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Title: Important Findings from Rigorous Research about Elementary Grade Children’s Reading Comprehension and Writing

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Symposium Justification

Reading comprehension and writing are cornerstones of literacy instruction in elementary grades. These two foundational skills are important to the long-term success of children in academic and career settings, and living a healthy productive life as adults. Unfortunately, many children fail to master these important skills resulting in a negative spiral of events eventually leading to lifelong challenges.

In this symposium we present findings from three recent rigorous research studies focusing on these foundational skills and populations of upper elementary grade children who experience the greatest challenges in our schools today. The session will present strong and relevant results from cluster randomized controlled trials with elementary grade children focusing on:

- persuasive writing
- reading comprehension with Spanish speaking English learners
- reading comprehension with struggling readers

These projects were funded by the U.S. Department of Education Institute of Education Sciences and have shown important and strong findings with rigorous research studies and are most relevant to our children and communities of interest.

Presentation order
Dr. Karen R. Harris:
Teacher-Led Web-Enhanced Self-Regulated Strategies Development Instruction to Improve Persuasive Writing Skills of 4th and 5th Graders

Dr. Kausalai (Kay) Wijekumar:
Reading Comprehension Improves When Upper Elementary Grade Spanish Speaking English Learners Use Web-Based Text Structure Instruction with Linguistic Supports

Ms Andrea Beerwinkle:
Fourth- and Fifth-Grade Struggling Readers Show Strong Improvements in Reading Comprehension when Taught the Structure Strategy using a Web-based Tutoring System
Title: Teacher-Led Web-Enhanced Self-Regulated Strategies Development To Improve Persuasive Writing Skills of 4th and 5th Graders

Background / Context:

Writing is a cornerstone of academic success, self-expression, lifelong learning, and professional success. Despite the importance of writing, the majority of students in this country are not good writers. On the National Assessment of Educational Progress (NAEP; Salahu-Din, Persky, & Miller, 2008), only 33 percent of grade 8 and 24% of grade 12 students performed at or above the “proficient” level (defined as solid academic performance) in writing. Further, 55% of grade 8 and 58% of grade 12 students scored at or below the “basic” level, denoting only partial mastery of the writing skills needed at these grade-levels. The problems are compounded by lack of reading comprehension skills (to synthesize information from source texts), teachers lacking training on how to teach writing, and a lack of effective technologies to support writing. National concern about poor writing skills is reflected in the new grade-level expectations for writing in the Common Core State Standards Initiative (CCSSI; Gewertz, 2011). These standards have been adopted by 44 states and the District of Columbia and provide a road map for the writing skills students need to be ready for college and work. A prominent emphasis in the standards is learning how to synthesize source texts to write logical, coherent, and compelling arguments, with persuasive writing at the 5th grade.

To solve the problems related to poor writing skills among students, inconsistent teacher knowledge about effective writing instruction, and lack of effective technologies, we bring together two approaches with a long history of strong and positive experimental evidence: the self-regulated strategies development model for writing instruction (SRSD; Harris, Graham, & Mason, 2006; Harris, Graham, Mason, & Friedlander, 2008) and text structure based reading comprehension instruction –structure strategy (Meyer, 1975; Meyer & Wijekumar, 2007; Wijekumar, Meyer & Lei, 2011; Wijekumar Meyer, & Lei, 2013; Wijekumar, et al., 2014; Williams, et. al., 2009).

Purpose / Objective / Research Question / Focus of Study:

The objective of We-Write - Persuasively is to combine SRSD and text structure strategy instruction in a teacher-managed web-supported intervention to improve persuasive writing with fourth- and fifth-grade students. We-Write teaches students how to select, encode, and take notes from source materials (synthesize source materials), write logical, coherent, and compelling persuasive arguments (learning to write) as well as how to use such writing as a tool for learning content material (writing to learn). The research questions guiding this study were:
1. Does the individual attention, scaffolding, and feedback provided by We-Write improve writing quality?
2. Is strategy use better for students using We-Write?
3. Does interacting with We-Write lessons yield more positive attitudes towards writing and self-efficacy?
4. What are the operational challenges related to implementing We-Write in classroom settings?

Setting:
Research was conducted within authentic educational settings in rural and suburban elementary schools in the northeast and southwest.

**Population / Participants / Subjects:**

Schools in the northeast were from rural areas and served over 91% children eligible to receive a free or reduced price lunch. The schools in the southwest served over 90% of Spanish speaking English learners and over 95% eligible for free or reduced price lunch. All schools came from states that had adopted the CCSS and had poor writing scores.

**Intervention / Program / Practice:**

The We-Write intervention consisted of teacher-led lessons to support the six stages of SRSD instruction for persuasive writing carefully choreographed with web-based lessons designed to support and extend the learning. Students learned three mnemonics (i.e., POW, TAP, and TREE) to guide their note-taking from source materials and writing. Figure 1 presents a sample activity on the computer where students identify TREE in a teacher provided essay. “(please insert figure 1 here).”

Pick your ideas (Topic, Audience, and Purpose)
Organize your notes (Topic Sentence, Reasons (3 or more), Explanations (3 or more), and Ending)
Write and say more

We-Write lessons were implemented for 18 weeks after the pre-tests were completed. Project Directors conducted focus group meetings with participating teachers and administrators to identify operational challenges related to the research project as well as the implementation of the We-Write intervention in classroom settings.

**Research Design:**

An under powered cluster randomized controlled trial was used to gather data about the efficacy of the We-Write intervention with fourth- and fifth-grade students and focus group data collection was used to gather data about implementation challenges and solutions.

**Data Collection and Analysis:**

11 fifth grade classes in 3 schools completed the writing pretest and posttest. Their compositions were scored for overall writing quality using a nine point scale (1-9) that included anchor papers for scores of 2, 4, 6, and 8 (higher scores represented better writing). Before scoring, all papers were typed and spelling miscues were corrected, so that transcription skills would not influence raters’ scoring of content. Raters were instructed to score these papers holistically, taking into account ideation, organization, vocabulary, sentence structure, and grammar, but not giving undo
weight to any single factor. Papers were independently scored by two trained graduate students unfamiliar with the design and purpose of the study (interrater reliability was .83).

Findings / Results:

Results for the primary research question regarding treatment effect of the We-Write system on different outcome variables show large effect sizes favoring the students in the intervention classrooms. Treatment effect and the associated standard error estimates were taken from the two-level random-intercept main-effect models (M1) with adjustments for students’ pretest outcome scores, pretest levels, and gender. Effect sizes were also calculated based on adjusted treatment effect estimates (i.e., standardized adjusted differences between We-Write and control groups). Students using the We-Write system generally made a larger gain than control students on all posttest measures in both grade levels. The positive effect of We-Write was statistically significant and large for both planning (ES = 1.72) and essay quality (2.11), on most reading outcome measures except for main idea quality and comparison

Conclusions:

The findings from the study show promise as evidenced by the improvements noted above. Students were actively engaged in both the teacher lessons and the computer lessons and reported high levels of efficacy in writing and computer attitude. Teachers and students noted that this approach was unique and was quite different from previous implementations of technologies for learning.
Title: Reading Comprehension Improves When Upper Elementary Grade Spanish Speaking English Learners Use Web-Based Text Structure Instruction with Linguistic Supports.

Background / Context:

Early and targeted intervention is critical to solving the problem of content area reading comprehension of Spanish speaking English learners in upper elementary grades. Spanish speaking English language learners (Els) have shown poor performance on high-stakes assessments on this important comprehension skill (NAEP, 2015). Spanish speaking Els face many challenges as the progress to higher grade levels. Kieffer (2008) has reported on longitudinal analyses showing that early differences between monolingual and bilingual learners diverge as students progress to upper elementary grades. Some reasons for these challenges include the increasing volume of unfamiliar vocabulary, linguistic complexity, and density of content area texts.

Purpose / Objective / Research Question / Focus of Study:

The objective of the strategy instruction on the Web for Spanish speaking English learners (SWELL) was to teach Els how to read and comprehend expository texts using five text structures: comparison, problem and solution, cause and effect, sequence, and description (Wijekumar, Meyer, & Lei, 2015). The SWELL system has two specific adaptations designed to address the needs of Spanish speaking Els at upper elementary grades. The Spanish Scaffolding adaptation was designed for children classified as requiring instruction in Spanish. In this adaptation, children received instruction about the text structure and read the passage in Spanish first and then received the same instruction in English. The English Extension adaptation was designed to provide instruction in English with extensions for vocabulary translation (i.e., hovering over a word showed the Spanish translation), linguistic modification of sentences (e.g., picture and description for contextual cues), or reading the passage in Spanish if the child selects the option. The English Extension system was preferred by almost all participating schools and children.

The primary research question guiding this study was:

Do students in grades 4, 5, and 6 classrooms using the SWELL delivery of the text structure strategy as a partial substitute for the standard language arts curriculum outperform students in control classrooms on standardized and researcher-designed measures of reading comprehension?

The study also posed two secondary questions concerning whether the effect of SWELL delivered instruction about the text structure strategy for reading comprehension varies depending on other factors, including initial reading skills and gender. The two secondary questions are: 1. Does the effect of SWELL on reading comprehension depend on students’ initial reading level? 2. Does the effect of SWELL on reading comprehension differ between male and female students?

Setting:
Research was conducted within approximately 14 fourth grade and 17 fifth grade classrooms in a Southern state. The intervention was delivered in authentic education settings during regular class periods dedicated for language arts instruction. The implementation was supported by trained graduate research associates.

**Population / Participants / Subjects:**

The participating schools served approximately 88.7% of Spanish speaking ELs. The schools’ overall student population was 86% socioeconomically disadvantaged (eligible for free or reduced priced lunch). Approximately 15% of the students in participating schools were considered proficient in reading.

**Intervention / Program / Practice:**

SWELL is a web-based tutor providing one-on-one tutoring for Spanish speaking Els in upper elementary grades. Children learn how to utilize knowledge about five text structures (e.g., comparison) to select important ideas from expository texts and encode strategic memory structures. Within the SWELL system specific adaptations were created to address the linguistics needs of the Spanish speaking Els. SWELL uses the same platform and utilizes the same interaction models as the efficacious intelligent tutoring system for the structure strategy (ITSS) designed and tested with fourth, fifth, and seventh grade monolingual learners.

SWELL is unique in that its web-based interface was designed to reduce the cognitive demands of reading in a non-dominant language by creating adaptations that address the needs of ELs.

For this research study, participants with parental permission completed the following measures at pre and posttest:

A. Gray Silent Reading Test (GSRT)
B. Reading comprehension measure (e.g., main idea, cloze task, and full recall)
C. Survey of computer attitudes, reading efficacy, text structure efficacy

The software was used throughout the academic year after pretests and was implemented as a partial substitute to the language arts curriculum for approximately 45-60 minutes each week. Posttests were completed at the end of the academic year.

**Research Design:**

This pilot study utilized an under-powered multisite randomized controlled trial design in which classrooms were randomly assigned to intervention and business-as-usual control conditions within schools. Trained graduate research associates maintained daily logs and notes of the implementation.

**Data Collection and Analysis:**
The GSRT answer sheets were scanned and the researcher designed measures were transcribed and translated if necessary. A computerized scoring system was employed to score all constructs. The scores were checked by a trained graduate assistant and the Project Director. Because students were nested within classrooms and classrooms are nested within schools, we ran three-level unconditional models for each outcome variable by grade level to estimate the level of dependence due to each of the school and class levels. As the school-level ICC values were small (no larger than .05) for all post-test outcome measures, we conducted two-level random-intercept models by grade level for each of the outcome measures to address the research questions. Due to the differential amount of missing data by outcome variables, missing data were deleted during analysis for each model to maximize the usage of available data for each outcome.

Findings / Results:

Students using the SWELL intervention made larger gains than control students on reading posttest measures in all three grade levels. Effect sizes of SWELL on the standardized GSRT reading comprehension measure ranged from moderate (ES = .47 for Grade 5) to large (ES = .79 for Grade 4). Effect sizes were large for the signaling skill at both grade levels.

Conclusions:

These results show that the SWELL intervention had medium to large effects on the standardized reading comprehension distal measure and larger effects on the proximal researcher designed measures of text structure competence and summaries for Spanish speaking Els. These preliminary findings need to be replicated with other methodologically rigorous and larger scale studies and other populations.
Title: Fourth and Fifth Grade Struggling Readers Show Strong Improvements in Reading Comprehension when Taught the Structure Strategy using a Web-based Tutoring System.

Background / Context:

The fourth grade slump may be a critical life-altering trajectory for struggling readers. Children who do not learn to read and comprehend content area texts cannot access the wealth of knowledge in their textbooks, read for pleasure, succeed in school, enter and then successfully navigate college, or become productive professionals. Fourth grade is a critical reading year where children are transitioned from narrative to expository texts that focus on the content areas such as science and social studies.

Children who experience difficulties in reading and comprehending expository texts at both 4th and 5th grades will continue to face serious consequences throughout life.

Purpose / Objective / Research Question / Focus of Study:

The objective of the intelligent tutoring system for the structure strategy (ITSS) was to teach children how to read and comprehend expository texts using five text structures: comparison, problem and solution, cause and effect, sequence, and description (Meyer & Wijekumar, 2007). The focus of the present study was to study the efficacy of the web-based ITSS in delivering the structure strategy to 4th and 5th grade readers with persistent reading difficulties.

The research questions guiding this study were:

5. Does the individual attention, scaffolding, and feedback provided by ITSS improve reading comprehension of 4th and 5th graders with persistent reading difficulties on a standardized test?
6. Does the individual attention, scaffolding, and feedback provided by ITSS improve comparison competency, signaling word knowledge, problem and solution competency of 4th and 5th graders with persistent reading difficulties?
7. What were the challenges to implementing the ITSS software in classrooms?

Setting:

Research was conducted within approximately 131 fourth grade and 128 fifth grade classrooms in three states. The intervention was delivered during regular class periods dedicated for language arts instruction.

Population / Participants / Subjects:

The participating schools ranged from rural to suburban and small to large. These schools had an average of 15:1 students to teacher ratio. Schools’ educational expenditure rate was $12,145 (rural) per student and $12,037 (suburban). The suburban schools’ student population was 14% minorities and 44% economically disadvantaged (eligible for free and/or reduced priced lunch). The rural schools’ student population was 8% minorities and 39% economically disadvantaged.
**Intervention / Program / Practice:**

The structure strategy training implemented in the student-managed ITSS teaches readers to:

1. Identify the overall top-level structure of an expository text (such as, Comparison, Problem and Solution) by identifying signaling words (Meyer, 1975) used in the text to explicitly cue these structures (such as, “in contrast” and “on the other hand” for the comparison structure).
2. Write the main idea using patterns for each of the different text structures. For example, the comparison structure pattern is: _______ and _______ (2 or more ideas) were compared on ______, ________, and ________ (number of issues compared).
3. Organize their understanding and recall by using the structure and main idea.
4. Infer, elaborate, apply, and monitor comprehension.

The software was used throughout the academic year after pretests and was implemented as a partial substitute to the language arts curriculum for approximately 30-45 minutes each week. Posttests were completed at the end of the academic year.

**Research Design:**

A multi-site cluster randomized design was used in this study with rural and suburban 4th and 5th grade classrooms. The within school random assignment to ITSS or control groups facilitated efficiencies in the design. A volunteer sample of 128 teachers and their 5th-grade classrooms and 131 4th-grade teachers were randomly assigned to the ITSS and control groups within schools.

Observations were conducted to gather data about the implementation of ITSS and to document challenges.

**Data Collection and Analysis:**

Data was collected for all students with parent permission. Computer scoring was used for signaling word measure and trained raters blind to the research condition scored the main idea quality and comparison text structure competence measures. This analysis used all students who scored less than the 25th percentile on the GSRT pre-test classified as struggling readers. A series of hierarchical linear modeling (HLM: Raudenbush & Bryk, 2002) equations were specified to determine if there were differences between ITSS and control classrooms with respect to reading performance, data analyses were conducted for each of the primary dependent variables (GSRT and researcher-designed measures of reading comprehension) using the HLM7 software program.

**Findings / Results:**

The analysis of fourth and fifth graders in ITSS, who scored less than the 25% percentile on the GSRT pre-test, showed the highest effect sizes on the standardized test scores on the posttests. For fourth graders the GRST difference for the ITSS condition versus the control was 1.45 (or .28 SDs, p = .14) after controlling for gender and reading pretest differences. On the comparison structure outcomes at the 4th grade, signaling score difference was 1.83 (or .34 SDs, p < .01), main idea quality difference was .83 (or .55 SDs, p < .001), and comparison competence difference was .55 (or .28 SDs, p < .01) holding reading pretest scores and gender constant.
These 4th grade students used shortened ITSS lessons to reduce the typing burden and only completed the signaling word and matrix version of the main idea task.

Noteworthy, performance was better at 5th grade where children used the complete lessons and the GSRT posttest difference was 3.51 (or .52 SDs, p < .01). On the comparison structure outcomes at the 5th grade, signaling score difference was 2.55 (or .45 SDs, p < .001), main idea quality difference was .73 (or .46 SDs, p < .01), and comparison competence difference was .56 (or .25 SDs, p < .05) holding reading pretest scores and gender constant.

**Conclusions:**

These results show that the text structure strategy delivered via the web-based ITSS had good and meaningful effects on the standardized reading comprehension distal measure and larger effects on the proximal and distal researcher designed measures of text structure competence, knowledge, and summaries for children experiencing persistent reading difficulties. The findings from this study need to be replicated with other studies and other populations.