transferred to reading comprehension: 1) Oral Retell, and 2) Multiple Choice. The same reading passages were used for both measures. Students were asked to read a passage, provide an oral retell of the passage, and then answer the multiple-choice questions. This order ensured the multiple-choice questions did not influence the oral retell results. The RAs assessed students at pretest and again within five days following the intervention.

Two forms of the measure were created and counterbalanced across the pretest and posttest for both treatment conditions to control for potential differences in passage length and difficulty. The RAs individually-administered the untimed measures, which comprised two 3-paragraph passages and two 2-paragraph passages. The passages were written by the research team to ensure that (a) each paragraph of the passages represented a single text structure, and (b) that all five text structures were represented twice. The first author chose the topics for the passages to ensure a mixture of science and social studies topics were used. Graduate assistants wrote initial versions of the passages, which were then presented to the research team. The team provided comments about the cohesiveness, grammar, and adherence to the text structures within each paragraph. After initial revisions, the first author calculated Lexile levels for each paragraph of the passages, as well as the overall passage, to ensure the passages fell within the target Lexile range of from 410L to 940L. Passages were further modified until they fell within the desired Lexile range and a final read of the team was conducted to look for final edits and ensure each paragraph represented only a single text structure. Table 3 shows a comparison of the features of each form of the assessment passages.

Students read the first passage, retold everything they could recall without referencing the passage (the retells were audio-recorded), and then answered the multiple-choice questions. Students repeated the process for the three subsequent passages. Time for students to complete both the oral retell and multiple-choice measures ranged from 10 to 20 minutes.

Oral retell. Similar to written retell procedures used by Hammann & Stevens, (2003), RAs scored Oral Retells according to the total number of idea units recalled in participants' responses. An idea unit consisted of a single fact represented in the passage (e.g., automakers make cars). The first and second authors agreed upon the facts represented in each passage and created the Idea Units score sheets. Passages ranged from 19-35 idea units per passage. Due to differences in the number of idea units per passage, the scores represent the percentage of idea units recalled for each passage.

Trained graduate RAs independently scored the Oral Retells and double scored 20% of them. Point-by-point agreement for each idea unit was used to analyze the inter-scorer agreement. The number of agreements was divided by the total number of possible agreements and multiplied by 100. Inter-scorer agreement for the Oral Retell was .94.

Multiple choice comprehension test. Following the oral retell, students answered comprehension questions for each passage. Two questions were created for each paragraph of each passage, and each question involved information related to the text structure. For example, questions about compare/contrast passages asked about similarities or differences. Items were scored as correct or incorrect. The total score ranged from 0 to 20. Cronbach's alpha calculations indicated internal consistencies of .71 and .70 for Form A and Form B, respectively.

Fidelity of Implementation

Lesson-specific fidelity checklists were used to assess the percent of primary instructional activities implemented by intervention teachers. See Appendix D for the Lesson 2 Structures Treatment Fidelity Form. The first and second authors observed 30% of lessons for every teacher as they delivered instruction to their groups and measured fidelity of the lessons in-person using the checklists.

Data Analysis

We evaluated differences between the experimental and mathematics-writing control conditions on post-test outcomes using a regression-based approach. For outcomes involving both a pretest and posttest, we entered the pretest score as a control variable in the multiple regression model, which helps account for individual differences at pretest. Additionally, we included gender and pretest TOSREC scores in the models, due to pre-intervention differences found between the treatment groups.

In the models, the pretest covariates were mean-centered so that the intercept (B_0) is interpreted as the mean for the mathematics-writing control group when the pre-test score is average. Simple regression of a continuous outcome onto a binary predictor (i.e., experimental dummy variable) is mathematically equivalent to an independent samples t-test. Cohen's *d* effect sizes (1988) were computed based on the unstandardized regression coefficient for condition and the standard deviation of the outcome variable. In other words, we essentially divided *B* by the pooled standard deviation of the posttest, resulting in an effect size representing the conditional effect when controlling for the covariates used in the model (see Lipsey & Wilson, 2001). Because the standardized mean difference effect size (*d*) is upwardly biased in small samples, a small sample correction was applied to the effect size, resulting in Hedge's *g* (Hedges, 1981).

Results

Teachers implemented the lessons with a high degree of fidelity (96.15%). Descriptive statistics for outcome measures are provided in Table 4. A correlation matrix showing the relationships between the measures is provided in Table 5. The three writing measures developed for this study were statistically significantly correlated with the WIAT-III Essay Composition Subtest, with correlations ranging from .47-.55. These moderate correlations provide some evidence for the validity of the researcher developed writing measures.

Statistically significant correlations among the researcher created and norm-referenced measures similarly demonstrate evidence of construct validity of the researcher designed reading measures. The *Structures Identification* was statistically significantly correlated with the *WRMT-II Passage Comprehension* subtest (r = .45), the *Structures Multiple Choice* measures was significantly correlated with all of the *TOSREC* and *WRMT-III* subtests (r ranged from .43 to .61), and the *Structures Oral Retell* measure was significantly correlated with the TOSREC and the WRMT-III subtests (r ranged from .43 to .66), with the exception of the *Word Attack* subtest (r = .39, *ns*).

The next section provides statistical analyses of the effectiveness of the intervention for improving student performance on the proximal measures, followed by similar analyses for the distal measures.

Research Q1: Proximal Outcomes (Structures Writing)

The regression analyses indicated statistically significant effects for all three *Structures Writing* measures. Pretest scores were included in the model for each measure to account for pre-existing differences between the students in the different conditions, so the slope parameter is conditional on the covariate (i.e., mean difference at post-test accounting for pre-existing differences). Gender and TOSREC standard scores were also included in the models to control for statistically significant pre-existing differences found for the groups on those variables. See Table 6 for the regression results for each of the proximal measures.

For the Simple Description Writing outcome, students in the experimental condition scored, on average, 1.03 points higher than students in the mathematics-writing control condition ($B_1 = 1.03$, $\beta = 0.31$, $p = .006$). The TOSREC was a significant predictor of the outcome and suggested that an increase (or decrease) of 10 in the standard score predicted a corresponding increase or decrease of .6 points on the outcome measure. The pretest was also significant, indicating that an increase of 1 point on the pretest measure predicted a corresponding increase of .28 on the posttest outcome. The resulting conditional effect when controlling for covariates was $g = 0.65$ [95% $CI = 0.12, 1.18$].

For the Compare/Contrast Writing outcome, students in the experimental condition scored, on average, 1.08 points higher than students in the mathematics-writing control condition ($B_1 = 1.08$, $\beta = 0.29$, $p = .008$). The TOSREC was a significant predictor of the outcome and suggested that an increase (or decrease) of 10 in the standard score predicted a corresponding increase or decrease of .6 points on the outcome measure. The pretest was also significant, indicating that an increase of 1 point on the pretest measure predicted a corresponding increase of .35 on the posttest outcome. The resulting conditional effect when controlling for covariates was $g = 0.59$ [95% $CI = 0.06, 1.12$].

For the Sequence Writing outcome, students in the experimental condition scored, on average, 1.38 points higher than students in the BAU control condition ($B_1 = 1.38$, $\beta = 0.42$, $p < .001$). The pretest was the only other significant predictor of the posttest outcome in the model, indicating that an increase of 1 point on the pretest measure predicted a corresponding increase of .43 on the posttest outcome. To keep the effect sizes comparisons consistent, the regression coefficient was used to calculate the effect size, which is also conditional on the pretest covariates. The resulting conditional effect when controlling for covariates was $g = 0.97$ [95% $CI = 0.44, 1.51$].

Research Q2: Distal Outcomes

Table 7 includes the results of the regression models for each of the distal outcomes. For the Structures Identification outcome, students in the experimental condition scored, on average, 2.32 points higher than students in the mathematics-writing control condition ($B_1 = 2.32$, $\beta = 0.30$, $p = .006$). The TOSREC was a significant predictor of the outcome and suggested that an increase (or decrease) of 10 in the standard score predicted a corresponding increase or decrease of .9 points on the outcome measure. The pretest was also significant, indicating that an increase of 1 point on the pretest measure predicted a corresponding increase of .68 on the posttest outcome. As with the proximal measures, the regression coefficient was used to calculate the effect size, and was also conditional on the pretest covariates. The resulting conditional effect when controlling for covariates was $g = 0.63$ [95% $CI = 0.10, 1.16$].

Scores on the oral retell, multiple choice, and WIAT-III measures did not significantly differ between the two groups at post-test.

Discussion

The purpose of this study was to investigate the effects of a standard protocol writing intervention (i.e., *Structures Writing*) on the informational writing skills of elementary-aged students experiencing reading difficulties.

The analysis indicated that the writing intervention had moderate to large effects on researcher-designed proximal measures of students' ability to write informational text using simple description ($ES = 0.66$), a compare/contrast ($ES = 0.61$), and a sequence ($ES = 0.94$) text structures. Because the effect sizes are conditional on the covariates, they are slightly larger than if they were to be calculated using simple means, suggesting there were potential suppression effects. In any case, these impacts are relatively large considering the brevity of the intervention. The intervention was conducted as an underpowered pilot study to examine the promise of the intervention, with an average of 8 passage writing exercises per text structure. These results should be interpreted cautiously, as the intervention was not compared to typical writing instruction provided in schools, but show promise for the intervention.

This research suggests that teaching students to write informational text by providing information does have impacts on the overall quality of students' informational text writing, although the treatment group did not reach ceiling on the measure, indicating there is still room for improvement. Considering total intervention time (6 hours) and teacher training (2 hours), these effects are also practically significant and the intervention is cost effective. The intervention shows promise for improving the impacts of informational text writing for students, warranting further development and study on a larger scale.

The proximal impacts of the intervention also lend support for the theory of writing development used in the development of the intervention. As stated in the introduction, Berninger and Amtmann (2003) proposed that transcription skills and executive functions provide a foundation for text generation in the Simple View of Writing Model. They further stipulated that executive functions may be dependent on other regulation processes through guided assistance until writers matured. The *Structures Writing* program was designed specifically to facilitate the maturation of struggling early writers' executive functions by reducing the cognitive load placed on working memory by transcription skills and idea generation. By reducing the demands of idea generation, word choice, and transcription skills (i.e., spelling), the *Structures Writing* program provides the foundation for the development of executive functions, such as planning, organizing (based on text structures), reviewing, and revising. Although this theory was not tested directly, the writing quality results suggested that the students receiving instruction in planning and organization were able to apply those skills more adeptly for the writing tasks used in this intervention after only a short period of instruction. Further research should be conducted to more directly examine the impacts of this intervention on executive functions used during writing.

We were also interested in the potential impacts of this intervention on distal outcomes, including general writing skills and reading skills. Unfortunately, there were no statistically significant differences found on a norm-referenced measure of writing. It may be that the brevity of the intervention did not allow students to capitalize on the knowledge gained. On the other hand, it may be that the proximal writing task is too contrived to generalize to other writing tasks. Further study needs to be conducted to determine if a more complete version of the intervention would lead to better transfer, as well as to study the validity of the *Structures Writing* measure.

Regarding the impacts of the writing instruction on reading skills, the intervention resulted in statistically significant impacts on students' ability to identify and discriminate text structures, but not on their ability to provide an oral retell or answer multiple choice questions about the assessments. The ability to identify and discriminate text structures is not considered to be a measure of reading comprehension, but rather a lower-level skill that may assist in expository reading comprehension. Similar to a previous study (Author, in press), the results of this study demonstrated improvement on identification and discrimination of text structures, but that alone was not sufficient for improving reading comprehension. As such, further development of this intervention should include components designed to capitalize on the impacts of identification skills by extending them or adding additional components designed to lead to improved informational text reading comprehension. Although these results do not align with the findings of Graham and Hebert (2011), it may also be noted that both of the comprehension assessments (i.e., oral retell, multiple choice) included items to untaught text structures and the intervention was brief. This should lead to a cautious evaluation of the results as evidence that the writing intervention cannot have an impact on reading comprehension, until a more complete version of the intervention can be tested.

Limitations

Several factors limit the conclusions that can be drawn from this study. First, differential attrition occurred across the groups. The attrition occurred prior to instruction, but after randomization. Reasons for attrition were mainly due to schedule, but occurred primarily in the control group. Although there does not appear to be a systematic explanation for the attrition related to the experiment, we cannot rule it out. Replication of the findings is necessary.

Second, there were some differences between the groups in terms of gender and pretest TOSREC scores. Although these differences were controlled for, this led to possible suppression. Additionally, we cannot know whether the groups may have differed based on other unmeasured factors that were not controlled for in the experiment. The differential attrition may have played a role in the group differences.

Third, the two reading comprehension measures (i.e., oral retell and multiple choice) were based on the same reading passages. We controlled the order of the measures by having students complete the oral retell prior to the multiple-choice measure to ensure students' retells would not be influenced by multiple-choice questions. However, it is possible that the oral retell may have influenced the multiple-choice outcome. That is, if a student said something incorrectly during the retell, it might have led to answering a related multiple-choice question incorrectly. Additionally, if there were any problems with the reading passages used for the measures, the problems would carry over across both measures. In future studies, we may want to use different passages for multiple-choice or oral retell measures.

Finally, the pilot test of this intervention only included lessons for three of the five text structures (i.e., simple description, compare/contrast, and sequence), for one instructional component of the complete intervention. Other components include lessons for discrimination of text structures and note-taking based on the text structure. While the findings of this study show promise of the intervention to improve informational text writing outcomes and text structure identification skills, the more complete intervention may lead to stronger impacts, or additional impacts on reading outcomes. Future studies should examine the impacts of the full intervention.

Conclusion

The results of this pilot study indicate the Structures Writing intervention shows promise for impacting the informational text writing skills of students with writing difficulties. Students receiving instruction in the treatment group wrote higher-quality simple description, compare/contrast, and sequence passages than students in the control group, despite the control group also receiving writing instruction (albeit in a different genre). However, there were mixed results for distal reading and writing outcomes, with the only statistically significant differences occurring on the Structures Identification measure. Based on the limitations and scope of this study (students were only taught the writing component of the multi-component intervention, and only 3 of the 5 text structures), it may be too early to draw conclusions about the potential impacts of the complete intervention on distal outcomes. However, the promising results warrant further development of the intervention and study of the full-intervention (including all of the components). Additionally, this study offers some evidence that providing struggling writers with information may provide an important scaffold in helping them to develop executive functions and organizational skills for informational text writing. Future studies should be designed to test this hypothesis more directly, as well as to determine whether such instruction primes writers for future instruction in more complex informational text writing skills (such as identifying the important information from course text, taking notes, paraphrasing, and transforming knowledge when writing by reframing the information according to their intent).

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