

Web-Based Intelligent Tutoring for the Structure Strategy (ITSS)

Intervention Brief | Adolescent Literacy Topic Area

WHAT WORKS CLEARINGHOUSE™

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Literacy skills are critical to students’ academic achievement and setting them on a path to successful high school graduation and readiness for college and careers. *Web-Based Intelligent Tutoring for the Structure Strategy (ITSS)* is a supplemental web-based program for students in grades K-8. It is designed to develop literacy skills needed to understand factual texts encountered in classrooms and everyday life. The program teaches students how to follow the logical structure of factual text and to use text structure to improve understanding and recall. In particular, *ITSS* highlights five main text structures that are used to (1) make comparisons; (2) present problems and solutions; (3) link causes and effects; (4) present sequences; and (5) describe things,

people, creatures, places, or events. The program helps students classify the structure of a passage by identifying certain key words, such as “solution” and “in contrast,” that clue readers in to the type of arguments the text is making.

This What Works Clearinghouse (WWC) report, part of the WWC’s Adolescent Literacy topic area, explores the effects of *ITSS* on comprehension. The WWC identified two studies of *ITSS* that meet WWC standards. The evidence presented in this report is from studies of the impacts of *ITSS* on students in grades 4, 5, and 7 and a variety of school settings, including suburban and rural districts.

What Happens When Students Participate in ITSS?

The evidence indicates that implementing *ITSS* is likely to increase students’ comprehension.

Findings on *ITSS* from two studies that meet WWC standards are shown in Table 1. The table reports an effectiveness rating, the improvement index, and the number of studies and

students that contributed to the findings. The improvement index is a measure of the intervention’s effect on an outcome. It can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention.

Table 1. Summary of findings on *ITSS* from studies that meet WWC standards

Outcome domain	Effectiveness rating	Study findings	Evidence meeting WWC standards (version 4.0)	
		Improvement index (percentile points)	Number of studies	Number of students
Comprehension	Positive effects	+9	2	6,724

Note: The improvement index can be interpreted as the expected change in percentile rank for an average student in the comparison group if that student had received the intervention. For example, an improvement index of +9 means that the expected percentile rank of the average comparison group student would increase by 9 points if the student received *ITSS*. The improvement index values are generated by averaging findings from the outcome analyses that meet WWC group design standards, as reported by Wijekumar, Meyer, and Lei (2012, 2017). A positive improvement index does not necessarily mean the estimated effect is statistically significant. Comprehension outcomes include the Gray Silent Reading Test and 13 researcher-designed measures that test students’ ability to understand written text by identifying main ideas, problems and solutions, and assessing the use of structure to organize correct ideas. The effects of *ITSS* are not known for other outcomes within the adolescent literacy topic area, including alphabets, reading fluency, general literacy achievement, writing conventions, writing productivity, and writing quality.

BOX 1. HOW THE WWC REVIEWS AND DESCRIBES EVIDENCE

The WWC evaluates evidence based on the quality and results of reviewed studies. The criteria the WWC uses for evaluating evidence are defined in the [Procedures and Standards Handbooks](#) and the [Review Protocols](#). The studies summarized in this report were reviewed under WWC Standards (version 4.0) and the Adolescent Literacy topic area protocol (version 4.0).

To determine the effectiveness rating, the WWC considers what methods each study used, the direction of the effects, and the number of studies that tested the intervention. The higher the effectiveness rating, the more certain the WWC is about the reported results and about what will happen if the same intervention is implemented again. The following key explains the relationship between effectiveness ratings and the statements used in this report:

Effectiveness rating	Rating interpretation	Description of the evidence
Positive (or negative) effects	The intervention is <i>likely</i> to change an outcome	Strong evidence of a positive effect, with no overriding contrary evidence
Potentially positive (or negative) effects	The intervention <i>may</i> change an outcome	Evidence of a positive effect with no overriding contrary evidence
No discernible effects	The intervention <i>may result in little to no change</i> in an outcome	No affirmative evidence of effects
Mixed effects	The intervention <i>has inconsistent effects</i> on an outcome	Evidence includes studies in at least two of these categories: studies with positive effects, studies with negative effects, or more studies with indeterminate effects than with positive or negative effects

How is *ITSS* Implemented?

The following section provides details of how *ITSS* was implemented. This information can help educators identify the requirements for implementing *ITSS* and determine whether implementing this intervention would be feasible in their districts or schools. Information on *ITSS* presented in this section comes from studies that meet WWC group design standards (Wijekumar et al., 2012, 2017) and from correspondence with the developer.

- **Goal:** *ITSS* aims to improve comprehension of factual (nonfiction) text.
- **Target population:** *ITSS* is designed for students in grades K–8. The two studies that contribute to this intervention report included students in grades 4, 5, and 7.
- **Method of delivery:** *ITSS* is a web-based program, which students access on a personal computer with earphones. It is typically used during class to supplement the English language arts curriculum.

Comparison group: In the two studies that contribute to this intervention report, students in the comparison group received the school’s standard language arts curriculum. Additional information on these curricula is not available. Total daily and weekly amounts of language arts instruction were the same for both intervention and comparison classrooms.

- **Frequency and duration of service:** Developers recommend students use *ITSS* twice a week for about 30 minutes per session for 7 months to 1 year. Refer to Table 2 for additional details.
- **Intervention components:** *ITSS* includes several components (see Table 2).

Table 2. Components of *ITSS*

Key component	Description
Instruction	<i>ITSS</i> models how to use the structure of the factual text to improve understanding and recall. An animated person, called an Intelligent Tutor (I.T.), explains the five main text structures: comparisons, problems and solutions, cause and effect, sequences, and descriptions. Then, the I.T. displays and reads aloud a passage that illustrates a text structure, modeling appropriate techniques for understanding the displayed passage. Techniques include finding signaling words, identifying the text structure, understanding the main idea of the text, and summarizing the text in written form. <i>ITSS</i> provides approximately 12 lessons for each text structure.
Exercises with immediate feedback	<p><i>ITSS</i> offers practice exercises using passages from a variety of substantive areas, including science, social studies, sports, and current events. It assesses student progress and provides learners with immediate feedback. After completing a lesson, the program allows students to practice what they learned in a series of exercises, and students work at their own pace. Each exercise involves reading a passage and then completing a series of tasks, such as finding signaling words, describing the main idea of the text, and summarizing the passage.</p> <p>Most exercises in <i>ITSS</i> follow this sequence:</p> <ol style="list-style-type: none"> 1. Students read nonfiction text displayed on the screen. 2. Students identify the author’s top-level text structure (i.e., comparison, problem and solution, cause and effect, sequence, or description). 3. Students select signaling words used in the text. 4. Students write a sentence summarizing the main idea of the text, which is displayed on the screen, using the structure strategy. 5. Students generate a thorough summary of the text using the <i>ITSS</i> comprehension tools, such as an annotated matrix, diagram, sequence texts, or texts with embedded text structures. 6. Students write a “recall” summary of the text after the text is removed from view. This recall exercise becomes more challenging as students progress through the lessons. In early lessons, students recall and summarize the text while having access to their (or the I.T.’s) main idea summaries from steps 4 or 5. Later practice lessons remove this aid, and students monitor their recall using the structure strategy. More specifically, students use the text structure as a retrieval and writing guide. They monitor their understanding and recall through summarizing the main points according to the recall pattern identified for a particular text structure. 7. Students receive feedback from the I.T. after each step above. In the two studies that contributed to this report, after several unsuccessful attempts, the I.T. offered students hints, showed a model summary of the text, and asked students to correct their work. The students were not allowed to copy the model summary but were asked to think about the text’s structure and main idea and then revise their work. If students were unsuccessful after repeated feedback and increased help from the I.T., the I.T. told students to ask teachers for assistance. <p>The tasks can vary across lessons. Some lessons ask students to write or select a good title for a text based on text structure, write their own texts for each text structure by selecting signaling words from a specified short list, and correct a fictitious student’s muddled use of the text structure strategy. As students complete the exercises, the passages become more difficult.</p>

What Does *ITSS* Cost?

This preliminary list of costs is not designed to be exhaustive; rather, it provides educators an overview of the major cost components of implementing *ITSS*. The program costs described below are based on the information available as of June 2019.

- **Personnel costs:** *ITSS* developers require that school staff who would like to implement the *ITSS* program participate in professional development. In particular, teachers are required to attend a 2-day session, while school administrators are required to attend a 1-day session. The cost of professional development sessions varies from \$2,500 to \$8,000 per session depending on the number of school staff attending the session and the location of the sessions. An additional 4 to 6 days of in-school coaching is also required. No cost information on in-school coaching is available.

- **Facilities costs:** No additional facilities costs are needed to run the *ITSS* program; however, computer labs might be necessary for classrooms without personal computers.
- **Equipment and materials costs:** The *ITSS* web-based program can be accessed by students and educators at no cost.
- **Costs paid by students or parents:** Students and their parents do not pay to access *ITSS*.
- **In-kind supports:** No information on in-kind supports is available.
- **Sources of funding:** School districts typically cover *ITSS* training costs.

For More Information:

About ITSS

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About the studies reviewed

Wijekumar, K., Meyer, B., & Lei, P. (2012). Large-scale randomized controlled trial with 4th graders using intelligent tutoring of the structure strategy to improve nonfiction reading comprehension. *Educational Technology Research & Development*, 60(6), 987-1013. <https://eric.ed.gov/?id=EJ986753>.

Wijekumar, K., Meyer, B.J.F., & Lei, P. (2017). Web-based text structure strategy instruction improves seventh graders' content area reading comprehension. *Journal of Educational Psychology*, 109(6), 741-760. <https://eric.ed.gov/?id=EJ1149967>

In What Context Was ITSS Studied?

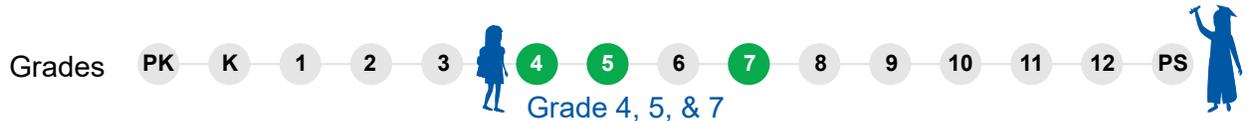
The following section provides information on the setting of the two studies of ITSS that meet WWC standards, and a description of the participants in the research. This information

can help educators understand the context in which the studies of ITSS were conducted, and determine whether the program might be suitable for their setting.

WHERE THE STUDIES WERE CONDUCTED

2 studies, 6,724 students in 2 states

suburban and rural school districts



LEARN MORE



Read more about the ITSS intervention and the studies that are summarized here in the [Intervention Report](#).