Boost Reading

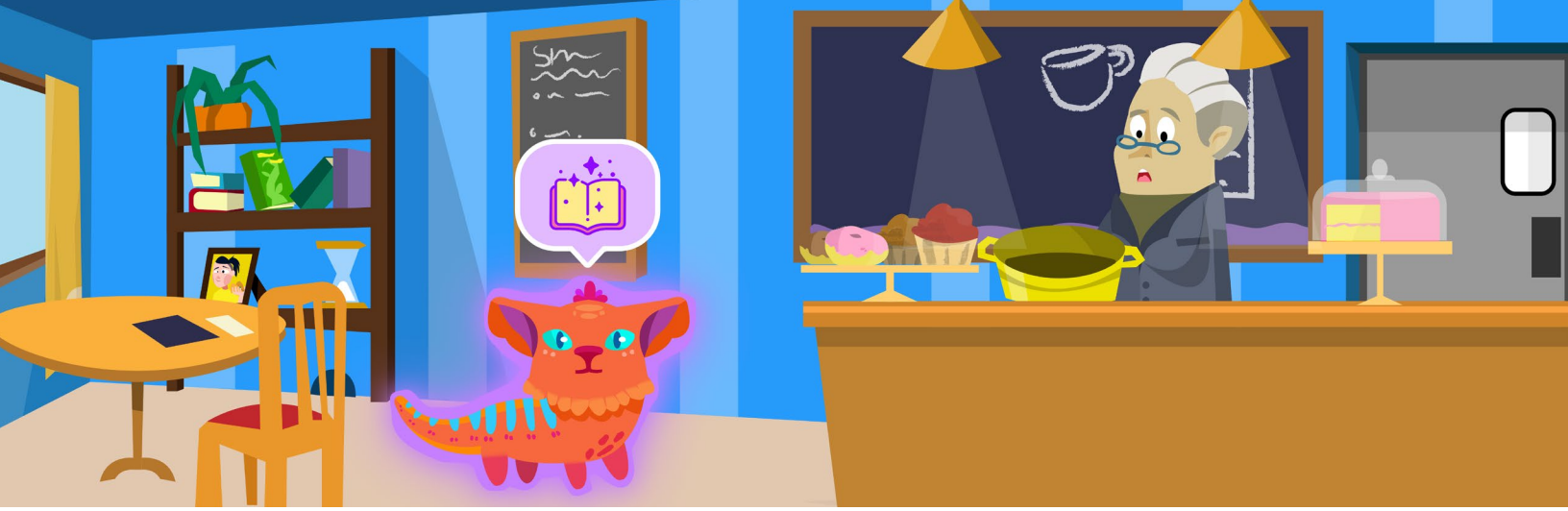
The missing link in reading comprehension

Amplify.

Introduction to Boost Reading

Boost Reading is a supplemental digital literacy program that provides students with practice and explicit instruction in the underlying phonics, phonological awareness, vocabulary, and comprehension skills that are essential for fluent reading with strong comprehension (e.g., Cartwright, 2010; NICHD, 2000; Oakhill, Cain, & Elbro, 2015). It is a research-based, standards-aligned curriculum that engages and motivates students through a variety of mini-games, each focusing on building proficiency in foundational reading skills, while also providing opportunities to apply those skills in increasingly complex texts.

The program was designed to include the content most effective at building the word reading and comprehension skills of elementary students (e.g., NICHD, 2000; NIFL, 2008), including at-risk and struggling readers (e.g., NICHD, 2000) and English learners (e.g., August & Shanahan, 2006). The purpose of this paper is to describe the approach to reading comprehension instruction incorporated into Boost Reading.



The state of reading comprehension research

Comprehension instruction in Boost Reading is grounded in the most current research on what strong readers do to make meaning from text. Comprehension instruction often focuses on the products of good comprehension (e.g., demonstrations of understanding after reading is complete), rather than on the processes of comprehension (e.g., the activities a reader does to build a mental model to comprehend text during reading) (Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007). However, a large body of research has documented the underlying skills critical for reading comprehension (e.g., Cartwright, 2010; Oakhill, et al., 2015)—these are the skills necessary for building a mental model or a network of idea units, which readers construct in order to comprehend the gist of what they are reading (e.g., Graesser, Singer, & Trabasso, 1994; Kintsch, 1988). Students who struggle with reading comprehension are often weak in the underlying language and literacy abilities required to create this coherent mental model (e.g., Cartwright, 2010; Oakhill, et al., 2015). These underlying skills are collectively referred to as comprehension processes.

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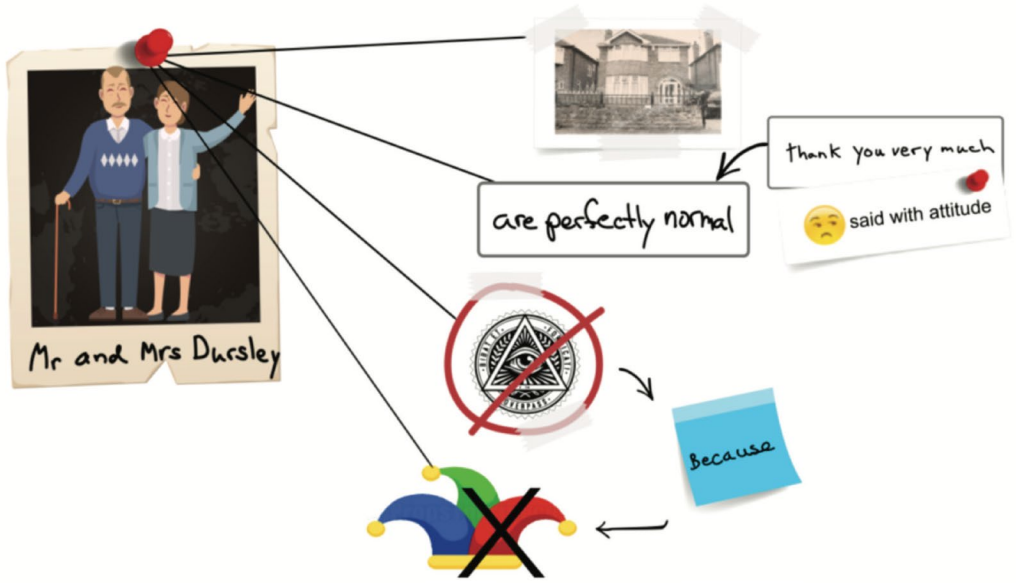
Comprehension processes: A new way of thinking about reading comprehension

In order to illustrate the importance of a solid mental model of a text, consider the following excerpt from Harry Potter (Rowling, 1998 as cited in Graesser, McNamara, & Louwerse, 2002;).

> "Mr. and Mrs. Dursley, of number four, Privet Drive, were proud to say that they were perfectly normal, thank you very much. They were the last people you'd expect to be involved in anything strange or mysterious, because they just didn't hold with such nonsense."

Set aside this paper and try to recall as much as you can of the Dursley's passage.

Most likely, you did not recall the precise wording—at least, not much of it. But you had the ideas: The Dursleys live on Privet Drive; they don't get involved with weird goings-on; because they believe that sort of thing is nonsense. Researchers use the term "mental model" to describe the structure you created in your memory to perform this feat (see Oakhill, et al., 2015; Willingham, 2017). We can think of a mental model as a network of idea units, perhaps something like this:



Poor mental models also help explain two findings from research into reading comprehension. The first is that readers who are poor at answering one type of comprehension question, such as finding the main idea of a passage, are typically equally poor at answering other types of comprehension questions, such as tracing the development of a character or predicting what will happen next (ACT, 2006). The second is that teaching strategies that address those weaknesses—teaching main-idea- finding or prediction—at first produce a gain in comprehension but, if taught repeatedly (as such strategies are in most ELA classrooms across the country), have little benefit (Willingham & Lovette, 2014).

The explanation for both of these findings lies in a new way of thinking about comprehension. Historically, educators have thought about the process of comprehension—everything that happens after each word is recognized—as a black box. But the Dursley's passage reveals two levels of comprehension at work: comprehension processes and comprehension products. Comprehension processes are what you do to build a mental model of a text during reading. Comprehension products are the work you are able to do with that model after reading, such as identifying the theme, or a character's changing beliefs.

If you've built a mental model from a text (comprehension processes) but executed it poorly, your answers to questions about that text (comprehension products) will also be poor. For example, if you do not notice that the narrator of The Tell-Tale Heart's goal is not what he says it is, you will struggle to answer any comprehension question about the story. Developing readers do not need more practice answering macro questions—which is often the target of comprehension strategy instruction and certain types of text-dependent questions. What they need are better comprehension processes: a better mental model.

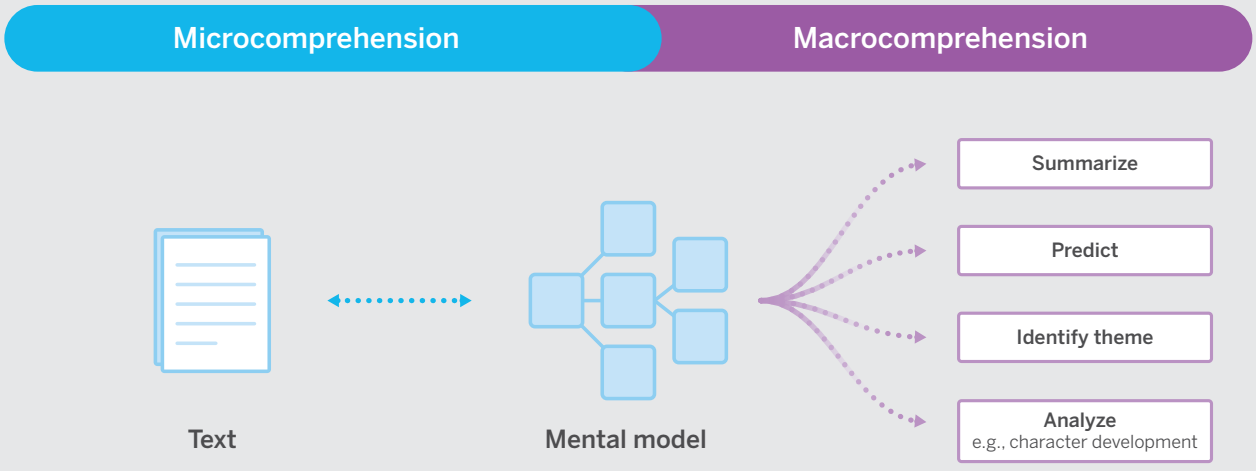


Figure 2. Microcomprehension (building the mental model) versus macrocomprehension (using the mental model)

Research on model-building

For decades, researchers have painstakingly uncovered the skills that weak comprehenders lack (e.g., Oakhill, et al., 2015; Cartwright, 2010; Graessar, et al., 1994).

Research has also documented that two drivers of poor model-building are lack of vocabulary (i.e., lack of knowledge of individual words impedes the ability to fit those ideas into the model) (Carroll, 1993 as cited in Oakhill, et al., 2015; Ouellette, 2006) and dysfluent decoding (i.e., spending too many cognitive resources during decoding leaves little left over for model construction) (LaBerge & Samuels, 1974; Pikulski & Chard, 2005). However, there are also readers with fluent decoding skills and solid vocabularies, yet poor comprehension (Cartwright, 2010). To better understand why these students are struggling and how to improve their skills, researchers have honed in on specific situations that cause these readers to struggle. For instance, compare these two sentences:

Weak comprehenders struggle with who "he" refers to in the first sentence but have no trouble with the "she" in the second. Stronger comprehenders get both automatically.

> Santiago lent his car to Peter because he had missed the last train.

> Santiago lent his car to Olivia because she had missed the last train.

Automaticity is a critical concept. Cognitive skills that are automatic are things you can do with no conscious effort, incredibly quickly and inescapably. (You can't not figure out that "she" refers to Olivia.) Weak comprehenders can figure out the first sentence if given time (and if they notice they didn't get it on the first read which many do not), but the additional cognitive effort distracts from model-building (Mesmer, 2017; Oakhill, et al., 2015; Megherbi & Ehrlich, 2005; Yuill & Oakhill, 1988). If you are learning to drive a stick-shift car, you don't have attention left over to hold a conversation with a passenger. Once your gear-shifting skills have become automatic, you can easily do so. For beginning readers, much of what they read feels like holding three conversations while shifting gears.

Leading researchers Oakhill and Cain catalogued these model-building skills using the term "inference" (Oakhill, et al., 2015). At roughly the same time, Graesser at

the University of Memphis was exploring the same topic from the direction of "coherence:" good texts have coherence (they aren't just collections of unrelated sentences) but poor mental models lack it (Graesser, et al., 2002). For the purposes of understanding the full research base in order to develop programs that effectively teach the skills elementary students need to build effective mental models, the work of these leaders in the field and others has been combined under the umbrella term "comprehension processes."

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There may be as many as 17 comprehension processes that impact students' ability to build and use their mental models, but these have been narrowed here to those that are most supported by the literature—both through evidence that weak comprehenders struggle with them, and evidence that if these skills are practiced, the targeted skill and overall comprehension improves. Below is a list of just some of these skills. sfavafd

Anaphora

Writers avoid repeating things like characters' names. Instead, they assume readers can figure out who they mean. The Santiago sentences above were examples. Poor comprehenders are weak in processing pronoun relationships (Megherbi & Ehrlich, 2005), identifying antecedents, and answering questions that require resolution of anaphora (Yuill & Oakhill, 1988). Explicit instruction in identifying anaphor-antecedent relationships and then practicein longer texts improves students' ability to correctly identify these relationships in short passages, as well as longer narrative and informational texts (Baumann, 1986; Dommes, Gersten, & Carnine, 1984).

Marker words

Writers use connective words (e.g., so, though, yet), structure cues (e.g., meanwhile), and predictive cues (e.g., "there are three reasons why...") to signal ways that the text fits together. Students' understanding of the use of marker words and their meanings supports text comprehension through more efficient text processing and integration (Halliday & Hasan, 1976), especially for readers with limited background knowledge of a given text (McNamara, Kintsch, Songer, & Kintsch, 1996). One reason some students struggle with reading comprehension is limited knowledge of the meaning and function of these words (Oakhill, et al., 2015). Instruction that 1) teaches the meanings of these marker words in context through varied examples and 2) includes an aspect of sentence manipulation (like combining) improves students' understanding of these marker words (Crosson & Lesaux, 2013; Mesmer, 2017; Oakhill, et al., 2015).

Gap-filling inference

Writers make assumptions about what can be left unstated. For instance, when reading "Carla forgot her umbrella and got soaking wet," good readers will seamlessly use their prior knowledge to conclude that it rained. A lack of awareness of when and how to activate background knowledge to fill in the gaps may hinder a student's ability to make inferences and comprehend the text as a whole (Cain and Oakhill, 1999). When students are given the opportunity to practice making inferences with explicit instruction that probes the type of information that is left out, students' ability to activate relevant prior knowledge and make inferences is improved (Elleman, 2017; McMaster, et al., 2012; Oakhill, et al., 2015).

Comprehension monitoring

It may seem obvious to good readers that, when something doesn't make sense, you stop, re- read, and try to figure it out. Weaker readers often just keep going or do not recognize that something they are reading is disrupting their mental model. Young children and children with reading comprehension difficulties may find it difficult to monitor their comprehension (Englert, Hiebert, & Stewart, 1988; Helder, Van Leijenhorst, & van den Broek, 2016; Markman, 1979; Rubman & Salatas Waters, 2000), particularly when the information they are attempting to integrate is separated by some distance (Oakhill, Hartt, & Samols, 2005). Interventions focused on giving students opportunities to find pieces of text that do not match with information they read earlier in the passage build proficiency in this skill (Markman, 1979; Oakhill, et al., 2015).

Text schema

Proficient readers use their knowledge of different types of text to help them build a coherent mental model of what they are reading. The set of expectations about the internal structure of a text is constrained by its schema, or type (Mandler & Johnson, 1977). Each schema has its own set of rules that authors follow to organize the text, from overall topics, to specific vocabulary and syntactic structures (Littlefair, 1991). As readers become familiar with different types of schema, they become better at using the conventions of the schema to structure their own learning, thus increasing their comprehension (Mandler & Johnson, 1977; Meyer & Rey, 2011). Research suggests that when students are taught about the different ways authors organize text, they are better able to recall details about texts, and have better overall reading comprehension (Meyer & Ray, 2011).

Visualizing the model

When students create an imagined visualization of the story they are reading, this enhances their comprehension of the text (Graesser, Singer, & Trabasso, 1994). As students read and construct a mental model of the text, they constantly refer to and update this model as the story evolves. Strategies such as manipulating story-related objects and creating physical storyboards with images may help students to monitor their comprehension for meaning and derive the inferences needed in order to construct and update a coherent mental model of a text as the story evolves (Glenberg et al., 2004; Rubman & Salatas Waters, 2000).

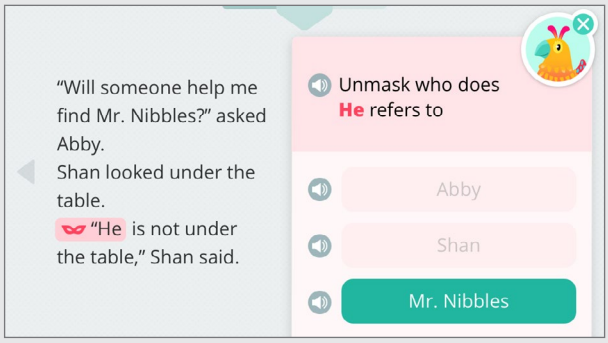
Comprehension processes in Boost Reading

All readers, especially students struggling with comprehension, can benefit from instruction in these and other comprehension processes. These skills are addressed in multiple contexts within Boost Reading. When explicit instruction is required, students engage in mini-games that include models of the skill with think- aloud instruction and clear and consistent feedback. These mini-games give students opportunities to practice these critical skills with increasingly challenging texts. The content is tightly controlled, allowing students to focus on the critical skill rather than other skills or text variables. The skills are introduced and then reviewed over the course of the program. Because using knowledge across tasks promotes student learning, (Merrill, 2002) Boost Reading encourages generalization through ebooks with embedded activities that reinforce skills recently practiced in related games in longer, more authentic texts. For example, students learn the concept of anaphora in a game called UnMask That! They begin by linking pronouns to their referents within single and then multiple sentences and then short paragraphs. After practicing the skill and demonstrating a degree of proficiency, they will encounter anaphora in their e-reader texts. Students are reminded to use what they have learned with an UnMask That! Icon embedded within the text.

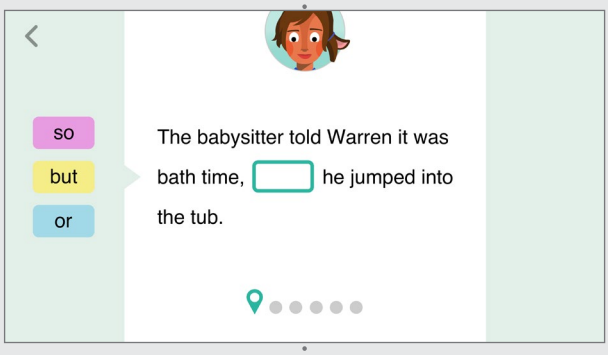
Providing instruction in this way will help all students to gain and practice the skills needed to build their mental models of text. Instruction in comprehension processes is provided in addition to instruction that includes work on comprehension skills. Because Boost Reading is responsive to student performance within the games (i.e., it adapts based on how students respond to tasks within and across games), the program is able to target the specific areas of need for each student, allowing them to practice those skills where they struggle and to later use their mental model building skills to respond to and analyze increasingly complex texts.

Figure 3. A sample of microcomprehension games in Boost Reading

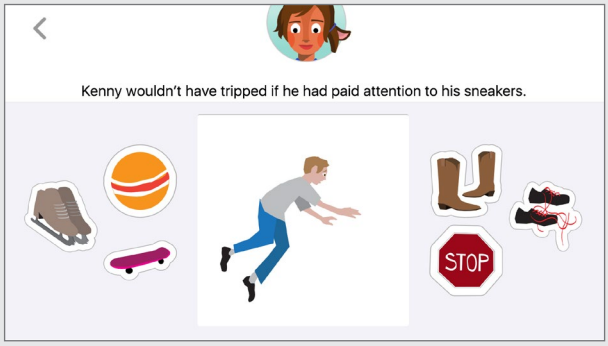
a. Anaphora in authentic text



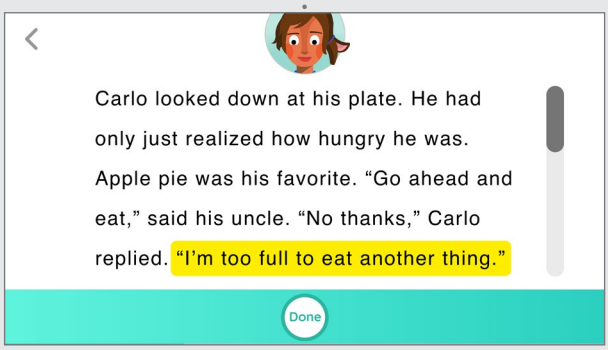
b. Connective words



c. Gap-filling inference



d. Comprehension monitoring



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