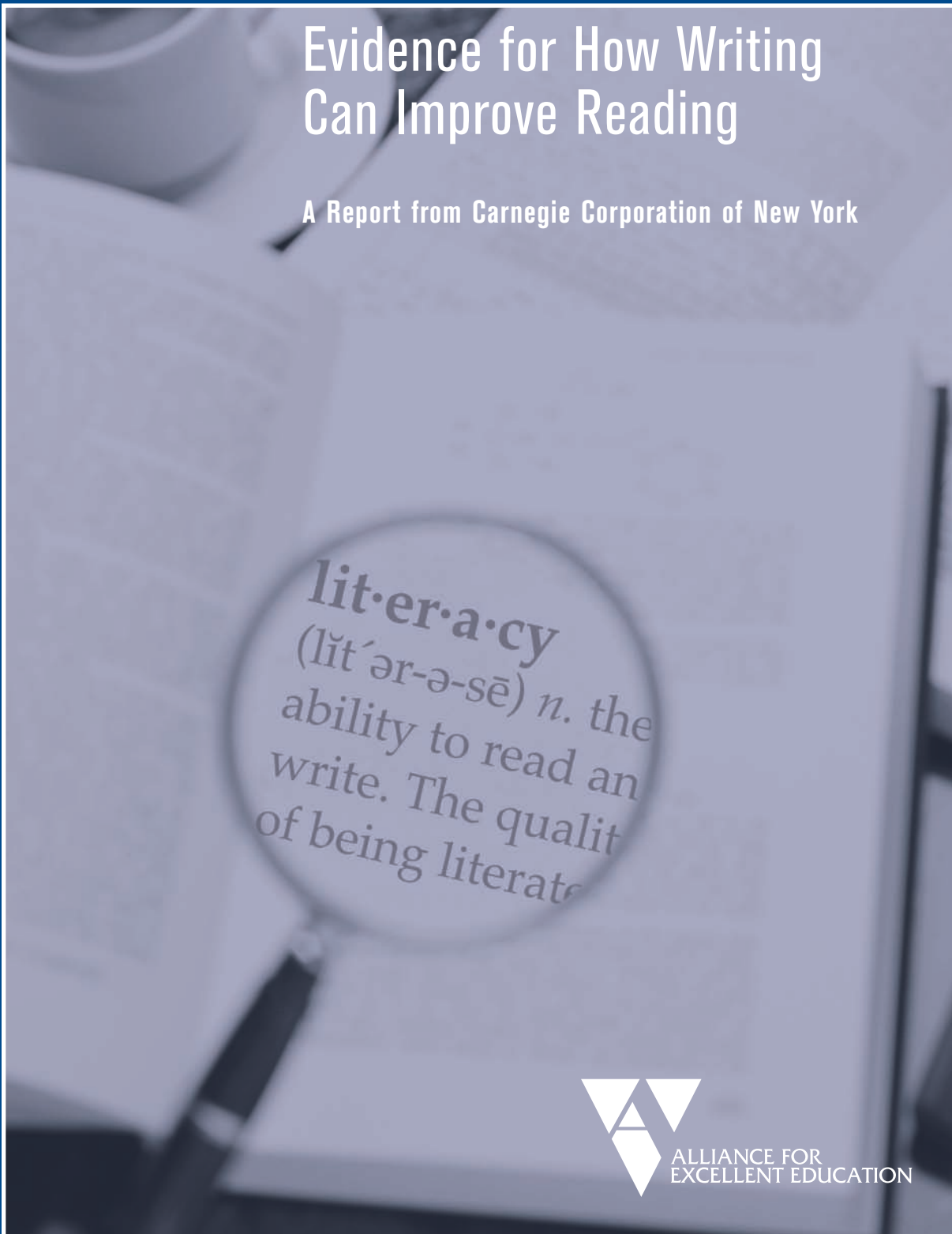
Writing to Read

Evidence for How Writing Can Improve Reading

A Report from Carnegie Corporation of New York



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ALLIANCE FOR EXCELLENT EDUCATION

Acknowledgments

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Steve Graham
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FOREWORD

Around the world, from the cave paintings in Lascaux, France, which may be 25,000 years old, to the images left behind by the lost Pueblo cultures of the American Southwest, to the ancient aboriginal art of Australia, the most common pictograph found in rock paintings is the human hand. Coupled with pictures of animals, with human forms, with a starry night sky or other images that today, we can only identify as abstract, we look at these men's and women's hands, along with smaller prints that perhaps belong to children, and cannot help but be deeply moved by the urge of our ancestors to leave some permanent imprint of themselves behind.

Clearly, the instinct for human beings to express their feelings, their thoughts, and their experiences in some lasting form has been with us for a very long time. This urge eventually manifested itself in the creation of the first alphabet, which many attribute to the Phoenicians. When people also began to recognize the concept of time, their desire to express themselves became intertwined with the sense of wanting to leave behind a legacy, a message about who they were, what they had done and seen, and even what they believed in. Whether inscribed on rock, carved in cuneiform, painted in hieroglyphics, or written with the aid of the alphabet, the instinct to write down everything from mundane commercial transactions to routine daily occurrences to the most transcendent ideas—and then to have others read them, as well as to read what others have written—is not simply a way of transferring information from one person to another, one generation to the next. It is a process of learning and hence, of education.

Ariel and Will Durant were right when they said, "Education is the transmission of civilization." Putting our current challenges into historical context, it is obvious that if today's youngsters cannot read with understanding, think about and analyze what they've read, and then write clearly and effectively about what they've learned and what they think, then they may never be able to do justice to their talents and their potential. (In that regard, the etymology of the word *education*, which is "to draw out and draw forth"—from oneself, for example—is certainly evocative.) Indeed, young people who do not have the ability to transform thoughts, experiences, and ideas into written words are in danger of losing touch with the joy of inquiry, the sense of intellectual curiosity, and the inestimable satisfaction of acquiring wisdom that are the touchstones of humanity. What that means for all of us is that the essential educative transmissions that have been passed along century after century, generation after generation, are in danger of fading away, or even falling silent.

In a recent report, the National Commission on Writing also addresses this concern. They say, "If students are to make knowledge their own, they must struggle with the details, wrestle with the facts, and rework raw information and dimly understood concepts into language they can communicate to someone else. In short, if students are to learn, they must write."

It is in this connection that I am pleased to introduce *Writing to Read*, which builds on *Writing Next* by providing evidence for how writing can improve reading. As both reports warn, American students today are not meeting even basic literacy standards and their teachers are often at a loss for how to help them. In an age overwhelmed by information (we are told, for example, that all available information doubles every two to three years), we should view this as a crisis, because the ability to read, comprehend, and write—in other words, to organize information into *knowledge*—can be viewed as tantamount to a survival skill. Why? Because in the decades ahead, Americans face yet another challenge: how to keep our democracy and our society from being divided not only between rich and poor, but also between those who have access to information and knowledge, and thus, to power—the power of enlightenment, the power of self-improvement and self-assertion, the power to achieve upward mobility, and the power over their own lives and their families' ability to thrive and succeed—and those who do not.

Such an uncrossable divide will have devastating consequences for the future of America. Those who enrich themselves by learning to read with understanding and write with skill and clarity do so not only for themselves and their families, but for our nation as well. They learn in order to preserve and enhance the record of humanity, to be productive members of a larger community, to be good citizens and good ancestors to those who will follow after them. In an age of globalization, where economies sink or swim on their ability to mine and manage knowledge, as do both individual and national security, we cannot afford to let this generation of ours and, indeed, any other, fall behind the learning curve. Let me bring us back to where we began: for all of us, the handprint must remain firmly and clearly on the wall.

Vartan Gregorian

President, Carnegie Corporation of New York

*Note: This text originally appeared as the forward to *Writing Next*, and is reprinted here with minor changes. Our deep thanks to Vartan Gregorian for permitting us to reprint it.

EXECUTIVE SUMMARY

The Challenge

Although some progress has been made in improving the literacy achievement of students in American schools during the last twenty years (Lee, Grigg, and Donahue, 2007; Salahu-Din, Persky, and Miller, 2008), the majority of students still do not read or write well enough to meet grade-level demands. Poor literacy skills play a role in why many of these students do not complete high school. Among those who do graduate, many will not be ready for college or a career where reading and writing are required. These young people will find themselves at a serious disadvantage in successfully pursuing some form of higher education, securing a job that pays a living wage, or participating in social and civic activities.

The financial and social costs of poor literacy have been well documented (Greene, 2000). The consequences of poor reading and writing skills not only threaten the well-being of individual Americans, but the country as a whole. Globalization and technological advances have changed the nature of the workplace. Reading and writing are now essential skills in most white- and blue-collar jobs. Ensuring that adolescents become skilled readers and writers is not merely an option for America, it is an absolute necessity.

The Approach

During this decade there have been numerous efforts to identify instructional practices that improve adolescents' literacy skills, such as *Reading Next* (Biancarosa and Snow, 2004), which drew a set of fifteen instructional recommendations for an effective adolescent literacy program based on the professional knowledge and research of nationally known and respected literacy researchers. Such efforts also include systematic reviews of high-quality research to identify effective instructional practices for improving the comprehension of struggling adolescent readers (Scammacca et al., 2007), as well as similar analyses to identify effective practices for improving adolescent students' writing (Graham and Perin, 2007a; Rogers and Graham, 2008).

Despite these efforts, educators and policymakers need additional evidence-based practices for improving the literacy skills of students in American schools.

One often-overlooked tool for improving students' reading, as well as their learning from text, is writing. Writing has the theoretical potential for enhancing reading in three ways. First, reading and writing are both functional activities that can be combined to accomplish specific goals, such as learning new ideas presented in a text (Fitzgerald and Shanahan, 2000). For instance, writing about information in a science text should facilitate comprehension and learning, as it provides the reader with a means for recording, connecting, analyzing, personalizing, and manipulating key ideas from the text. Second, reading and writing are connected, as they draw upon common knowledge and cognitive processes (Shanahan, 2006). Consequently, improving students' writing skills should result in improved reading skills. Third, reading and writing are both communication activities, and writers should gain insight about reading by creating their own texts (Tierney and Shanahan, 1991), leading to better comprehension of texts produced by others.

This report provides evidence answering the following three questions:

1. Does writing about material students read enhance their reading comprehension?
2. Does teaching writing strengthen students' reading skills?
3. Does increasing how much students write improve how well they read?

Although writing is typically recommended as a part of a strong literacy program (e.g., Biancarosa and Snow, 2004), and several important reviews have selectively examined the impact of writing on reading (e.g., Applebee, 1984; Emig, 1977; Klein, 1999; Neville and Searls, 1991; Smith, 1988; Stotsky, 1982), the special strength of this report is that it comprehensively summarizes high-quality research using the powerful statistical method of meta-analysis. This technique allows researchers to determine the consistency and strength of the effects of an instructional practice, and to highlight practices holding the most promise.

Writing Next presented the results of a large-scale statistical review of research on the effects of specific types of writing interventions, and identified specific teaching techniques for improving the quality of adolescent students' writing. *Writing to Read* draws on the same type of statistical review of the research to highlight writing techniques shown to enhance students' reading.

To be successful, students today need strong literacy skills, and also need to be able to use these skills as tools for ongoing learning. This report builds on *Writing Next* by identifying writing practices found to be effective in helping students increase their reading skills and comprehension. We hope that besides providing classroom teachers with research-supported information about how writing can improve reading, our data will stimulate discussion and action at the policy and research levels, leading to the greater use of writing as a tool for enhancing reading and a greater emphasis on the teaching of writing in our nation's schools.

The Recommendations

Writing Practices That Enhance Students' Reading

This report identifies a cluster of closely related instructional practices shown to be effective in improving students' reading. We have grouped these practices within three core recommendations, here listed in order of the strength of their supporting evidence.

I. **HAVE STUDENTS WRITE ABOUT THE TEXTS THEY READ.** Students' comprehension of science, social studies, and language arts texts is improved when they write about what they read, specifically when they

- **Respond to a Text in Writing (Writing Personal Reactions, Analyzing and Interpreting the Text)**
- **Write Summaries of a Text**
- **Write Notes About a Text**
- **Answer Questions About a Text in Writing, or Create and Answer Written Questions About a Text**

II. **TEACH STUDENTS THE WRITING SKILLS AND PROCESSES THAT GO INTO CREATING TEXT.** Students' reading skills and comprehension are improved by learning the skills and processes that go into creating text, specifically when teachers

- **Teach the Process of Writing, Text Structures for Writing, Paragraph or Sentence Construction Skills (Improves Reading Comprehension)**
- **Teach Spelling and Sentence Construction Skills (Improves Reading Fluency)**
- **Teach Spelling Skills (Improves Word Reading Skills)**

III. **INCREASE HOW MUCH STUDENTS WRITE.** Students' reading comprehension is improved by having them increase how often they produce their own texts.

Writing to Read does not identify all the ways that writing can enhance reading, any more than *Writing Next* identified all of the possible ways to improve students' writing. However, all of the *Writing to Read* instructional recommendations have shown clear results for improving students' reading.

Nonetheless, even when used together these practices do not constitute a full curriculum. The writing practices described in this report should be used by educators in a flexible and thoughtful way to support students' learning.

The evidence is clear: writing can be a vehicle for improving reading. In particular, having students write about a text they are reading enhances how well they comprehend it. The same result occurs when students write about a text from different content areas, such as science and social studies.

This result is consistent with the finding from *Writing Next* that writing about science, math, and other types of information promotes students' learning of the material. In addition, teaching writing not only improves how well students write, as demonstrated in *Writing Next*; it also enhances students' ability to read a text accurately, fluently, and with comprehension. Finally, having students spend more time writing has a positive impact on reading, increasing how well students comprehend texts written by others. Taken together, these findings from *Writing to Read* and *Writing Next* highlight the power of writing as a tool for improving both reading and content learning.

RECOMMENDATIONS FOR USING WRITING TO IMPROVE READING, AS IDENTIFIED BY META-ANALYSIS

Writing is often recommended as a tool for improving reading. In *Reading Next* (Biancarosa and Snow, 2004), intensive writing was identified as a critical element of an effective adolescent literacy program. *Reading Next* stated that writing instruction improves reading comprehension and that the teaching of writing skills such as grammar and spelling reinforces reading skills. It is also believed that writing about a text improves comprehension, as it helps students make connections between what they read, know, understand, and think (Carr, 2002).

This report provides long-needed guidance for teachers and policymakers by identifying specific writing practices that enhance students' reading abilities. The special contribution of this report is that it draws on empirical evidence in grades 1–12 in doing so. Its findings show that having students write about texts they read, explicitly teaching writing skills and processes, and having students write more *do* improve reading skills and comprehension.

We set out to collect, categorize, and analyze experimental and quasi-experimental data on the effectiveness of writing practices for improving students' reading skills and comprehension. The empirical evidence from this analysis resulted in the identification of research-supported writing practices for improving students' reading. The method used, meta-analysis, provides a measure of effectiveness using the effect size statistic.

A TECHNICAL NOTE ON EXPERIMENTAL AND QUASI-EXPERIMENTAL STUDIES

The benefit of using experimental and quasi-experimental types of studies for our review is that they allow for stronger inferences about cause-and-effect relationships than do other types of studies. In both, children in an experimental group receive a specific intervention (or treatment) and their performance is compared to a control group of children that receives a different treatment or no treatment. Experimental studies control for preexisting differences between students in the two groups through random assignment to a group, while quasi-experimental studies do so through other means. For the current analysis, we only included quasi-experimental studies that assessed students' reading performance at the start of the study, so that possible preexisting differences between students in each condition could be controlled.

The Meta-Analysis

Meta-analysis is a statistical technique for integrating, summarizing, and interpreting sets of empirical research that involve quantitative measures (Lipsey and Wilson, 2001). In this report, meta-analysis was used to investigate the effectiveness of writing about text, the effectiveness of the teaching of writing, and the effectiveness of having students write more.

This is the first meta-analysis examining the effects of different writing practices on students' reading performance. Previous meta-analyses focused only on single practices, such as the impact of sentence combining on reading comprehension (e.g., Neville and Searls, 1991), aggregated reading measures with other types of outcome measures (Bangert-Drowns, Hurley, and Wilkinson, 2004), or did not isolate the effect of the writing practice (Moore and Readence, 1984). The findings in this report are cumulative in that they build on earlier reviews examining the impact of writing on reading (e.g., Applebee, 1984; Emig, 1977; Graham and Perin, 2007a; Klein, 1999; Moore and Readence, 1984; Neville and Searls, 1991; NICHD, 2000; Smith, 1988; Stotsky, 1982). All pertinent studies from these prior reviews were included, and new studies were located through an extensive search of the literature (see Appendix A for details).

A TECHNICAL NOTE ON META-ANALYSIS

What is a meta-analysis?

Meta-analysis is a particularly powerful way of summarizing large bodies of research, as it aggregates conceptually similar quantitative measures by calculating an effect size for each study. The strength of meta-analysis is that it allows consideration of both the strength and the consistency of a treatment's effects.

What is an effect size?

An effect size reports the average difference between one type of instruction and a control condition. It indicates the **strength** of the effect. The following guidelines provide a benchmark for interpreting the magnitude of an effect:

- 0.20 = **small** or mild effect
- 0.50 = **medium** or moderate effect
- 0.80 = **large** or strong effect

A **positive** effect size means the writing treatment had a positive effect on students' reading when compared to the control condition.

A **negative** effect size means that the control condition had a stronger effect on students' reading than the writing treatment.

Although these guidelines are commonly accepted, it is important to interpret an effect size within the context of a given field. Consequently, the findings from this meta-analysis are compared to findings from other meta-analyses examining different reading interventions (i.e., NICHD, 2000; Rosenshine and Meister, 1994; Slavin, Cheung, Groff, and Lake, 2008). Such comparison better contextualizes the power of writing as a means of improving reading achievement.

Also, it is important to remember that a large number of factors that influence youngsters' literacy outcomes and the difficulty of improving reading, especially for older students, render any significant effect meaningful.

The recommendations from this review are in no way meant to detract from the significant contributions that other types of research make to the understanding of the effects of writing on reading. Likewise, many perspectives, including cognitive, sociocultural, rhetorical, cross-curricular, linguistic, and student centered (see Fitzgerald and Shanahan, 2000; Shanahan, 2006), contribute to knowledge of how writing influences reading.

Appendix A describes the methodology used in the meta-analysis. **Appendix B** lists all the studies that were analyzed and provides descriptive information about each.

THE RECOMMENDATIONS

Effective Practices for Strengthening Reading Through Writing

I. **HAVE STUDENTS WRITE ABOUT THE TEXTS THEY READ.** Students' comprehension of science, social studies, and language arts texts is improved when they write about what they read, specifically when they

- **Respond to a Text in Writing (Writing Personal Reactions, Analyzing and Interpreting the Text)**
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II. **INCREASE HOW MUCH STUDENTS WRITE.** Students' reading comprehension is improved by having them increase how often they produce their own texts.

In the following sections, we discuss each of these findings in turn by discussing the theory behind the practices and the results of the analysis. In several places, we also elaborate the activities involved in implementing the practices. Results are reported in effect size statistics, which allow us to understand the magnitude of impact an instructional practice can have on student outcomes.

When reading these sections, readers should keep in mind three important aspects of effect sizes. First, while it is tempting to regard practices that have large effect sizes as more effective than those with small effect sizes, effect sizes cannot be interpreted in this fashion. The effects we estimate for a particular practice always exist in relation to whatever practices were used in the "control" condition. In short, the effects for any two practices described in this report cannot be compared directly to or against each other.

Second, we report the effect sizes we found for two types of tests commonly used in research: norm-referenced tests and researcher-designed tests (see sidebar on page 12). Norm-referenced tests generally yield much smaller effect sizes than researcher-designed tests do. For example, two of the most robust reading instructional practices for improving children's reading comprehension, Reciprocal Teaching and generating questions, have effect sizes of 0.32 and 0.36 respectively when assessed using norm-referenced tests, and effect sizes of 0.88 and 0.86 respectively when assessed using researcher-designed

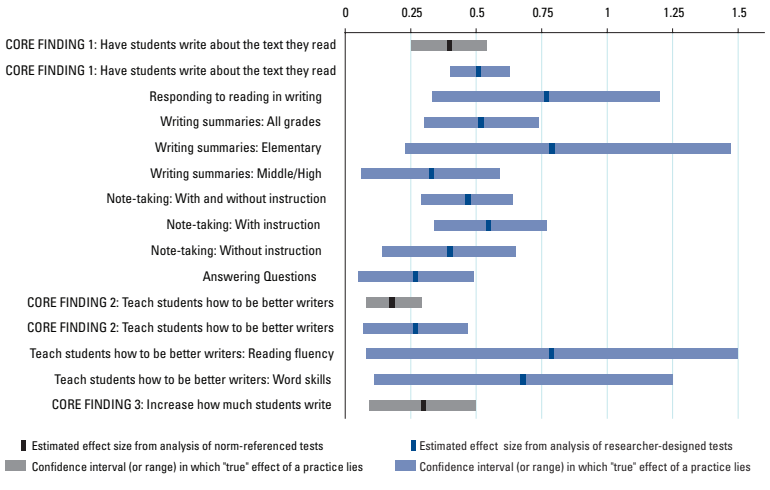
measures (Rosenshine and Meister, 1994; Rosenshine, Meister, and Chapman, 1996). Similar differences in effect sizes for different tests are found throughout our report (see graph below).

Third, because effect sizes are statistics, we can estimate more than the average effect size—we can also estimate a confidence interval. The confidence interval specifies the range in which we think the "true" effect of a practice lies. Thus, we present confidence intervals around the effect sizes we found in Figure 1. In general, confidence intervals tend to be smaller when the number of studies we have is bigger and also when tests are more precise. In fact, readers will likely note that we have a few very large confidence intervals for some of the effects. These large ranges suggest that we are less certain of a practice's real effect, but critically we are still quite certain that there *is* an effect because none of these confidence intervals extends as low as zero. As a result, even when confidence intervals are large, we are reasonably certain that these practices do affect students in a positive way, we are just less certain of how large that effect is.

NORM-REFERENCED VS. RESEARCH-DESIGNED TESTS

Norm-referenced tests are designed to represent an individual's ability relative to the range of abilities of a population on a measured skill. In contrast, researcher-designed tests generally do not have the time or the resources to sample the full range of abilities of a measured skill, and therefore cannot place an individual's performance in that context. Even so, researchers generally take steps to ensure that their test results are as reliable as possible. Because of these differences, norm-referenced tests tend to have smaller margins of error when estimating student abilities. As a result, norm-referenced tests tend to yield smaller effect sizes and smaller confidence intervals. Nonetheless, both types of tests yield important information about the effectiveness of instruction. Whereas norm-referenced tests help us understand how well a targeted skill generalizes to other similar tasks, researcher-designed tests help us understand how well an intervention impacts a targeted skill.

WRITING TO READ EFFECT SIZES WITH CONFIDENCE INTERVALS



I. HAVE STUDENTS WRITE ABOUT THE TEXT THEY READ

Average Weighted Effect Size = 0.40 Published Standardized Norm-Referenced Tests (Based on 11 Studies)
Average Weighted Effect Size = 0.51 Researcher-Designed Tests (Based on 50 Studies)

Comprehending a text involves actively creating meaning by building relationships among ideas in text, and between the text and one's knowledge, beliefs, and experiences (Wittrock, 1990). Having students write about a text should enhance reading comprehension because it affords greater opportunities to think about ideas in a text, requires them to organize and integrate those ideas into a coherent whole, fosters explicitness, facilitates reflection, encourages personal involvement with texts, and involves students transforming ideas into their own words (Applebee, 1984; Emig, 1977; Klein, 1999; Smith, 1988; Stotsky, 1982). In short, writing about a text should enhance comprehension because it provides students with a tool for visibly and permanently recording, connecting, analyzing, personalizing, and manipulating key ideas in text.

The evidence shows that having students write about the material they read *does* enhance their reading abilities. In fact, fifty-seven out of sixty-one outcomes (93 percent) were positive, indicating a consistent and positive effect for writing about what is read. The impact of writing about reading applied broadly across different levels of schooling, as students participating in this research were in grades 2–12, with the majority in middle or high school. These positive effects were evident when students wrote about text in science and social studies as well as in English (60 percent of comparisons involved these disciplines; see Appendix B).

These effect sizes compared favorably with effects obtained by other researchers examining the impact of specific reading approaches, such as reading programs at the secondary level, reciprocal teaching (a popular method for teaching comprehension), and vocabulary instruction. The effect size for writing about text that was read (0.40) exceeded each of these effects, providing additional validation of its effectiveness as a tool for improving students' reading comprehension.

Writing about read texts was also an effective activity for lower-achieving students. In twelve studies involving such students, the average weighted effect size for writing about a text was 0.63. However, the average weighted effect size for writing about text activities was not greater than zero when lower-achieving students were not explicitly taught how to use them. This was not the case when such instruction was provided, as was true in the other nine studies. Although these findings must be viewed cautiously due to the small number of studies, they suggest that having lower-achieving students write about text without teaching them how to do so may not be effective. Our findings are consistent with findings from other reviews that explicit instruction is an important ingredient in the successful teaching of literacy practices (e.g., Graham and Perin, 2007a; NICHD, 2000).

Writing about a text proved to be better than just reading it, reading and rereading it, reading and studying it, reading and discussing it, and receiving reading instruction. These above-mentioned reading activities were undertaken 87 percent of the time by students in the control conditions.

The average weighted effect sizes for writing about text read versus these control conditions was positive and significant (0.35 for published standardized norm-referenced tests in nine studies and 0.49 for researcher-designed ones in forty-four studies).

We next consider how different types of writing about reading activities influence students' comprehension of text. These analyses are based on the findings from the sixty-one studies above.

Have Students Respond to a Text (Writing Personal Reactions, Analyzing and Interpreting the Text)

Average Weighted Effect Size = 0.77 Researcher-Designed Tests (Based on 9 Studies)

Writing an extended response to material involves either a personal reaction to the text or analysis and interpretation of it. The former includes writing a personal response to narrative material read or writing about a personal experience related to it. Analysis and interpretation activities, in contrast, focus on writing an analysis of the characters in a novel, writing a paper showing how to apply material that was read, composing a letter to another student explaining how to play a game described in a text, and analyzing a text in writing to develop a particular point of view. Newer and better understandings of textual material are likely to occur when students write about text in extended ways involving analysis, interpretation, or personalization (Langer and Applebee, 1987).

Our review of the data shows that extended writing has a strong and consistently positive impact on reading comprehension. All nine of the comparisons produced a positive outcome. Extended writing produced greater comprehension gains than simply reading the text, reading and rereading it, reading and studying it, reading and discussing it, and receiving reading instruction. These reading activities served as control conditions in all nine studies. (Note that in contrast to the other

EXTENDED WRITING: EXAMPLES

With **guided journal writing** students respond to text by answering open-ended questions about it in writing. For example, students might be asked to analyze why they think characters acted as they did and indicate what they would do in the same situation.

Source: Wong, Kuperis, Jamieson, Keller, and Cull-Hewitt (2002).

Students might also be asked to complete an **analytic essay** about the material they are reading. For instance, after reading about the history of the industrial revolution, students might be asked to write an essay in which they identify the three most important reasons for industrial growth during the nineteenth and twentieth centuries and explain the reasons for each of their choices.

Source: Langer and Applebee (1987).

writing about reading activities studied in this review, students were not expressly taught how to write extended responses. Finally, for writing a personal response to text, students applied this procedure over a three- to fourth-month period in several studies.)

Have Students Write Summaries of a Text

Average Weighted Effect Size = 0.52 Researcher-Designed Tests (Based on 19 Studies)

Transforming a mental summary of text into writing requires additional thought about the essence of the material, and the permanence of writing creates an external record of this synopsis that can be readily critiqued and reworked. As a result, summary writing seems likely to improve comprehension of the material being summarized.

Summary writing practices studied ranged from writing a synopsis with little to no guidance (e.g., writing a one-sentence summary) to the use of a variety of different guided summarizing strategies such as writing a summary of text using a set of rules or steps; developing a written outline of text and converting it to a summary; locating the main idea in each paragraph and summarizing it; and creating a written/graphic organizer of important information and converting it to a summary.

For students in grades 3–12, writing summaries about text showed a consistently positive impact on reading comprehension. Seventeen of the nineteen comparisons (89 percent) produced a positive outcome. While summary writing significantly improved middle and high school students' comprehension of text (average weighted effect size = 0.33 based on eleven studies), it had an even stronger effect on elementary students' comprehension (average weighted effect size = 0.79 based on four studies).

SUMMARY WRITING: EXAMPLES

Students are directly taught rules for how to **write a summary of material read.** This can involve teaching them how to write a summary of a paragraph using the following operations:

1) identify or select the main information;
2) delete trivial information;
3) delete redundant information; and
4) write a short synopsis of the main and supporting information for each paragraph.

In teaching this strategy, the teacher first explains each step and its purposes. Use of the strategy is then modeled, and students practice applying it, receiving teacher help and assistance as needed.

Source: Rinehart, Stahl, and Erickson (1986).

A different summary writing method focuses on the summarization of longer text. Students begin by creating a skeleton outline, starting with a thesis statement for the passage. Next, they generate main idea subheadings for each section of the text, and add two or three important details for each main idea. They then convert their outline into a written summary of the whole text.

Source: Taylor and Beach (1984).

Writing summaries about a text proved to be better than simply reading it, reading and rereading it, reading and studying it, and receiving reading instruction. The above reading activities served as control conditions in all but four studies (74 percent). The average weighted effect size decreased slightly, to 0.48, when summary writing was compared to control conditions only involving reading activities.

Have Students Write Notes About a Text

Average Weighted Effect Size = 0.47 Researcher-Designed Tests (Based on 23 Studies)

The act of taking written notes about text material should enhance comprehension (Kiewra, 1989; Peverly et al., 2007). This writing practice involves sifting through a text to determine what is most relevant and transforming and reducing the substance of these ideas into written phrases or key words. Intentionally or unintentionally, note takers organize the abstracted material in some way, connecting one idea to another, while blending new information with their own knowledge, resulting in new understandings of texts.

In the studies we reviewed, taking notes about text ranged from a prompt to take notes with little or no direction to the use of a wide variety of structured note-taking procedures such as developing a written outline of text; designing a written chart showing the relationship between key ideas, details, concepts, and vocabulary in text; and taking notes about text and separating these notes into different columns related to main ideas, details, and questions.

For students in grades 3–12, the various note-taking activities studied had a moderate and consistently positive impact on reading comprehension. Twenty-one of the twenty-three comparisons (91 percent) produced a positive outcome.

Taking notes about text proved to be better than just reading, reading and rereading, reading and studying, reading and underlining important information, and receiving explicit instruction in reading practices. The above reading activities served as the control conditions in all but two studies. The average weighted effect size increased slightly, to 0.48, when note taking was compared to control conditions only involving reading activities.

NOTE TAKING: EXAMPLES

Structured note taking involves creating a written organizational structure for material read. With one approach, students are taught how to create an organizer resembling a flow chart, depicting changes in the events of a story over time.

Source: Denner (1987).

Concept mapping is another approach for helping students organize their notes about material read. Students place each important concept from text in a circle and then show how the concepts link together using words and lines. One way of teaching this strategy is to first present a model of an *expert concept map* for a particular reading. After discussing this map, students then practice completing other *expert maps* that are incomplete, moving from more to less complete maps, until they can create their own map for material read.

Source: Chang, Chen, and Sung (2002).

Have Students Answer Questions About a Text in Writing, or Create and Answer Written Questions About a Text

Average Weighted Effect Size = 0.27 Researcher-Designed Tests (Based on 8 Studies)

Answering questions about a text can be done verbally, but there is greater benefit from performing such activities in writing. Writing answers to text questions makes them more memorable, as writing an answer provides a second form of rehearsal. This practice should further enhance the quality of students' responses, as written answers are available for review, reevaluation, and reconstruction (Emig, 1977).

For generating or responding to questions in writing, students either answered questions about a text in writing; received practice doing so; wrote their own questions about text read; or learned how to locate main ideas in a text, generated written questions for them, and then answered them in writing. These practices had a small but consistently positive impact on improving the reading comprehension of students in grade 6–12 when compared to reading or reading instruction. All eight of the studies resulted in a positive outcome for generating or answering questions in writing.

QUESTIONS: EXAMPLES

Answering questions in writing involves writing responses to questions inserted into text or presented at the end of a segment of text. For example, students may be asked to write short answers to four questions (one detail, two inferences, and one main idea) after reading a segment of text. They then check and correct their responses before reading the next segment of text.

Source: Peverly and Wood (2001).

Generating questions in writing is a strategy where students create written questions about text. For instance, students are taught the difference between a good question and a bad question, and then practice generating and answering their own questions about text. If they cannot answer a question, they generate a new one that can be answered.

Source: Cohen (1983).

II. TEACH STUDENTS THE WRITING SKILLS AND PROCESSES THAT GO INTO CREATING TEXT

While writing and reading are not identical skills, both rely on common processes and knowledge (Fitzgerald and Shanahan, 2000). Consequently, educators have long believed that the benefits of writing instruction carry over to improved reading. Our evidence shows that writing instruction does in fact strengthen a variety of reading skills.

Teach the Process of Writing, Text Structures for Writing, Paragraph or Sentence Construction Skills (Improves Reading Comprehension)

Average Weighted Effect Size = 0.18 Published Standardized Norm-Referenced Tests (Based on 12 Studies)
Average Weighted Effect Size = 0.27 Researcher-Designed Tests (Based on 5 Studies)

Teaching patterns for constructing sentences or larger units of text should improve reading skills. The practice of putting smaller units of writing together to create more complex ones should result in

greater skill in understanding such units in reading (Neville and Searls, 1991). This is the basic premise behind the writing instructional strategy known as sentence combining (Saddler and Graham, 2005). Better understanding of even larger units in text should be facilitated by teaching students basic structures for writing paragraphs, or common elements included in specific types of writing, such as persuasive essays.

Writing instruction did in fact show a small, but consistently positive, impact on reading comprehension when measured by both norm-referenced published standardized tests and researcher-designed tests. The outcomes in all studies were positive. The control condition in most of these studies (79 percent) was reading or reading instruction. When only these studies were considered, the average weighted effect size rose slightly, to 0.23 on published standardized norm-referenced tests (based on nine studies) and 0.30 on researcher-designed tests (based on four studies).

The effect of writing instruction on published standardized norm-referenced tests compares favorably with effects obtained in two other reviews examining the impact of a range of reading programs (Slavin et al., 2008) and vocabulary instruction (Elleman et al., 2009). (However, it was smaller than the effect of 0.32 obtained by Rosenshine and Meister [1994] for reciprocal teaching of comprehension strategies.)

It is important to note that there was variability in the types of writing instruction provided to students. These different types of writing instruction included the process approach, where students write frequently for real audiences; engage in cycles of planning, drafting, and revising text; take personal responsibility and ownership of writing projects; interact and help each other with their writing; participate in a supportive writing environment; and receive assistance and instruction as needed (Graham and Perin, 2007b). Note that studies examining process writing were limited to grades 1–4.

WRITING INSTRUCTION: EXAMPLES

One writing instructional procedure that facilitates reading growth is **sentence combining**. With this method, the teacher models how to combine simpler sentences into more complex ones. Students then practice combining similar sentences. An interesting twist on this approach is to have students combine sentences in material they are reading or disassemble such sentences.

Source: Hunt and O'Donnell (1970).

Students' reading skills can also be enhanced by teaching them how to use **text structure** as an aid for writing text. To illustrate, students are taught the basic elements of persuasion by identifying and discussing them in model essays. They then write their own persuasive texts using these elements, and revise the texts based on feedback from peers and the teacher.

Source: Crowhurst (1991).

We also included studies where other writing skills were systematically and explicitly taught to students. In several studies, this practice involved teaching a variety of skills, including how to write sentences, paragraphs, and longer units of text. In other instances, it involved teaching students how to write

more sophisticated sentences by learning how to combine less complex sentences into more complex ones. It further included several studies where students learned to use the structure of specific types of texts as a model or tool for writing their own papers. Finally, the spelling of content words was taught in one investigation. Studies examining the effectiveness of these approaches (instruction in spelling; instruction in writing sentences, paragraphs, and longer units of text) were limited to grades 4–12. In these twelve studies, the average weighted effect size on norm-referenced standardized measures of reading was 0.16. (Although small, the effect was statistically significant and compared favorably to the 0.17 effect size obtained by Slavin et al. [2008] in their meta-analysis of middle and high school reading programs.)

Teach Spelling and Sentence Construction Skills (Improves Reading Fluency)

Average Weighted Effect Size = 0.79 Published Standardized Norm-Referenced and Researcher-Designed Tests Combined (Based on 4 Studies)

Teaching students how words are spelled provides them with schemata about specific connections between letters and sounds, making it easier for them to identify and remember words in text containing these connections (Ehri, 1987; Moats, 2005/2006). The practice of putting smaller units of writing together in order to create more complex ones—from letters to words or words to sentences—should result in greater skill in understanding of these units in reading (Ehri, 2000; Neville and Searls, 1991).

In three of the four studies examining the impact of writing instruction on reading fluency, spelling skills were taught. In the other study, students were taught how to write more sophisticated sentences by combining simpler sentences into more complex ones. The overall effect size for these studies combined both standardized tests (two studies) and researcher-designed tests (two studies).

Writing instruction had a strong and consistent impact on improving students' reading fluency. *All* of the studies yielded a positive outcome. With one exception, the control condition was reading instruction. When the exception was eliminated, the average weighted effect size rose to 0.87. (Note that the studies reviewed all involved students in grades 1–7. Consequently, the impact of writing instruction on the reading fluency of older students is not known.)

Teach Spelling Skills (Improves Word Reading Skills)

Average Weighted Effect Size = 0.68 Published Standardized Norm-Referenced and Researcher-Designed Tests Combined (Based on 5 Studies)

As noted above, teaching students how to spell theoretically makes it easier for them to identify and remember words in text (Ehri, 1987; Moats, 2005/2006). More explicitly, spelling and word reading rely on the same underlying knowledge, and therefore instruction and practice in one should aid development of the other (Ehri, 2000; Snow, Griffin, and Burns, 2005).

Spelling instruction had a moderate and consistent impact on improving students' word reading skills. The five studies examining the impact of writing instruction on word reading skills all involved spelling instruction. The overall effect size for these studies combined both standardized tests (two studies) and researcher-designed tests (three studies). All of the studies yielded a positive outcome. These findings support the claim that learning to spell supports reading (Graham, 2000; Moats, 2005/2006).

With one exception, the control condition was reading or reading instruction. Notably, when the exception was eliminated, the average weighted effect size rose to 0.77. (Because all studies involved students in grades 1–5, we cannot generalize the findings to older students.)

III. INCREASE HOW MUCH STUDENTS WRITE

Average Weighted Effect Size = 0.30 Published Standardized Norm-Referenced Tests (Based on 6 Studies)

Reading and writing are communication activities, and writers can gain insights about reading by creating a text for an audience to read, even when the student is the intended audience (Nelson and Calfee, 1998). The process of creating a text prompts students to be more thoughtful and engaged when reading text produced by others. By writing, students learn to make their assumptions and premises explicit as well as observe the rules of logic when composing a text (Applebee, 1984), making them more aware of such issues in the material they read. Finally, writing involves generating meaning by using experience and knowledge to create a text and build relationships among words, sentences, and paragraphs (Wittrock, 1990).

According to the data we reviewed, increasing how much students write does in fact improve how well they read. The average weighted effect size on published standardized norm-referenced tests was small in all the studies we reviewed, but still consistently positive, as all studies yielded positive outcomes. The control condition in each of these experiments was either reading or reading instruction. Activities for increasing the amount of writing in the studies reviewed included writing about self-selected topics or topics chosen in collaboration with peers, setting aside fifteen extra minutes a day for sustained writing, using the Internet to write to pen pals, writing journal entries about daily experiences, interacting with others using a dialogue journal, and writing short passages using inference words. (Since all of the studies we reviewed involved students in grades 1–6, this finding cannot be generalized to older students.)

INCREASING STUDENTS' WRITING: EXAMPLES

Pen palling is a method in which two or more writers dialogue with each other about topics of interest. This can involve a younger student writing to an older student and vice versa.

Source: Dana, Scheffler, Richmond, Smith, and Draper (1991).

Daily writing about self-selected topics allows students to write about any topic of their choice. This can be done as a journal activity where the teacher reads and responds to something written by the student in a journal (without editing or correcting). Students sharing their writing with the teacher becomes optional over time.

Source: Peters (1991).

An average weighted effect size of 0.30 on published standardized norm-referenced tests compares favorably with effects obtained by other researchers examining the impact of specific approaches to teaching reading. It exceeded the overall effect of 0.17 for a range of reading programs studied by Slavin et al. (2008) as well as the effect of 0.10 for vocabulary instruction obtained by Elleman et al. (2009), and was equivalent to the effect of 0.32 obtained by Rosenshine and Meister (1994) for reciprocal teaching of comprehension strategies.