

Teaching Struggling Middle School Readers to Comprehend Informational Text

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Abstract: This project involves developing a reading comprehension curriculum based on the Construction-Integration model (Kintsch, 1998) and implementing a pilot efficacy study in middle-school classrooms. The curriculum (BRAVO) explicitly defines the cognitive processes involved in skilled reading, teaching students how to establish local and global text coherence and use background knowledge to create a mental model – the prerequisite to deep, meaningful learning. A crucial and unique component is the use of sequenced texts related to a single over-arching topic, enabling students to use their expanding prior knowledge while reading complex expository texts. BRAVO, consistent with Common Core State Standards, bridges the divide between grade-school narratives and secondary-level textbooks.

Introduction

This report describes an ongoing project to develop a reading comprehension curriculum targeted to middle school children and aligned with Common Core State Standards (CCSS) for comprehending informational texts. Drawing on current cognitive theory and research on comprehension and the limited results of classroom- and lab-based studies, the **Boulder Reading Intervention (BRAVO)** offers a detailed, content-based literacy curriculum. BRAVO is being employed in classrooms as part of the language arts curriculum in participating schools. Most of the instructional components are familiar to educators; what is new here is that the components are organized and motivated by an explicit theory, the Construction-Integration model of comprehension (Kintsch, 1988; 1998). What the theory offers, thus, is a narrative that makes sense of literacy instruction. Our goal here is to figure out just how the various components of the theory need to be integrated and presented so that future teachers can use them creatively and effectively in their work, and not just vainly attempt to follow a script.

Significance of the Project

The BRAVO curriculum addresses an important and widely recognized problem in education, namely, that many children in America read well below national standards. Based on the CI Model, BRAVO helps students understand difficult content-rich, informational text, teaching them to detect and remedy comprehension failures, overcome misconceptions, understand the text meaning and build knowledge. Using middle school science content, students learn how to form coherent and cohesive understandings of the ideas in a text, while integrating the new content with prior knowledge to build rich and flexible knowledge of the topic. Strategy instruction in BRAVO takes place as students work through a graduated series of texts of increasing complexity all related to a single, important theme. They learn appropriate mental processes by means of concrete, targeted activities to help them unlock the meaning of new text while drawing on their growing repository of knowledge about the topic. They work with the new content in various ways so that it becomes integrated in their existing store. This principled approach with its joint focus on comprehension and knowledge building, is what differentiates BRAVO from other reading programs.

Background

The importance of improving reading achievement is not in dispute (e.g., Biancarosa & Snow, 2004). It is critical to address this problem if we are to prevent students from dropping out of high school because they are unable to read well enough to learn from the complex, content-rich materials encountered in the secondary curriculum (Caccamise & Snyder, 2009; Carnegie Council on Advancing Adolescent Literacy (CCAAL), 2010). When students begin upper elementary school, they are expected to read content-area texts (often in the form of a textbook); however, they are rarely provided with instruction on *how* to read informational texts. The result is the well-known fourth-grade slump. Beyond Grade 4, students with inadequate reading skills have difficulty catching up (e.g., Francis & Stuebing, 1996). Even many college-bound students lack the more advanced literacy skills needed to understand content area textbooks and to learn from what they read (Allen & Sconing, 2005).

The problem that many poor readers share is not their inability to read the words on a page but rather their inability to comprehend what they read (Biancarosa & Snow, 2004). Poor readers struggle with issues related to inadequate knowledge: knowledge of content of course, but also knowledge of syntax, of syntactic

markers for logical relations and coherence, and knowledge of the diverse text structures used in expository writing (Hirsch, 2006; Torgesen et al., 2007). Remediation of adolescent literacy difficulties, therefore, is not simply a matter of revisiting elementary school instruction or using easier materials. Instead, it is a matter of providing these readers with explicit, concrete tools for getting the meaning of what they are reading.

Faulty literacy skills are only part of the problem. Building the requisite domain knowledge is also essential (Caccamise & Snyder, 2005; 2009; Kintsch, 1998; Kintsch & Kintsch, 2005). As Torgesen et al. (2007, p. 63) point out, there is “compelling evidence that as students improve their knowledge in any specific area, their ability to comprehend text in that area improves. Consequently, any effort to improve adolescent literacy in the long term must focus on the efficacy of teaching essential content within and across grade levels as an important reform goal”. BRAVO, addresses both the literacy and the knowledge problem together by embedding the instruction of explicit reading comprehension skills within content-area learning.

Attributes and Shortcomings of Existing Practice

A widely used approach to comprehension instruction consists in teaching middle school students comprehension strategies like the ones expert readers use, to be applied in situations where comprehension breaks down. However, this approach also presumes that all students come adequately prepared to form their own interpretations of informational text, that they are able to detect a failure to comprehend, and that they know which strategy or strategies to apply to achieve a more complete and accurate understanding. Expository texts are especially problematic, not only because of the unfamiliar subject matter, but due to the higher density of ideas, lack of coherence and more complicated references employed in such texts. Hence, getting the meaning from assigned readings in content area classes often poses an insurmountable obstacle for these readers. Students who struggle at the text level have no basis from which to determine which strategy or strategies might help them improve or expand their comprehension.

Therefore, we argue that strategy instruction alone cannot meet the needs of readers with comprehension problems, who need to learn how to connect the words, phrases and sentences and larger text segments into coherent, comprehensible ideas — a perspective that is lacking in most comprehension strategy interventions. Moreover, curriculum materials that typically emphasize broad topic coverage are not conducive to building coherent subject matter knowledge that is well elaborated and integrated with personal knowledge. This kind of deep understanding, according to Kintsch (e.g., 1998; Kintsch & Kintsch, 2005), is crucial for creating lasting, usable knowledge.

A Better Pedagogical Model

According to Biancarosa and Snow (2004; also Caccamise & Snyder, 2009; CCAAL, 2010), direct, explicit comprehension instruction, guided by a principled understanding of the learning process and that is *focused on content* is necessary to improve middle and high school literacy. The BRAVO curriculum provides explicit comprehension instruction within a content-area context. The intervention is derived from Kintsch’s (1988, 1998) Construction-Integration (CI) Model of Text Comprehension, which explicitly defines the cognitive processes involved in successful comprehension and learning. Thus, the CI model provides the blueprint for designing instruction, materials, and assessments in BRAVO.

Theoretical and Empirical Rationale: The CI Model of Text Comprehension

The CI model (Kintsch, 1988; 1998), as well as other recent cognitive models (e.g., Graesser, Singer, & Trabasso, 1994; Just & Carpenter, 1987; van den Broek, Young, Tzeng, & Linderholm, 1999) mark a change in comprehension research from an earlier focus on memory representation (i.e., what readers remember *after* they read) to a specification of the mental processes involved in reading (i.e., what readers do *while* they read). This theoretical direction since the 1990s has sought to understand how readers make sense of text word-by-word, line-by-line, and moment-by-moment, developing an understanding of the content as they go along, an understanding that is guided by top-level goals, beliefs, personal skills, and knowledge. Readers’ understanding changes and develops as they read, based on the words on the page and on the meaning they make in their minds from the text and from their own knowledge.

The CI Model describes the cognitive processes of comprehension as the interaction of the *textbase* (*ideas in the text*) and the *situation model* (*integration with own knowledge*). The reader develops a textbase representation from the propositions, or idea units, explicitly stated in the text, inferring information as needed to form a coherent understanding of the text content. The reader builds a situation model representation by integrating the textbase with his or her own background knowledge that is relevant to the text or that is required for comprehension (Kintsch, 1988; 1998). Developing a textbase and building a situation model are dynamic interactive processes that happen simultaneously. Successful comprehension at both levels of processing depend on the reader’s background knowledge: knowledge about the topic, about language use, about expository text structures, as well as knowledge about how strategic processes interact to support the construction of a coherent, accurate and personalized memory representation.

Readers who attend only to the words, phrases and sentences will develop a shallow understanding that does not last. Building a situation model is essential for deep comprehension that is sustained over time. A situation model enables the reader to find a place for new knowledge in the brain by linking the new information to existing pieces of knowledge. These links in the memory network may later serve as cues for retrieving the information in future applications (Ericsson & Kintsch, 1995; Kintsch & Kintsch, 2005).

Many factors prevent inexperienced readers from comprehending text deeply, i.e., from developing a coherent and well-integrated memory representation; some are inherent in the reader, others are features of the texts themselves. For example, readers may lack sufficient topic knowledge to realize what particular non-text knowledge or facts may be relevant to understanding the text at hand (e.g., McNamara & Kintsch, 1996; Voss & Silfies, 1996). In addition to inadequate conceptual background and vocabulary, readers may have difficulty parsing the more complex and less familiar syntactic forms and organizational structures of expository prose (e.g., Meyer, 1975). Difficult, inhospitable text characterizes many content area readings and likewise impedes understanding. Such text factors include the following: ambiguous or indirect references; absence of information that establishes an appropriate context for the content and that provides a link to existing background knowledge; lack of clearly signaled connections between ideas or events; irrelevant details; and sentences with a high density of concepts and propositions (Best, Rowe, Ozuru, & McNamara, 2005; Britton & Gülgöz, 1991; McKeown, Beck, Sinatra, & Loxterman, 1992; McNamara, Kintsch, Songer, & Kintsch, 1996). Textbook writing often avoids linking ideas with connectives and subordinate relationships in the interest of making shorter sentences that conform to readability formulas (Kintsch & Kintsch, 2005). Science textbooks especially feature brief paragraphs of short, choppy sentences, listing facts and definitions with little elaboration or explanation of how they are related. Lacking knowledge of the basic coherence-making processes, struggling readers are unable to make sense of such materials. Short sentences may lure readers into a false sense of understanding, such that they often do not even realize when their understanding is incomplete or how to bootstrap their understanding with appropriate problem-solving strategies (e.g., McNamara, 2007). However, even readers with adequate skills and knowledge, often fail to engage in the effortful, inferential processes needed for deep understanding (Kintsch & Kintsch, 2005; McNamara & Kintsch, 1996). Thus passive, unengaged reading is also a problem for many students.

The BRAVO Intervention

Our project explores the notion that direct, explicit teaching and practicing of the cognitive processes of comprehension *within the context of content learning* can, in fact, enhance cognitive engagement during reading and improve comprehension of text. In accordance with the CI model's emphasis on knowledge building as fundamental to successful comprehension, we believe that an instructional model that teaches comprehension processes simultaneously with content knowledge will be more effective for readers with poor comprehension. McKeown, Beck, and Blake (2009) offer supporting evidence for this argument in their two-year study of 5th graders comparing strategy instruction with and without content focused instruction. Consistent, though small effects favoring the content group were found on recall and on one transfer task. McKeown et al. (2009) argue that although it is important to teach students about reading strategies, instruction should focus primarily on the meaning of the text: how to construct a coherent understanding of the content.

This is precisely the goal of BRAVO. In BRAVO knowledge building at both the textbase and situation model levels is supported by working through a series of carefully sequenced texts and learning activities pertaining to a single overarching topic. Rather than end-of-chapter questions and strategy instruction applied to different text genres and topics, students learn how to deeply comprehend and how to monitor and remediate comprehension problems in the context of learning thematically related content. During the 8-week course of instruction students expand their knowledge of the topic, using texts that vary conceptually, structurally, and linguistically. They become familiar with different mid-level organizing structures used in informational text, such as sequence, cause-effect, problem-solution, and compare and contrast.

The curriculum is divided into four modules. In expert reading, comprehension occurs at different levels of processing more or less simultaneously and in an integrative fashion. However, for ease of presentation and learning the first three modules in this curriculum deal with comprehension problems that occur at each level in turn, organized from easier to more difficult. The goal throughout is coherence building: within and between sentences in Module 1, between paragraphs and larger segments of text in Module 2, finally dealing with inferential complexity in Module 3. In Module 4 students review these comprehension skills, while integrating the content across all the chapters to form a situation model of the overall theme of ecology.

The texts that students read were manipulated so that students learn to recognize and repair particular problems at each processing level. Thus the three texts for each module are sequenced to first illustrate the particular comprehension problem, followed by "problem" texts that feature coherence gaps and diminishing textual support. In this way, students learn to treat the comprehension of complex text as a problem-solving activity for which they learn the appropriate remedial strategies. The text manipulations reflect real "problems" that students encounter in "authentic" texts such as the lack of explicit signal words to indicate topic transition,

or the use of pronouns and other co-referents to refer back to the subject from an earlier line/section in the text. The texts in Module 3 were manipulated to elicit deeper inferencing on the part of the reader with each subsequent text.

An overview of the instructional curriculum is as follows:

In Module 1 students learn to identify various signals to local, inter-sentential connections, for example, by identifying the referents of pronouns and synonymous terms, identifying and filling in missing connections (e.g., *then*, *and so*, *for example*, *because*, *also*, etc.), and clarifying unfamiliar vocabulary. In so doing they become familiar with more complex sentence structures and learn to form gist statements at the paragraph level as they re-read the text chapter.

Module 2 focuses on identifying textual signals to the underlying structure, (e.g., headings, subheadings, boldface terms, and global level connectives (e.g., *in sum*, *an example of X*, *as a result*, *in contrast*, etc.) that signal different kinds of mid-level and overall structures (e.g., compare-contrast, steps in a process, definition-example, problem-solution); they organize the content into graphic organizers that make the structure explicit; they write summaries that subsume several paragraphs and the entire text chapter. As they proceed through successive chapters they also select key concepts to include in a concept map of the overall ecology theme.

Module 3 addresses the more effortful, inferential kinds of processes that are essential to constructing deep and lasting, personalized memory for the material. Students learn about inferring beyond the text meaning, how to recognize when inferences need to be made and which inferences are appropriate. Appropriate inferences are ones that fill out and elaborate the author's meaning, for example, relevant implications, predictions, self questioning and explaining, critical evaluations, stating how current text relates to previous ones, and the like.

Each sequenced text in Modules 1-3 introduces science concepts while also referring back to concepts presented in previous chapters, helping students reinforce concepts and relations among concepts both within and across texts. The single overview text in Module 4 sets the stage for integration and review, in which students focus on semantically linking ecology concepts from the previous texts, while engaging in all of the coherence building and inferential tools used by expert readers. An important activity is labeling the relations between concepts in their concept maps, thereby creating an overt situation model of their understanding. Finally, students consolidate their knowledge by writing an opinion essay addressing a broad problem in the field of ecology.

Interim Outcomes

In our most recently completed Colorado implementation (AY2012-2013) to test the feasibility of BRAVO as a model for how to improve comprehension instruction for middle school struggling readers and learners, middle school teachers were provided with professional development and ongoing mentoring as they implemented the 8-week program. Before starting BRAVO and right after completing the program, students read one of two counterbalanced, unfamiliar expository texts followed by a written recall task. A paired-samples t-test was conducted to compare recall performance collected before and after implementing BRAVO in the classroom. Results show a significant improvement in the scores for the posttest ($M = 7.90$, $SD = 3.22$) compared to the pretest ($M = 5.73$, $SD = 2.54$), $t(44) = 4.418$, $p < .001$. The effect size for this difference is .37. When compared against the annual reading gain effect size of .24 for an average middle school student across seven nationally normed tests, it suggests that BRAVO improved comprehension skills. Furthermore, as the students in this sample were in remedial reading support classes, the improvement in this population is quite promising. A larger, controlled efficacy study is underway this year in both general classrooms and reading resource classrooms.

Relevance to the Conference Theme

Comprehension instruction in BRAVO focuses directly and explicitly on the mental processes that serve the cumulative building of content knowledge during reading. The conference theme, "Learning and Becoming in Practice" is realized here by developing students' content knowledge as they learn about and practice expert comprehension skills. Thus, at the conclusion of a lesson sequence we anticipate that students who have exhibited poor understanding of content area reading assignments will be empowered to read complex, grade-level informative texts, texts that they were previously unable to fathom. In the pilot study currently underway we expect to demonstrate (a) the feasibility of comprehension instruction based on theoretically specified cognitive processes within a content oriented framework; and (b) the fidelity of implementing the intervention in a typical educational setting.

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