Lerner DIGITAL™
interactive books

WHAT THE RESEARCH SAYS:

How Lerner Interactive Books Support Reading Comprehension and Content Knowledge Acquisition

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WHITE PAPER

WHAT THE RESEARCH SAYS: HOW LERNER INTERACTIVE BOOKS SUPPORT READING COMPREHENSION AND CONTENT KNOWLEDGE ACQUISITION

The instructional value of reading to children has long been understood. In today's classrooms, however, time for such reading is limited and often takes place only in a group context. This in turn limits the benefits that students, particularly struggling readers, might otherwise be able to gain from this type of interactive reading experience.

Lerner Interactive Books represents one solution to this dilemma. These best-selling nonfiction books for grades K–5 have now been released in an interactive, electronic format that allows students to read on the computer while listening and tracking the narrated text and viewing the illustrations.

The purpose of this white paper is to describe some of the research-supported instructional benefits related to reading comprehension and content knowledge acquisition that can come from use of this interactive format.

WHAT ARE LERNER INTERACTIVE BOOKS?

Lerner Interactive Books are nonfiction books featuring audio support and interactive elements to promote learning. Key features include the following:

Focus on essential standards-based, age-appropriate content

Two speeds of audio narration that can be selected or turned off by students

Text that highlights as it is read aloud

The ability to double-click a word to hear it pronounced again

Tools that allow students and educators to write or draw, highlight, and erase on any page

Appropriate illustrations and full-color photography that support the development of content knowledge

Interactive glossary and index as appropriate for some books with a specific content focus

A comprehension quiz

Interactive activities that allow students to engage further with content covered in the books

COMMON MODELS FOR USING LERNER INTERACTIVE BOOKS

Common instructional models for using Lerner Interactive Books include the following:

Students read the Lerner Interactive Books independently at a computer.

Struggling readers read the Lerner Interactive Books individually at a computer under the supervision or guidance of a teacher, ESL teacher or special education instructor, librarian, or aide.

A teacher, librarian, or aide guides a small group of students through a Lerner Interactive Book using a computer, set of computers, or interactive whiteboard while the rest of the class completes another activity.

A teacher or librarian uses a Lerner Interactive Book as a resource for large-group or whole-class instruction, using a computer projection system or interactive whiteboard.

Students read the Lerner Interactive Books at home on a computer with parents (e.g., on school laptops available for checkout).

ABOUT THIS WHITE PAPER

The remainder of this white paper includes the following informative sections:

An executive summary presenting key findings from the body of research

Separate sections describing the research-based advantages of Lerner Interactive Books as a resource for:

- ***Learning through sight and sound***
- ***Acquiring content knowledge despite decoding barriers***
- ***Exposure to models of fluent reading***
- ***Choice of narration speed***

Conclusion

EXECUTIVE SUMMARY—KEY FINDINGS

Research presented in the sections that follow support the following findings:

Research evidence suggests that simultaneous presentation of text visually and auditorily can aid comprehension, especially among struggling students (Balajthy, 2005; Montali & Lewandowski, 1996; Ruzic & O'Connell, 2001; Weinberger, 2004).

Such bi-modal presentation of text can help support student acquisition of age-appropriate content knowledge despite difficulties in decoding text (Howard, 2004; Montali & Lewandowski, 1996; Weinberger, 2004).

Research-informed expert opinion suggests a value in helping students develop fluency by supporting student reading with the availability of spoken narration (McKenna et al., 1999; Montali & Lewandowski, 1996; Weinberger, 2004).

Research supports the value in reading-while-listening (RWL) activities of providing text that is spoken at roughly the same speed as the listeners' reading rate and of allowing students to select their preferred listening speed (Bergman; 1999; McMahon, 1983).

LEARNING THROUGH SIGHT AND SOUND

Research evidence suggests that simultaneous presentation of text visually and auditorily can aid comprehension, especially among struggling students. Montali and Lewandowski (1996) explained the theory behind this approach as follows:

Various studies have investigated individuals' task performance when they were given auditory, visual, or bi-modal stimuli. By measuring participants' reaction time…researchers have commonly found a facilitative effect of the bi-modal condition when stimuli presented to each sensory channel were the same or functionally related….Students with reading disabilities do not automatically acquire sound-symbol knowledge. Instead, they build incorrect connections….A bi-modal technique presumably would increase exposure to words via sight and sound, thereby increasing exposure to correct visual-to-auditory matches…and, hence, strengthening sound-symbol associations. At the same time, the two sensory channels may act as backups for each other by filling in the gaps missed by one sensory input (either auditory or visual) (pp. 271–272).

In general, bi-modal presentation has been found to enhance recall (Montali & Lewandowski, 1996, p. 271).

The value of listening as a learning mode for younger students has been attested by research. Montali and Lewandowski (1996) summarized "studies investigating differences in comprehension achieved via reading silently, reading orally, or simply listening [which] found that silent reading appears to be significantly less effective for comprehension than either oral reading or listening for young and less skilled readers" (p. 272, citing Fletcher & Pumfrey, 1988; Miller & Smith, 1990). They cited a recommendation that "teachers read to pupils as a means of enhancing their comprehension," but went on to point out that "[u]nfortunately, it is not often practical for teachers to read to students one-on-one, due to shortages of time and human resources" (p. 272). Use of "bi-modal reading via computer"—reading words while hearing them spoken—was proposed as a possible solution to this shortage of resources (Montali & Lewandowski, 1996, p. 272).

*"**The value of listening** as a learning mode for younger students has been attested by research."*

More specifically, Montali and Lewandowski argued that bi-modal reading may improve comprehension by strengthening automaticity in word recognition and freeing up cognitive resources for higher-level tasks (1996, p. 272). They summarized previous research on this point as follows:

> Previous research in a variety of areas suggests that a bi-modal presentation of text material will offer poor readers benefits in decoding words, recalling text information, and feeling confident in their comprehension abilities (p. 273, following summarization of Elkind, Cohen, & Murray, 1993; Olson, Foltz, & Wise, 1986; Wise, 1992; Wise et al., 1989; Wise, Olson, & Treiman, 1990).

These findings were borne out by Montali and Lewandowski's own research. In a study of 18 average readers and 18 less skilled readers in junior high school, they found that:

> less skilled readers comprehended more with bi-modal versus uni-modal presentations. Overall, their performance in the bi-modal condition was commensurate with average readers' comprehension in the visual condition....In addition, results of a brief consumer satisfaction survey suggested that low-skilled readers felt most successful in terms of their comprehension when passages were presented bi-modally (1996, p. 271).

Research on text-to-speech systems (TTS) has generally confirmed these positive findings. A report published by the CAST National Center on Accessing the General Curriculum examined research studies on the use of text-to-speech capabilities in classrooms. Four studies they examined looked at text-to-speech in a reading context by individual students with reading disabilities. All four of these studies, each of which included students in the K-6 grade range, found that use of text-to-speech was associated with increased learning (Ruzic & O'Connell, 2001, citing Dawson et al., 2000; Farmer et al., 1992; Hebert & Murdock, 1994; McCullough, 1995). Based on these studies, the researchers concluded that TTS is a potentially promising resource for "helping students with reading disabilities comprehend written materials" (Ruzic & O'Connell, 2001).

Another survey of research literature cited studies finding that "combined visual and auditory presentation of text by TTS software improves comprehension, especially for struggling readers" (Balajthy, 2005, citing Disseldorp & Chambers, 2002; Leong, 1995; Wise & Olson,1994). Weinberger (2004) summarized evidence in this area as finding that "[m]ulti-sensory support in learning targeted words as well as opportunities for consistent, meaningful practice, have been shown to help struggling students become more accurate and fluent readers" (p. 5).

> ***[M]ulti-sensory support*** *in learning targeted words as well as opportunities for consistent, meaningful practice, have been shown to help struggling students become more accurate and fluent readers.*

HOW LERNER INTERACTIVE BOOKS SUPPORT STUDENT LEARNING THROUGH SIGHT AND SOUND

By simultaneously providing written text for students to look at and spoken narration for students to listen to, Lerner Interactive Books support bi-modal learning. The highlighting of each word as it is spoken draws the reader's attention to the sound-symbol correspondence. These audio and visual features can be paused for convenience if desired. Students who do not need this extra level of support have the option to turn off the narration.

ACQUIRING CONTENT KNOWLEDGE DESPITE DECODING BARRIERS

Reading is more than a set of essential skills children must master. Starting in the elementary grades and increasingly as children get older, reading is also an essential medium for learning about the world. Limitations in reading skill become bottlenecks for acquisition of other kinds of knowledge, thus making it more difficult for poor readers to learn in other areas as well. Because knowledge about the world in turn impacts reading ability, this can contribute to a vicious circle sometimes referred to as the "Matthew effect" in which poor readers find it increasingly hard to make up their deficits as they get older (Stanovich, 1986, as summarized in Weinberger, 2004, p. 3).

This gap between the content knowledge students need to develop and the reading skills needed to acquire that knowledge can be particularly large for beginning readers, struggling readers, and English language learners. A first grade teacher noted:

> My first graders have plenty of ability to comprehend text and ideas, but not all of them have the skills to decode at as high a level as they can comprehend....Selecting learning materials solely on the basis of students' decoding ability rather than their ability to comprehend the content can create an imbalance in students' reading skills as they get older (Howard, 2004, p. 27).

As Howard indicated, students' problems with reading often relate specifically to decoding. Montali and Lewandowski (1996) similarly noted, "The poor reader is characteristically a child who demonstrates deficiencies in phonological/auditory processing...and/or orthographic/visual processing" (p. 271, citing Liberman & Shankweiler, 1985; Vellutino, Steger, Moyer, Harding, & Niles, 1977; Raynor, 1986).

In such cases, it is critical that students' ability to acquire content knowledge not be limited by their decoding deficits. Weinberger (2004) advised:

> In the case of struggling readers, reading for content and information should not be limited by decoding ability. When there is a divergence in these skill levels, efforts should be made to provide access to grade-level content. . . . Reading materials should be selected based on speaking and listening ability to allow students to function at their cognitive rather than their reading levels. This may mean providing accommodations to make these materials accessible. (Weinberger, 2004, p. 4, summarizing Califee, Chambliss, & Beretz, 1991; Fielding & Pearson, 1994).

Where students know the meaning of spoken words but are not able to decode them, text narration has the potential to help them learn the content despite decoding barriers. Howard (2004) demonstrated this by selecting four science texts at varied levels of reading difficulty for her first grade students to use during guided reading and then creating both an audiotaped narration and (for students needing more support) an electronic version of the book using scanned images of the pages and text-to-speech software so that students could either highlight words to be read aloud or choose to have an entire page read to them. Howard reported:

> I was amazed at the way the guided reading time turned out. All of my students were focused, engaged, and curious....Students were discussing the questions with their partners, pointing out things they noticed, and asking each other questions. During our wrap-up time, when we shared what we learned from the books, students saw what their classmates were reading and learning. The students that I assigned to use the digitized book with [an ebook reader] were able to find examples to support each of the questions and to participate in our discussion. They were using [the ebook reader] to read aloud the words they did not know and then to read on their own. Many asked if they could read the other books the next day. Because I had provided multiple scaffolds for the books, students were able to read the other books when they wanted, either independently, with a partner, on audiotape, or on the computer....At the end of the unit, and even well into a different study, my first graders still retained the knowledge they had gained.
>
> The preparation was time consuming—3–5 hours. However, the time spent was well worth it....When reading books they chose and knowing that they had ways to get help on words they didn't know, my students[’] attention spans improved greatly (pp. 28–29).

HOW LERNER INTERACTIVE BOOKS SUPPORT STUDENT ACQUISITION OF CONTENT KNOWLEDGE DESPITE DECODING BARRIERS

Spoken narration supports students in learning from Lerner Interactive Books, even when their decoding skills are not up to the task of reading the individual words. Lerner Interactive Books present important age-appropriate nonfiction content, thus helping to support students' acquisition of content knowledge. Such books support the kind of use described by Howard (2004) but without the expenditure of teacher time to prepare the materials.

EXPOSURE TO MODELS OF FLUENT READING

Simultaneously reading while listening (RWL) has the potential to help improve student fluency, both by increasing automaticity of word recognition as noted above and by providing models for fluent reading. Montali and Lewandowski (1996) wrote:

> Automaticity in word recognition is important to the reading process, as comprehension depends on it (Perfetti, 1985; Seidenberg & McClelland, 1989; Stanovich, 1986). Children who are not decoding at their expected level often have difficulty comprehending the material....Bi-modal instruction could facilitate comprehension by providing the reader with exposure to unknown sight words and at the same time modeling the correct pronunciation of words (p. 271).

Bi-modal instruction *could facilitate comprehension by providing the reader with exposure to unknown sight words and at the same time modeling the correct pronunciation of words.*

Based on an analysis of existing research in light of developmental stage theory in reading, McKenna et al. (1999) specifically recommended "[w]ide reading of electronic trade books" as a strategy to help in "moving children to the point of fluency":

> Because reading is supported by built-in resources, like digitized pronunciations, problem readers can read books at or near their listening level at classroom centers of in lab settings. The growing availability of such books offers a powerful tool to teachers faced with the dilemma of assisting children in the upper elementary grades to achieve fluency (p. 118).

Weinberger (2004) summarized a research comparison of three methods of reading-while-listening as finding that "[s]imultaneous oral reading while listening to text promoted fluency in struggling readers" (p. 10, summarizing Van Bon et al., 1991).

HOW LERNER INTERACTIVE BOOKS SUPPORT FLUENT READING

Narration in Lerner Interactive Books provides a model that students can listen to as they follow along in the printed text. Because each word is highlighted as it is spoken, students can easily follow the flow of the text. By clicking on individual words, students can hear them pronounced as often as desired.

CHOICE OF NARRATION SPEED

McMahon (1983) speculated that differences in results from various studies of reading-while-listening (RWL) activities could be explained by a mismatch in some cases between students' own reading rates and the speed of narrated text. This hypothesis was borne out by research with 15 first grade students and 15 third grade students. Asked to identify mismatches between the text they were hearing and what they read on the printed page, students at both levels "performed the task well at their own oral reading rates" (p. 38). Students also did "reasonably well" when the narration was 35% faster than their oral reading rates (p. 45). However, at narration speeds typical of published recordings for reading-while-listening in the primary grades (112 words per minute for first grade and 141 words per minute for third grade), "the skill observed ...seem[ed] to break down" (p. 46). This effect was particularly strong for first graders.

McMahon also found that oral reading rates among students in the study varied widely, from 18–50 words per minute among first graders and from 50–91 words per minute for third graders. These ranges in oral reading rates underscore the importance of providing variation in the narration speeds that are available to students, even within the same age and grade level.

Bergman (1999) tested the feasibility and effectiveness of allowing 69 first graders to select their own narration speed. Stories in Hebrew (the students' first language) were narrated at several different speeds, ranging from 30 words per minute to 90 words per minute. The average reading rate for students in this group was 53.4 words per minute—a little over half the average narration rate of 105 words per minute that the researcher reported in "Israeli tapes and software designed for this age group." Bergman found that "having a choice of narration rates had a significant effect on the participants' comprehension and their accuracy in text reading.…The overall results indicate with high significance that giving children a choice of narration rate had a positive effect on their learning with the RWL technique."

*"**Having a choice** of narration rate is more effective than standard RWL for students in the initial stages of learning to read. The results indicate that, overall, control over narration rate yields improvements in reading comprehension and text-level reading accuracy."*

Bergman also found a significant correlation "between the children's actual reading rates and the narration rate they selected," suggesting that "children tend to choose realistically according to their abilities, overcoming their desire to hear the story at a faster pace." Additionally, "participants found that reading with a narration rate they chose was 'easier' and 'more fun' than undertaking RWL with a fixed rate."

Positive results were also found for 13 members of the group who were designated as "poor readers" based on test scores during the experiment and/or prior teacher assignment: "[C]hoice of narration rates had a significant positive effect on the poor readers' group in the area of reading accuracy (both text and word levels), but not for comprehension or speed."

Bergman concluded:

> The results of this study confirm the hypothesis that having a choice of narration rate is more effective than standard reading-while-listening for students in the initial stages of learning to read. The results indicate that, overall, control over narration rate yields improvements in reading comprehension and text-level reading accuracy. Results regarding word-list accuracy reached significance only for the poor readers.…The positive effect on the children's performance under the control-over-rate condition was confirmed with high significance.

HOW LERNER INTERACTIVE BOOKS SUPPORT STUDENT CHOICE OF APPROPRIATE NARRATION SPEED

Students can choose to hear the Lerner Interactive Books narrated at either of two speeds. The slower speed is approximately 15-30% slower than the faster speed. Slower speeds typically fall within the range of oral reading rates found by McMahon for the appropriate grade levels.

CONCLUSION

Lerner Interactive Books provide a valuable potential resource to help support student learning. Research evidence suggests that simultaneous presentation of text visually and auditorily can aid comprehension, especially among struggling students. Such bi-modal presentation of text can help support student acquisition of age-appropriate content knowledge despite difficulties in decoding text. Research-informed expert opinion also suggests a value in helping students develop fluency by supporting student reading with the availability of spoken narration. Such resources are particularly valuable if the narration is spoken at roughly the same speed as the listeners' reading rate and students are able to select their preferred listening speed.

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