Title: **The many facets and applications of text structure in supporting educational trajectories of elementary and middle grade children in content area reading comprehension and writing**

Authors and Affiliations:

Dr. Elizabeth Albro (Moderator and Discussant)
    Associate Commissioner for Teaching and Learning
    Teaching and Learning Division, NCER
    Institute of Education Sciences
    Washington, DC 20208-5500

    Elizabeth.Albro@ed.gov

Dr. Joanna P. Williams
    Professor Emeritus, Teachers College Columbia University
    jwilliams@exchange.tc.columbia.edu

Dr. Kausalai (Kay) Wijekumar
    Professor, Texas A&M University
    K_Wijekumar@tamu.edu

Dr. Bonnie J. F. Meyer
    Professor, The Pennsylvania State University
    Bjm8@psu.edu

Dr. Karen R. Harris
    Mary Emily Warner Professor of Education, Arizona State University
    Karen.r.harris@asu.edu

Abstract Body
Limit 4 pages single-spaced.

Background / Context:
Description of prior research and its intellectual context.

Content area reading comprehension and writing have been a challenge for children in the U.S. schools for many years as evidenced by state and national assessments. One promising solution to the problem is text structure based instruction that promotes strategic selection, encoding, retrieval, and use of information for myriads of activities within the learning environment and beyond. The text structure based instruction has been researched extensively since 1975 (Meyer, 1975; Meyer, Brandt, and Bluth 1980; Meyer, Middlemiss, Theodorou, Brezinski, McDougall, and Bartlett 2002; Meyer, Wijekumar, Middlemiss, Higley, Lei, Meier, and Spielvogel 2010; Williams, Hall, Lauer, Stafford, DeSisto, and deCani 2005; Williams, Stafford, Lauer, Hall, and Pollini 2009) and has received considerable attention with the adoption of the Common Core State Standards by many states. These standards focus on history/social studies, science, and technical reading materials that prepare learners for lifelong learning. The English Language Arts Standards on informational texts require that students understand main ideas (e.g., R1.4.2), describe the overall structure of the text (e.g., R1.4.5 – explicitly mentions chronology, comparison, cause/effect, problem/solution), compare and contrast events (e.g., R1.4.6), and integrate knowledge and ideas (R1.4.9).

The goal of this panel presentation is to showcase how text structure instruction can be designed for early and upper elementary school children and middle grade students transitioning to advanced content area texts. This panel will present findings from four U.S. Department of Education Institute of Education Sciences funded projects related to text structure based reading comprehension and writing. Three projects were recently completed and one is in progress. The panel will be moderated by Dr. Liz Albro, Associate Commissioner for Teaching and Learning – U.S. Department of Education Institute of Education Sciences – NCER.

Brief descriptions of each presentation are presented here and all other sections of the structured abstract presenting information about the large scale randomized controlled efficacy trials on the web-based intelligent tutoring system for the structure strategy (ITSS), panelist #2.

Joanna Williams (Columbia University) will present her findings from her research on developing text structure instruction for children in lower elementary grades, with learning disabilities and at-risk for academic failure. She will present evidence from a recently completed study where cause and effect text structure instruction was embedded in social studies content and delivered by teachers. Findings from this study will be compared to previous studies on teaching the comparison text structure within the same content domain. These studies present evidence of the effectiveness of text structure instruction at the earliest grade levels. They also focus on improving content area reading comprehension for children at-risk for academic failure.

Kay Wijekumar (Texas A&M University) will present findings from a recently completed large scale efficacy study on the web-based intelligent tutoring system for the structure strategy (ITSS) in grade 4,5,7, and 8 in rural and suburban schools. ITSS shown in Figure 1, was developed to present structure strategy instruction on five text structures in social studies, science, current

events, and sports domains. The five text structures presented are: comparison, problem and solution, cause and effect, sequence, and description. The web-based tutor provides modeling, practice, assessment, scaffolding, and feedback to the learner to support the development of skills in selecting, encoding, application, and monitoring of reading comprehension. A multi-site randomized controlled trial was conducted at grades 4,5,7, and 8. Approximately 130 volunteering classrooms at each grade level were randomly assigned to ITSS or business as usual control groups. The ITSS software replaced approximately 30 minutes of language arts instruction per week in the intervention classrooms for the most of the academic year. The business as usual control classrooms used the standard language arts curriculum throughout the year. The Gray Silent Reading Test (Wiederholt and Blalok, 2000), a standardized test of reading comprehension, and researcher-designed measures of signaling word use, main idea quality using the comparison text structure, and total recall and recall competency with the comparison and problem and solution text structures were administered as pre- and post-tests. The research was the first such large-scale study and met the What Works Clearinghouse standards for RCTs (e.g., very low attrition of classrooms).

Bonnie J. F. Meyer (Penn State) will discuss changes in students' understanding of comparative relationships between paragraphs of expository text as students of different proficiency levels in reading comprehension progress across 4th grade to late middle school years. She will focus on individual differences in children's and young adolescents' knowledge of one type of signaling devices, text structure signaling words (broader but similar to: "coherence markers," Sanders, Land, & Mulder, 2007; "clue words," Williams et al. (2005); "conjunctions," Halliday & Hasan (1976)). Text structure signaling words are those words and phrases that explicitly denote the structural relationship among text propositions as well as serve as indicators of the overall rhetorical structure of a text (e.g., "on the other hand, "however, "unlike," "solution") (Meyer, 1975, 1985b). The signaling for comparison text structure was targeted for this investigation because students across these grade levels have some understanding of comparison signaling words, which cue readers to differences and similarities, but can show growth in this understanding across age (e.g., Cain et al., 2005; Meyer, Ray, & Middlemiss, 2012). Meyer et al. found that high, average, and low students in reading comprehension in grades 4, 6, and 9 vary on alternate forms of a two-paragraph comparison text used in a cloze task with blanks for four signaling words: "different," "unlike," "smaller/larger," and "same as." Average comprehenders show the largest gains over the three grade levels, a finding that supports the Meyer, Brandt, & Bluth (1980) finding that signaling words in authentic text particularly help average ninth-grade comprehenders rather than high or low comprehenders. Low comprehenders in the Meyer et al. (2012) study scored at the same low, minimal levels on the signaling test for the comparison text structure across the three grades. These data came from testing most students at these three grades in one school district in Pennsylvania (61% of the students qualified for free or reduced lunch due to family poverty). Meyer will discuss the replication of this study with pretest data from recent IES sponsored efficacy trials with 22 rural and 23 suburban schools in PA or MI (e.g., Wijekumar et al., in press) with 4th, 5th, 7th and 8th grade students. Also, she will discuss how well the structure strategy intervention could remediate understanding of comparison rhetorical structures and signaling words across grade levels for students scoring in the bottom third on reading comprehension for of their grade level.

<u>Karen R. Harris (Arizona State University)</u> will present preliminary results from an on-going IES funded project to integrate text structure instruction with the self-regulated strategies development (SRSD) model of persuasive writing with fifth grade learners (Graham, Harris, & Mason, 2005; Harris, Graham, & Mason, 2006). In this project a unique computer enhanced learning environment is being designed to work in concert with the teacher and peers to improve source-based persuasive writing in fifth grade. The team has conducted two usability studies and one psychometric data collection for the science persuasive writing prompts. Results from these studies and unique aspects of the design of the software to be choreographed with teacher-led and peer supported learning will be presented.

Purpose / Objective / Research Question / Focus of Study:
Description of the focus of the research.
The goal of these large-scale randomized controlled trials was to study whether the structure strategy delivered through ITSS to children in grades 4,5,7, and 8 is efficacious in improving reading comprehension as measured by standardized and researcher designed measures. The research questions at each grade level were similar and we present the 4th grade questions here:

Do 4th grade classrooms using the ITSS system as a partial substitute for the standard language arts curriculum outperform control classrooms on standardized and researcher-designed measures of reading comprehension?

The study also posed exploratory questions to study whether the effect of ITSS delivered instruction about the structure strategy on reading comprehension varies depending on other factors, such as gender, initial reading comprehension proficiency, and locale.

Setting:
Description of the research location.
Rural and suburban schools in two states participated in the study.

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features, or characteristics.

Participants were 4th, 5th, 7th, and 8th grade teachers and students in volunteering rural and suburban schools. Approximately 130 classrooms at each grade level were randomly assigned to intervention ITSS or business as usual control groups.

Intervention / Program / Practice:
Description of the intervention, program, or practice, including details of administration and duration.

ITSS is a web-based intelligent tutoring system designed to provide modeling, practice, assessment, scaffolding, and feedback to the learner. The system shown in Figure 1, presents approximately 12 lessons in each of the five text structures – comparison, problem and solution, cause and effect, sequence, and description. An animated pedagogical agent I.T. models how he would use text structure to read and comprehend texts. He then initiates interactions by asking students to click on signaling words, write main ideas, write recalls, or fill in a matrix main idea pattern as shown in Figure 1. I.T. assesses the student responses immediately and provides

feedback and guides the learner. Each question can have multiple attempts and I.T. provides more assistance to the learner for each attempt in answering the question.

Research Design:
Description of the research design.

A multi-site cluster randomized controlled trial design was employed for the ITSS efficacy studies.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.

A standardized test and researcher designed measures of reading comprehension were administered at pre- and post-tests. To determine if there are differences among intervention levels with respect to reading performance outcomes, a series of hierarchical linear modeling (HLM: Raudenbush and Bryk 2002; Raudenbush, Bryk, and Congdon 2008) equations were specified. Analyses were run for each of the primary dependent variables. Missing data were deleted listwise at the time of analysis for each model to maximize the use of available data.

Findings / Results:
Description of the main findings with specific details.

Children in the ITSS classrooms at all grade levels statistically significantly outperformed the children in control classrooms on all researcher designed measures of reading comprehension (e.g., comparison main idea quality, signaling word knowledge). On the standardized measure of reading comprehension the children in the ITSS classrooms outperformed the children in control classrooms at all grade levels with the fifth grade showing the strongest effect size as well as statistically significant results. Panelist will present findings from all four grade levels (e.g., Table 1) and present evidence from an exploratory analysis of student main ideas. Preliminary reviews of students' main idea responses showed how prior knowledge and previous practices inhibit learning the text structure based skill for summarizing a text effectively.

Conclusions:
Description of conclusions, recommendations, and limitations based on findings.

Text structure based instruction for reading comprehension has shown statistically significant and positive outcomes at early (i.e., grade 2), upper elementary (i.e., grades 4 and 5) and middle grades (i.e., grades 7 and 8). These results also provide replication and extensions of many previous research studies on text structure based instruction. The We-Write project is the first extension of text structure for persuasive writing.

Appendices
Not included in page count.

Appendix A. References
References are to be in APA version 6 format.

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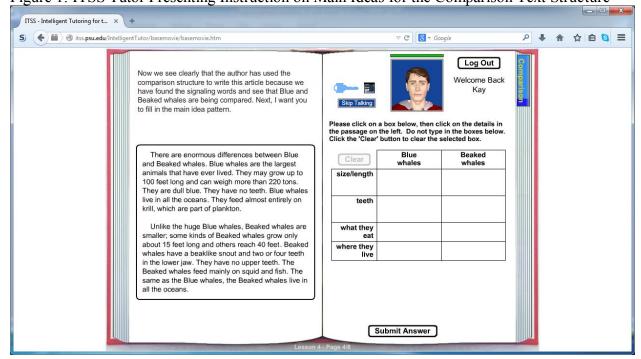
Appendix B. Tables and Figures

Table 1:
Grade 7 Effect Sizes of ITSS on Reading Measures

Measures	Coefficient for ITSS (standard error) from HLM [a]	Pooled student-level pretest standard deviation	Effect size
Gray Silent Reading Test	2.06** (.48)	11.52	.18
Comparison text (1)			
Signaling test	1.59*** (.41)	8.32	.19
Top level structure	.68*** (.12)	1.94	.35
# issues	.27* (.12)	1.48	.18
Competence	.29* (.12)	2.37	.12
Comparison text (2) Advanced			
Top level structure	.49*** (.13)	1.58	.31
# issues	.14* (.06)	.54	.26
Competence	.27** (.10)	1.09	.25
Main Idea			
Top level structure	.70*** (.10)	1.55	.45
# issues	.50*** (.08)	.55	.91
Competence	.37*** (.06)	1.54	.24

Note. Effect size = Adjusted difference between ITSS (coded ½) and Control (coded -½) groups divided by the student-level pooled standard deviation of pretest scores.
[a] Estimates are extracted from model 1; degrees of freedom = 80.
*p<.05, **p<.01, ***p<.001.

Figure 1: ITSS Tutor Presenting Instruction on Main Ideas for the Comparison Text Structure