Title:
Reading Comprehension Improves When Fourth- and Fifth-Grade Economically Disadvantaged Learners Use Web-Based Text Structure Instruction with Trained Teacher Support

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Background / Context:

Early and targeted intervention is critical to solving the problem of content area reading comprehension of economically disadvantaged students in upper elementary grades. Regardless of heritage and minority status, poverty has been one of the most defining characteristics highly correlated to poor performance on high-stakes assessments on reading comprehension skills (NAEP, 2015). Because reading comprehension is the foundation of all academic learning and civic engagement it is important to help children growing up in economically disadvantaged areas successfully learn the skill.

Purpose / Objective / Research Question / Focus of Study:

The objective of the framework for accelerating strategic comprehension of text (FASCT) was to teach children in grades 4 and 5 how to read and comprehend expository texts using five text structures: comparison, problem and solution, cause and effect, sequence, and description (Wijekumar, Meyer, & Lei, 2013). FASCT utilizes a web-based intelligent tutoring system to present instruction to children in English and Spanish and a strong teacher professional development component. Instruction about text structures are designed to guide students to select important ideas while reading, logically connect the ideas using one or more text structures, generate a strategic hierarchical memory structure, utilize these memory structures to write a main idea, make inferences, elaborate, write to inform, and write to persuade.

The current efficacy study uses a cluster randomized controlled study powered to answer a primary research question. Multiple exploratory analyses were also planned for variables of interest. The clusters were sites of 6 schools formed based on demographic characteristics. Random assignment was conducted by an independent consultant to the project.

The primary research question guiding this study was:

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

The study also posed three secondary questions concerning whether the effect of ITSS delivered instruction about the text structure strategy for reading comprehension varies depending on other factors, including initial reading skills and gender. The three secondary questions are: 1. Do students in grades 4 and 5 classrooms using ITSS delivery of the text structure strategy as a partial substitute for the standard language arts curriculum outperform students in control classrooms on state high-stakes assessments? 2. Does the effect of ITSS on reading comprehension depend on students' initial reading level? 3. Does the effect of ITSS on reading comprehension differ between male and female students?

Setting:

Research was conducted in fourth- and fifth-grade classrooms within 24 schools in three states. The schools had to serve at least 60% of students eligible for a free or reduced price lunch. Average rate of free or reduced price lunch for participating schools was 82%. There were approximately five classrooms at each grade level. The intervention was delivered in authentic education settings during regular class periods dedicated for language arts instruction. The implementation was supported by trained research associates.

Population / Participants / Subjects:

The participating schools served approximately 76.7% of Spanish speaking ELs. The schools' overall student population was 82% socioeconomically disadvantaged (eligible for free or reduced priced lunch).

Intervention / Program / Practice:

FASCT is an extended version of text structure intervention that uses the web-based ITSS tutor providing one-on-one tutoring for students in upper elementary grades and is supported by highly trained teachers. The original ITSS efficacy studies focused primarily on the web-based tutor with teachers receiving 3 hours of professional development. Because of the challenges facing high poverty schools, FASCT provided 2 full days of strong professional development to participating teachers prior to the school year followed by 4 in-school co-teaching or coaching sessions. Each school also nominated a lead teacher who received an additional day of professional development to support teachers within each building. The lead teachers also consulted with the research team weekly.

During the FASCT intervention children learned how to utilize knowledge about five text structures (e.g., comparison) to select important ideas from expository texts and encode strategic memory structures. Over 90% of participants used the English only ITSS version of the software. Approximately 10% of students used the Hybrid ITSS that provided on-demand assistance in Spanish for Spanish speaking English learners. ITSS was designed to adapt instruction, practice tasks, and feedback to students based on their performance on each lesson.

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

A. Gray Silent Reading Test (GSRT) Form B at pretest and Form A at posttests (Reliable measure with alternate equivalent forms)
B. Reading comprehension measure (e.g., main idea, cloze task, and full recall) that were scored by computer algorithms with reliability .99
C. Survey of computer attitudes, reading efficacy, text structure efficacy (Reliability over .80)
D. State level high-stakes assessment data was also gathered from the schools

The software was used throughout the academic year after pretests were completed 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.
During the planning year for the research study the research team surveyed the school personnel and reviewed all the textbooks used. All reviewed textbooks were found to contradict the ITSS instruction about text structures. Thus, additional teacher resources were created so that teachers could be consistent with the ITSS instruction during their language arts instructional time. These lesson samples were placed in a Dropbox site.

Research Design:

This multisite cluster randomized controlled trial used a volunteer sample of 24 schools grouped into six schools per site for random assignment. One large school district with 18 schools participated in the study forming three sites of 6 schools each. Three other smaller districts with similar demographic characteristics were combined to form another site for random assignment. Trained classroom support personnel provided weekly support to each intervention classroom during the computer lab ITSS time. Approximately 120 fifth-grade and 120 fourth-grade teachers were randomly assigned to the FASCT-ITSS and control groups within sites.

Observations, surveys, coaching session notes, focus groups, and computer logs were reviewed to gather data about the implementation of FASCT-ITSS and to document implementation fidelity.

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, classrooms were nested within schools, and schools were nested within sites we ran four-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 three-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 FASCT intervention made larger gains than control students on reading posttest measures at both grade levels. Effect sizes of FASCT on the standardized GSRT reading comprehension measure ranged from moderate (ES = .65 for Grade 5) to large (ES = .81 for Grade 4). Effect sizes were large for the signaling skill at both grade levels. Most importantly, exploratory analysis on state level high stakes assessments showed even larger effect sizes favoring the intervention schools.

Conclusions:

These results show that the FASCT 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 participating students. These results are much stronger than those observed in previous efficacy studies of ITSS. The strong results on the state level high-stakes assessments are the first time the research team has used these school level variables. The study was rigorous and did not experience any attrition at the school and classroom levels. Joiners were excluded from the analyses to ensure the highest quality conclusions from this study.

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