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The Influence of In-Text Instruction on Declarative Knowledge and Vocabulary Learning in Struggling Readers

How IQ Confounds the Story

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The process of comprehending written material requires the coordination of a complex set of skills, and as a consequence there are a number of potential sources of comprehension failure (Cain, Oakhill, & Bryant, 2000; Leach, Scarborough, & Rescorla, 2003; Mastropieri & Scruggs, 1997; National Center for Learning Disabilities, 1999; Oakhill, Cain, & Yuill, 1998; Paris & Oka, 1989; Perfetti, Marron, & Foltz, 1996; Pressley, 2000; Stanovich, West, Cunningham, Cipielewski, & Siddiqui, 1996; Torgesen, 1998). Gough's "simple view of reading" (Gough, 1996; Gough & Tunmer, 1986) postulates that two general types of skill are required for good reading comprehension: (1) the ability to accurately and fluently identify the words in print and (2) general language comprehension ability. Others have expanded on the "simple view of reading" by recognizing the importance of more specific knowledge (e.g., vocabulary, declarative) and active application of specific reading strategies required to maximize reading comprehension (e.g., Baker, 1979; Baker & Brown, 1984; Cain & Oakhill, 1999; Mastropieri & Scruggs, 1997; National Center for Learning Disabilities, 1999; Palincsar & Brown, 1984; Perfetti et al., 1996; Stanovich, Cunningham, & West, 1998; Stanovich & West, 1989). For instance, Cain and Oakhill (1999) and Perfetti et al. (1996) have suggested that the ability to make inferences and monitor comprehension processes also varies with comprehension skill. Children who are poor comprehenders have been shown to have difficulty spontaneously engaging in active strategies to enhance understanding and retention of information and to circumvent comprehension failures (Baker & Anderson, 1982; Deshler, Ellis, & Lenz, 1996; Palincsar & Brown, 1984; Pazzaglia, Cornoldi, & DeBeni, 1995; Yuill & Oakhill, 1991). These highly strategic processes have been referred to as comprehension-fostering and comprehension-monitoring processes and are considered important metacognitive skills that allow the reader to construct and retain a coherent representation of information contained in text (Garner, 1987; Palincsar & Brown, 1984). Thus, evidence indicates that individual differences in various skills, ranging from lower level word recognition skills to advanced language and metacognitive skills, are associated with reading comprehension variance in developing readers. Additionally, deficits in each of these areas have been implicated as a significant contributor to comprehension failure, appreciably decreasing children's ability to use text as a means of gaining information and knowledge (see Perfetti et al., 1996; Pressley, 2000).

Consequently, designing instruction to ameliorate the reading comprehension problems of struggling readers requires a set of instructional procedures that address a diverse range of literacy skills. Effective reading programs designed to improve struggling readers' comprehension skills must provide integrated work across decoding and word recognition, reading fluency, vocabulary and knowledge development, and reading comprehension strategy use (see Pressley, 2000). However, multiple consensus reports provide converging evidence that teachers have difficulty integrating multiple instructional components in an effective manner to teach reading to struggling readers (National Institute of Child Health and Human Development, 2000; RAND Reading Study Group, 2002; Snow, Burns, & Griffin, 1998). Additionally, few studies have systematically studied the effects of multicomponent reading programs on the reading skills of struggling readers. Our long-term research objective is to develop multicomponent reading programs to address the diverse needs of late elementary school students who are struggling readers. With this in mind, we have been examining the effects of in-text reading activities, embedded within multicomponent reading programs, on struggling readers' ability to construct and retain vocabulary and declarative knowledge from text. These text-based knowledge-building instructional procedures were combined with previously validated instruction in decoding and word recognition, reading fluency, and oral reading of text to form a multicomponent reading program to address the diverse needs of late elementary school students who are struggling readers.

THE PRIVILEGED RELATION BETWEEN TEXT READING AND KNOWLEDGE ACQUISITION

The relation among vocabulary knowledge, declarative knowledge, and reading comprehension is well documented (e.g., Anderson & Freebody, 1985; Anderson & Pearson, 1984; Anderson, Reynolds, Schallert, & Goetz, 1977; Beck, Perfetti, & McKeown, 1982; Blachowicz & Fisher, 2000; Nagy, Anderson, & Herman, 1987). Given that poor comprehenders tend to have impoverished vocabulary and declarative knowledge, it is widely accepted that background knowledge and vocabulary are important components of generally effective reading comprehension instruction for struggling readers (see National Institute of Child Health and Human Development, 2000; RAND Reading Study Group, 2002). Previous research (e.g., Anderson, Spiro, & Anderson, 1978; Perfetti et al., 1996; Stanovich, 2000) has demonstrated that increased knowledge positively impacts other important processes needed for text comprehension. In particular, knowledge increases seem to positively influence the control of comprehension monitoring processes and also the mechanisms that trigger inference making (see Perfetti et al., 1996; Stanovich & Cunningham, 1993). However, there is disagreement about how instruction should be designed to develop declarative knowledge and vocabulary in struggling readers. Some contend that direct instruction of relevant knowledge and vocabulary is an important means of developing the specific knowledge needed for struggling readers to comprehend text (e.g., Beck, McKeown, & Kucan, 2002; Carnine, Silbert, & Kame'enui, 1997; Tomesen & Aarnoutse, 1998; Kamil, 2004; White, Graves, & Slater, 1990). Others assert that context should be used as the primary means of inducing knowledge and vocabulary development (e.g., Adams, 1990; Landauer & Dumais, 1996; Kintsch, 1998; Stanovich et al., 1996; Sternberg, 1987).

Considering vocabulary first, knowing the meanings, relationships, and contextual interpretations of new vocabulary words enhances comprehension of context-area text (Baumann & Kame'enui, 1991). It is estimated that the rate of vocabulary acquisition in children during elementary through high school years is between 3,000 and 5,000 words per year (Nagy et al., 1987; Smith, 1941), which translates into 10 to 15 new words per day. To achieve this rate of vocabulary learning, it has been argued that most new words are added to the lexicon through reading (Cunningham & Stanovich, 1991; Landauer & Dumais, 1996; Stanovich & West, 1989). Compared with oral language, written text is considerably more lexically rich with significantly more low-frequency words (referred to as "rare" words) per 1,000 (Hayes & Ahrens, 1988). For example, children's books contain approximately 50% more rare words compared with adult prime-time television (Cunningham & Stanovich, 1998). This relative difference in word rarity has direct implications for vocabulary development. Opportunities to acquire new words occur when an individual is exposed to a word outside his or her current oral vocabulary. Reading text significantly increases the probability that children will encounter and incorporate new words into their evolving lexicons. Further, the more children read, the greater the probability they will encounter new words.

However, just reading more may not be sufficient to ensure expanded vocabulary knowledge through increased exposure to new words. Proponents of the cognitive efficiency hypothesis (e.g., Sternberg, 1985) argue that exposure alone through text reading is not enough to explain individual differences in vocabulary development. The cognitive efficiency hypothesis contends that, in addition to differences in exposure, differences in the ability to infer meaning from context accounts for vocabulary differences across individuals. Supporting this position is the fact that written context lacks many of the features of oral language that support learning new word meanings, such as intonation, body language, and shared physical surrounds (Beck et al., 2002). Studies estimate that of 100 unfamiliar words met in reading, between 5 and 15 will be learned (Nagy, Herman, & Anderson, 1987; Swanborn & de Glopper, 1999). Thus, although text reading appears to significantly increase the possibility that children will encounter new words, it is a far less supportive vehicle than oral language for inferring the meaning of new words (see Jenkins, Matlock, & Slocum, 1989). Compounding the problem is the fact that children who are poor readers tend to have limited declarative knowledge and vocabulary, and this interferes with the process of inducing meaning from context (see

Perfetti et al., 1996). In addition, children who are poor readers typically do not read widely or engage in effective word-learning strategies that facilitate the learning of word meanings (Baker, Simmons, & Kame'enui, 1995).

From an instructional standpoint, it appears that poor comprehenders would benefit from exposure to the rich vocabulary afforded by text if it were linked with a set of strategies that increased the probability that the meaning of an unknown word could be successfully derived. To address this need, we developed an instructional dialogue, set of strategies, and materials that would allow poor readers to derive the meaning of unfamiliar words encountered in expository text and also provided them with a set of antonyms and synonyms and glossary-type definitions to help strengthen the semantic network in which the word is embedded (see Kintsch, 1998; Landauer & Dumais, 1996).

A similar case has been made for declarative knowledge. Perfetti et al. (1996) have argued that "the component that may be the most important [to reading comprehension] and least interesting is domain knowledge" (p. 142). Numerous studies (Anderson et al., 1977; Anderson et al., 1978; Spilich, Vesonder, Chiesi, & Voss, 1979) provide evidence that declarative knowledge influences reading comprehension. Readers who possess high levels of declarative knowledge consistently exhibit better comprehension and retention than readers with low levels of knowledge (Chiesi, Spilich, & Voss, 1979; Langer & Nicolich, 1981; Pearson, Hanson, & Gordon, 1979). Good and poor readers differ not only in the amount of knowledge they have available but also in how they make use of their knowledge to facilitate comprehension (Bransford, Stein, Shelton, & Owings, 1981; Oakhill, 1984). There are also reports that when poor readers are prompted to use their prior knowledge or are provided with activities to build prior knowledge, their reading comprehension improves (e.g., Dole, Valencia, Greer, & Wardrop, 1991; Neuman, 1988; Recht & Leslie, 1988).

When translated into classroom instructional strategies, prior knowledge training usually takes the form of teacher-directed prereading activities to help students activate or build background knowledge (Graves, Cooke, & Laberge, 1983; Langer, 1984; McCormick, 1989). Although providing prereading instructional procedures to improve poor readers' use of prior knowledge has considerable face validity, some have questioned the efficacy of prior knowledge instruction as a means of improving reading comprehension. For instance, Stanovich (2000) has questioned the dominant unidirectional causal model that postulates that individual differences in knowledge (e.g., vocabulary and declarative) and lower level cognitive subprocesses (e.g., working memory, lexical processing, inference making, comprehension monitoring) determine reading comprehension ability. Instead, Stanovich has proposed a reciprocal or bidirectional causal model in which individual differences in exposure to print affect both the development of the cognitive processes and declarative knowledge bases that support further gains in comprehension growth. Similar to arguments made for vocabulary, text is considerably richer in terms of its declarative knowledge content compared with oral language. As a result, Stanovich and colleagues (Stanovich & Cunningham, 1993; West, Stanovich, & Mitchell, 1993) have argued, "Print is a unique source of declarative knowledge, not replaceable by electronic media or oral sources" (Stanovich et al., 1996, p. 17). Therefore, text appears exceptionally well suited for promoting knowledge acquisition in struggling readers. However, for poor readers to take advantage of the increased knowledge density contained in text, they must actively construct and reflect on the knowledge contained in the text. Simply requiring children who are struggling readers to read more connected text is not sufficient to build their general declarative knowledge. One reason is that poor-reading children routinely find themselves with reading materials that are far too difficult (Stanovich, 1986). Another is that a majority of children who are struggling readers fail to actively construct meaning as they read (e.g., National Center for Learning Disabilities, 1999; Palincsar & Brown, 1984; Yuill & Oakhill, 1991).

From an instructional standpoint, it again appears that poor comprehenders would benefit from exposure to the rich declarative knowledge afforded by text if it were linked with a set of strategies that increased the probability that the knowledge in the text could be integrated into the children's declarative knowledge. To examine the efficacy of in-text instruction on struggling readers' ability to acquire declarative knowledge from text, we based our in-text dialogue and strategies on the reciprocal teaching and transactional instructional methods developed by Palincsar and Brown (1984) and Pressley (2000), respectively.

IQ AS A POSSIBLE MODERATOR OF IN-TEXT INSTRUCTION EFFECTIVENESS

In this chapter, we are interested not only in the efficacy of in-text instruction on declarative knowledge and vocabulary acquisition but also whether child-level attributes moderate the effect of instruction. Baron and Kenny (1986) define a moderator variable as a "quantitative variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" (p. 1174). A moderator variable pinpoints the conditions under which an independent variable exerts its effects on a dependent variable. We focus on intelligence, assessed using a measure of Full-Scale IQ (FSIQ), as an important child-level predictor of response to in-text instruction. Multiple reviews of the literature have shown IQ to be highly predictive of concurrent and future reading comprehension skill (Gajria, Jitendra, Sood, & Sacks, 2007; Schatschneider, Harrell, & Buck, 2007). Furthermore, a review of the literature by Fuchs and Young (2006) and a treatment study by Berninger, Abbott, Vermeulen, and Fulton (2006) have identified intelligence as a significant predictor of children's response to intervention when the outcome measure of interest is reading comprehension.

OVERVIEW OF STUDIES

In this chapter, we present initial efficacy data from two studies evaluating the effects of a multicomponent instructional program for students in grades 3 to 5 who are struggling readers. In developing the instructional components and procedures, we recognize, and worked to exploit, the enormous potential of text to increase the vocabulary and declarative knowledge base of struggling readers. However, we also recognize that reading text without effective strategies for deriving and retaining vocabulary and knowledge is an ineffective means of instruction for struggling readers. Therefore, our primary objective in this study was to develop instructional dialogues, strategies, and materials that increased the probability that struggling readers would derive and retain vocabulary and declarative knowledge while reading text. To aid in generalization and transfer of these skills to the general education curriculum, the instructional program provided experience in applying the target skills in science and social studies texts. In addition, we examined possible treatment by FSIQ interactions as predictors of posttest knowledge and vocabulary skill. Significant interactions between treatment type and FSIQ would signal differences in response to treatment as a function of FSIQ.

In Study 1, we isolated the effects of metacognitive instruction on the retention of declarative knowledge in struggling readers. Specifically, we examined whether the use of reciprocal teaching (RT) practices, with its heavy emphasis on metacognition, during in-text reading would improve the reading comprehension skills of struggling readers. Studies have identified various obstacles encountered when using RT with struggling readers. For instance, it has been suggested that struggling students are unwilling or lack enough prior knowledge to lead productive RT sessions and that these students often modeled incorrect strategy usage and rarely provided the elaborations and inferences necessary for supporting understanding. For this reason, Hacker and Tenent (2002) have proposed that "having this process guided by experts (i.e., the teachers) rather than novices (i.e., the students) may have stronger impacts on learning" (p. 713). However, previous studies have suffered from inadequate experimental designs to isolate the effects of metacognition above and beyond strategy instruction in struggling readers. Furthermore, previous studies have not examined the possibility of individual differences explaining how children respond to RT instruction. It may be that some students make exceptional gains, while others attain modest or no gains. We examined whether there were benefits to including a metacognitive component to comprehension instruction on the retention of declarative knowledge in third- and fourth-grade children who were identified by their teachers as struggling readers. In addition, we examined whether FSIQ moderated the effects of metacognitive instruction among the struggling readers.

In Study 2, we examined the effects of text-level instructional programs designed to increase vocabulary and declarative knowledge acquisition during reading in expository text. This was a clinical trial involving struggling readers in grades 3 to 6. To our knowledge, no study has expressly contrasted the effects of two in-text training programs that share the same basic instructional procedures but vary in targeted knowledge acquisition. Specifically, we were interested in whether there were trade-offs between vocabulary learning and declarative knowledge acquisition based on the type of text-level instruction provided in expository text. Again, we examined whether FSIQ moderated the effects of instruction among the struggling readers.

ANALYTIC APPROACH TO ANALYZING CHILD × INSTRUCTIONAL RELATIONS

In both studies we used a randomized cluster design to evaluate the effects of in-text instruction and to examine possible moderating effects of FSIQ on struggling readers. Randomized cluster designs rely on the random assignment of clusters to treatment and control. This type of design allows causal relationships associated with treatment to be explored. In both studies small groups of struggling readers (i.e., clusters) were formed and randomly assigned to treatment conditions. Within a hierarchical linear modeling (HLM) framework, randomized clusters can be conceptualized as a two-level design, with students nested within treatment (Raudenbush & Bryk, 2002). Here, students are the Level 1 units and treatment clusters are the Level 2 units. The treatment contrast is defined at Level 2. In HLM, a one-way analysis of variance with random effects was used to estimate the proportion of within- and between-cluster variance on the outcome measures (i.e., intraclass correlation). In Study 1, 6% of the total variance on the knowledge measure resided at the level of the cluster. In Study 2, 15% of the variance in the knowledge measure and 11% of the variance in the vocabulary measure existed at the cluster level. Given the existence of significant variance at the level of the cluster, we used a two-level HLM.

In both studies we contrasted performance across three groups (two treatments and one control). We used dummy coding to examine treatment versus control (D_1 coded as 0.5, 0.5, and -1) and treatment 1 versus treatment 2 (D_2 coded as 1, -1, and 0). We controlled for pretest skill on the outcome measures of declarative knowledge and vocabulary and examined FSIQ as a moderator effect. The models for Study 1 and Study 2 are provided next:

Study 1

$$\text{Posttest Knowledge}_{ij} = \beta_{0j} + \gamma_{1j}\,(\text{Pretest Knowledge})_{ij} + \beta_{2j}\,(\text{FSIQ})_{ij} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(D_1)_j + \gamma_{02}\,(D_2)_j + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}\,(D_1)_j + \gamma_{22}\,(D_2)_j + u_{2j}$$

Study 2

$$\text{Posttest Knowledge}_{ij} = \beta_{0j} + \beta_{1j}\,(\text{Pretest Knowledge})_{ij} + \beta_{2j}\,(\text{FSIQ})_{ij} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(D_1)_j + \gamma_{02}\,(D_2)_j + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}\,(D_1)_j + \gamma_{22}\,(D_2)_j + u_{2j}$$

$$\text{Posttest Vocabulary}_{ij} = \beta_{0j} + \beta_{1j}\,(\text{Pretest Vocabulary})_{ij} + \beta_{2j}\,(\text{FSIQ})_{ij} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(D_1)_j + \gamma_{02}\,(D_2)_j + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}\,(D_1)_j + \gamma_{22}\,(D_2)_j + u_{2j}$$

At level 1 we examine the main effects of pretest knowledge and FSIQ on posttest performance. At level 2 we examine the main effects of treatment (D_1 and D_2) on posttest performance. Finally, we examine the cross-level interaction between child-level FSIQ and cluster-level treatment.

Study 1: Isolating the Effects of Metacognitive Instruction on the Retention of Declarative Knowledge

In Study 1 we assessed the additive affect of metacognitive instruction above and beyond strategy instruction. To accomplish this, 57 teacher-identified struggling readers in third and fourth grade were assigned to 25 different clusters. To be eligible for the study, children had to read at a rate of 40 words/min with accuracy of at least 75% in third-grade text. This ensured that children would be able to read in the science and social studies texts used in the study. Clusters were then randomly assigned to one of three conditions: (1) decoding only (DEC), (2) decoding + traditional strategy comprehension (TRAD), or (3) decoding + reciprocal teaching (RT). The DEC condition served as the control by providing children with decoding and fluency skill instruction without text reading. Clusters consisted of two to three children and each received either 30 min of instruction (DEC) or 60 min of instruction (TRAD or RT) three to four times per week for approximately 10 weeks for a total of 25 lessons. Instruction was provided outside the general education classroom by trained research assistants.

The DEC condition provided students with approximately 25 min of decoding and 5 min of fluency instruction. The decoding instruction incorporated practice with blending phonemes and application of three strategies from Word Identification Strategy Training, including compare and contrast, peeling-off affixes, and vowel variation (Gaskin, Downer, & Gaskins, 1986; Lovett, Lacerenza, & Borden, 2000). The compare and contrast strategy teaches children word identification by analogy (e.g., using a familiar word such as *rain* to identify an unfamiliar word with the same spelling pattern, such as *plain*) using a corpus of 120 key words that represent high-frequency English spelling patterns. In the peeling off strategy, children are taught 40 prefixes and suffixes (e.g., *un-, pre-, -ment, -tion*) and how to identify and segment affixes in multisyllabic words (e.g., *pre-/ven/-tion*). The vowel variation strategy teaches children to try different vowel pronunciations in an unknown word until a successful result is obtained. For example, when attempting to read the word *pint*, children try both the short- and long-vowel sound of *i* and then decide which vowel pronunciation yields a known word. Children were taught vowel sounds as well as vowel combinations with multiple pronunciations (e.g., *ea, ow, oo*). In addition to these strategies, children were taught an organizational structure for effective strategy application and evaluation known as the Game Plan (see Lovett et al., 2000). At the end of each decoding session, children received reading fluency instruction in short expository texts from the QuickReads series (Hiebert, 2003).

Students in the RT condition received 30 min of decoding and fluency instruction per session as described previously, as well as 30 min of comprehension instruction using the four RT strategies (questioning, summarizing, clarifying, and predicting). Students read three expository texts: *Young Pioneers* (Hamilton, 2001), *Chasing Tornadoes* (Gold, 1999), and *Secrets of the Rain Forests* (Meyers, 1999). In each text, students took turns reading a passage orally while the other students followed along in the book. After each passage, the students were first encouraged to clarify any idea or word that did not make sense in the passage. Students then generated questions pertaining to the main idea of the passage. Next, students created summaries that focused on the main idea of the passage but did not include details. Finally, students made predictions using clues (e.g., pictures, bold words, information in the previous paragraph) to guess what the next passage would be about. After each strategy, the group was encouraged to evaluate and extend each other's responses. Over the course of the program, the teacher modeled each of the four strategies, scaffolded instruction for each student, and slowly turned over responsibility of teaching the group to the students as they became more competent with the strategies.

Students in the TRAD condition also received an hour of instruction, including decoding, fluency instruction, and comprehension. Students in this condition read the same texts and learned the same RT comprehension strategies. This group, however, received the comprehension instruction without the metacognitive components. The teacher guided the group through answering questions, clarifying, summarizing, and predicting. In contrast to the RT condition, the teacher did not prompt the other students to evaluate or elaborate on answers, and the teacher maintained the leadership role throughout the program.

Students were given a pre- and posttreatment assessment on knowledge items that were presented in the texts. A total of 30 multiple-choice items made up the assessment. Twenty questions were generated directly from *Young Pioneers*, *Chasing Tornadoes*, and *Secrets of the Rain Forests*. Ten additional items were generated from books in the series that were not read as part of the study. This will allow us in the future to contrast items that children were exposed to versus those they were not. To control for reading ability, all items were read to the children at pre- and posttest. In addition, at the beginning of the study, each child was administered the four subtests of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999), which is linked to the Wechsler Intelligence Scale for Children. The subtests comprise Vocabulary, Similarities, Matrix Reasoning, and Block Design and allow an estimate of a child's FSIQ. To better quantify the reading skills of the sample, we also individually administered the two subtests of the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1997): Sight Word Efficiency (SWE) and Decoding Efficiency (DE); the Passage Comprehension (PC) subtest of the Woodcock Reading Mastery Test (WRMT; Woodcock, 1998); and the Gray Oral Reading Test (GORT-4; Weiderhold & Bryant, 2004). Table 3.1 provides pretest means, standard deviations, and range of scores for the three treatment groups. At pretest the treatment groups answered on average about 13 questions correctly on the knowledge measure. The average standard score for the sample was 88 on FSIQ, 86 on TOWRE, 91 on PC, and 83 on GORT-4. There were no statistically significant group differences at pretest on any of the measures.

TABLE 3.1. Pretest Means, Standard Deviations, and Ranges on the Pretest Knowledge Measure and FSIQ as a Function of Condition: Study 1

	Measure	
	Pretest knowledge	FSIQ
DEC		
M	13.20	87.30
SD	3.14	12.33
Range	8–21	73–110
TRAD		
M	13.28	90.64
SD	3.43	13.85
Range	7–20	69–114
RT		
M	12.76	85.53
SD	3.66	10.52
Range	4–20	70–107

Note. FSIQ = Full-Scale IQ; DEC = decoding-only condition; TRAD = decoding + traditional strategy comprehension condition; RT = decoding + reciprocal teaching condition.

Table 3.2 presents the parameter estimates for the two-level HLM model. Controlling for pretest knowledge and FSIQ, children on average answered 16.31 questions correctly (γ_{00}) on the posttest knowledge measure. Children in the treatment conditions answered 2.72 more questions correctly compared with the control children (D_1, γ_{01}), and children in the RT condition answered on average 1.5 more questions correctly compared to children in the TRAD condition (D_2, γ_{02}). There was a main effect of pretest knowledge (γ_{10}) and FSIQ (γ_{20}) on posttest knowledge performance; high pretest knowledge and FSIQ were associated with higher posttest knowledge scores. In addition, a significant cross-level interaction between treatment (D_2) and FSIQ was detected (γ_{22}). This moderator relationship is depicted in Figure 3.1. For children with lower FSIQ scores, there is little difference between RT and TRAD in supporting declarative knowledge retention during in-text reading. However, as child FSIQ increases, there is a clear advantage of RT over TRAD on posttest declarative knowledge, even after controlling for pretest knowledge.

Results from Study 1 suggest that even though RT is more effective than TRAD, these effects are being carried by children with higher FSIQs, therefore, we must qualify for whom RT is most effective. At present, we do not have a definitive answer as to why FSIQ plays such an important role in children's ability to benefit from RT. An important element of RT is that children must internalize the four strategies to be able to monitor their strategy use and become better self-regulators of

TABLE 3.2. Prediction of Posttest Declarative Knowledge Using Treatment Condition, Pretest Declarative Knowledge, and FSIQ: Study 1

Fixed effects	γ	*SE*	*p*
β_0 intercept posttest knowledge			
γ_{00} mean	16.31	0.40	.000
γ_{01} treatment versus control (D_1)	2.72	0.55	.000
γ_{02} RT versus TRAD (D_2)	1.53	0.47	.004
β_1 pretest knowledge			
γ_{10} mean	0.34	0.16	.034
β_2 FSIQ			
γ_{20} mean	0.13	0.04	.005
γ_{21} treatment versus control (D_1)	0.08	0.05	.125
γ_{22} RT versus TRAD (D_2)	0.10	0.04	.021

Note. FSIQ = Full-Scale IQ; RT = decoding + reciprocal teaching condition; TRAD = decoding + traditional strategy comprehension condition.

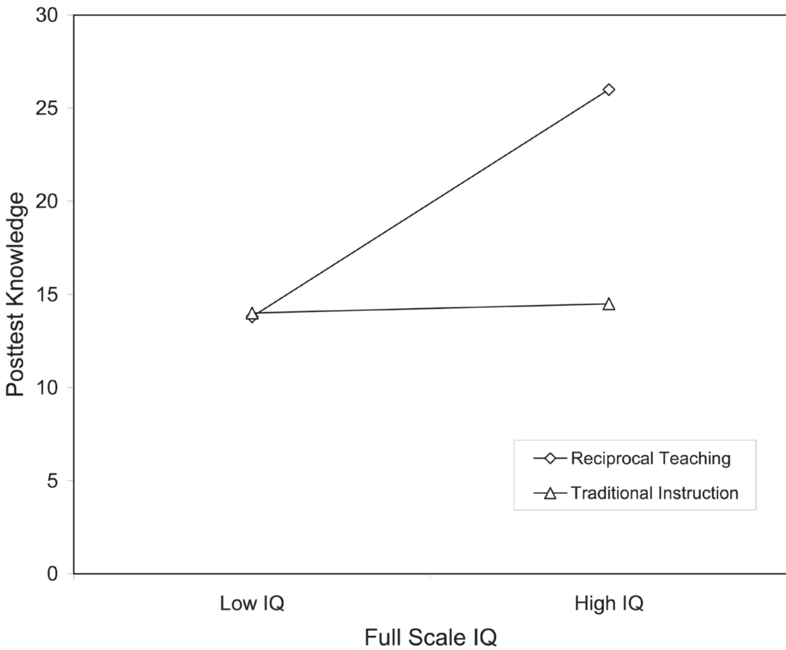

FIGURE 3.1. Moderating effects of Full-Scale IQ on posttest knowledge performance in the reciprocal teaching and traditional instruction groups: Study 1.

their own reading comprehension. We wonder whether the monitoring and self-regulatory aspects of RT place too high a cognitive demand on struggling readers with lower FSIQs. Additional work is needed before we conclude that the beneficial effects of RT should be reserved for struggling readers with elevated FSIQs.

Study 2: Facilitating Struggling Readers' Acquisition of Declarative Knowledge and Vocabulary Learning during Reading

In Study 2 we were interested in developing and evaluating the effects of an in-text vocabulary strategy program that borrowed techniques from the RT program. We were also interested in whether trade-offs may exist between vocabulary learning and declarative knowledge acquisition based on the type of text-level instruction provided to children during reading in expository text. For instance, we wondered whether children who focus on vocabulary learning during text reading would learn and retain less declarative knowledge compared with children who focused on knowledge building during text reading and vice versa. To accomplish this, 96 readers, in second to fifth grades were assigned to 28 different clusters, which were randomly assigned to three different conditions. Struggling readers were defined as children scoring below the 25th percentile on a standardized measure of reading comprehension (GORT-4) but able to read at least 40 words/min in third-grade text. Again, this allowed children to read the science and social studies texts used in the study. Clusters of two to four children received 90 min of instruction two times per week for 24 lessons (i.e., 36 hr of instruction). Instruction was provided at Vanderbilt University after school hours by trained research assistants. Clusters were randomly assigned to: (1) traditional comprehension instruction (COMP), (2) reciprocal teaching (KNOW), or (3) vocabulary instruction (VOC) conditions. All conditions were matched on instructional time. Students in all three conditions received the decoding and fluency instruction described in Study 1 for approximately 35 min per session. For the remainder of each session, students received comprehension instruction using the expository texts described in Study 1: *Young Pioneers, Chasing Tornadoes*, and *Secrets of the Rain Forests*. The COMP condition served as the control by providing children with the same program components but no strategy instruction during text reading. It was designed to mirror what we considered typical classroom practice in reading comprehension instruction. Students in this condition took turns reading the text without stopping to use a strategy or answer questions. At the end of the assigned reading for the session, students completed two to three worksheets. These worksheets consisted of drawing pictures, creating compare and contrast charts, matching terms, and answering cloze and multiple-choice questions about the text.

The KNOW condition was the same as the RT condition in Study 1. We rename it KNOW to represent training focused on promoting declarative knowledge learning. The VOC condition was created to parallel the KNOW condition in the amount of metacognition, dialogue, and gradual release of responsibility of teaching. In contrast to the KNOW condition, instruction in the vocabulary condition focused on the use of vocabulary strategies. We selected 80 target words across the three texts that were unlikely to be known to students, important to understanding the text, and likely to be found in other texts (high utility). In this condition, each student took turns reading a passage with identified target words and worked through four vocabulary strategies: (1) determining the part of speech (noun, verb, adjective), (2) using word analysis strategies (e.g., replacing *-un* with *not* to figure out that *unclear* means *not clear*), (3) using context clues, including signal words or phrases (e.g., *or, like, is known as*), or information in the text to infer meaning, and (4) a look-up strategy. A glossary was created for each target word and reviewed for the look-up strategy. The glossary contained a semantic map of antonyms and synonyms for each word as well as a short definition, part of speech, examples, nonexamples, and a sample sentence containing the target word. After working through each strategy, the students considered whether they had enough information to make sense of the text or needed to continue to the next strategy. The look-up strategy was always used last and only after the other strategies were exhausted.

Students were given a pre- and posttreatment assessment on knowledge and vocabulary items that were presented in the texts. The knowledge test was the same used in Study 1. A total of 40 multiple-choice items made up the vocabulary assessment. Thirty questions were generated directly from *Young Pioneers, Chasing Tornadoes*, and *Secrets of the Rain Forests*. Ten additional vocabulary items were generated from books in the series that were not read as part of the study. This will allow us in the future to contrast items that children were exposed to versus those they were not. To control for reading ability, all items were read to the children at pre- and posttest. In addition, at the beginning of the study, each child was administered the four subtests of the WASI (Wechsler, 1999). To better quantify the reading skills of the sample, we also individually administered the two subtests of the TOWRE (Torgesen et al., 1997)—SWE and DE—and the GORT-4 (Weiderhold & Bryant, 2004). Table 3.3 provides pretest means, standard deviations, and range of scores for the three treatment groups. At pretest the treatment groups answered on average about 13 knowledge questions and 14 vocabulary questions correctly. The average standard scores for the sample were 89 on the FSIQ, 90 on the TOWRE, and 82 on the GORT-4. There were no statistically significant group differences at pretest on any of the measures.

Table 3.4 presents the parameter estimates for the two-level HLM model of knowledge learning. Controlling for pretest knowledge and FSIQ, children on average answered 16.36 questions correctly (γ_{00}) on the posttest knowledge measure. Children in the treatment conditions (KNOW + VOC) answered only 0.21 more questions correctly compared with the control children (D_1, γ_{01}), and children in the KNOW condition answered on average 0.19 more questions correctly compared with chil-

TABLE 3.3. Pretest Means, Standard Deviations, and Ranges on the Pretest Knowledge Measure, Vocabulary Measure, and FSIQ as a Function of Condition: Study 2

	Measure		
	Pretest knowledge	Pretest vocabulary	FSIQ
COMP			
M	13.10	14.34	89.55
SD	3.17	5.15	13.00
Range	5–18	6–29	60–125
KNOW			
M	12.64	15.61	90.55
SD	3.52	5.12	14.61
Range	6–21	7–26	65–132
VOC			
M	13.42	13.42	87.81
SD	3.39	4.28	13.21
Range	6–23	5–29	64–128

Note. FSIQ = Full-Scale IQ; COMP = traditional comprehension instruction; KNOW = reciprocal teaching; VOC = vocabulary instruction.

dren in the VOC condition (D_2, γ_{02}). Results suggest that the type of in-text instruction (KNOW, VOC) had little additive effect over COMP on knowledge learning during reading. Importantly, though, there was no loss in declarative knowledge learning for children focusing on learning new vocabulary while reading.

There was a main effect of pretest knowledge (γ_{10}) and FSIQ (γ_{20}) on posttest knowledge performance: Higher pretest knowledge and FSIQ were associated with higher posttest knowledge scores. In addition, a significant cross-level interaction between treatment (D_1) and FSIQ was detected (γ_{21}). This moderator relationship is depicted in Figure 3.2. For children with lower FSIQ scores, there was an advantage for the in-text strategies (KNOW + VOC) over COMP in supporting declarative knowledge retention during in-text reading. However, as FSIQ increased, there was a clear advantage of COMP over the in-text strategy conditions. This suggests that a lack of some type of in-text instruction was detrimental to children with lower cognitive skills but advantageous for children of higher cognitive ability.

Table 3.5 presents the parameter estimates for the two-level HLM model of vocabulary learning. Controlling for pretest vocabulary and FSIQ, children on average answered 18.82 questions correctly (γ_{00}) on the posttest vocabulary measure. Children in the treatment conditions

TABLE 3.4. Prediction of Posttest Declarative Knowledge Using Treatment Condition, Pretest Declarative Knowledge, and FSIQ: Study 2

Fixed effects	γ	*SE*	*p*
β_0 intercept posttest knowledge			
γ_{00} mean	16.36	0.45	.000
γ_{01} treatment versus control (D_1)	0.21	0.69	.766
γ_{02} KNOW versus VOC (D_2)	0.19	0.48	.694
β_1 pretest knowledge			
γ_{10} mean	0.65	0.12	.000
β_2 FSIQ			
γ_{20} mean	0.15	0.03	.000
γ_{21} treatment versus control (D_1)	–0.11	0.03	.005
γ_{22} KNOW versus VOC (D_2)	0.02	0.03	.574

Note. FSIQ = Full-Scale IQ; KNOW = reciprocal teaching; VOC = vocabulary instruction.

(VOC + KNOW) answered 0.85 more vocabulary questions correctly compared with the control children (D_1, γ_{01}); this difference was not statistically significant. However, children in the VOC condition answered on average 1.95 more questions correctly compared with those in the KNOW condition (D_2, γ_{02}). There was a main effect of pretest vocabulary (γ_{10}) and FSIQ (γ_{20}) on posttest knowledge performance, with high pretest vocabulary and FSIQ being associated with higher posttest vocabulary scores. In addition, two significant cross-level interactions were identified between: treatment (D_1) and FSIQ (γ_{21}) and treatment (D_2) and FSIQ (γ_{22}). The moderator relationship between D_1 and FSIQ is depicted in Figure 3.3. For children with lower FSIQ scores, there was little difference between COMP and the in-text strategies (KNOW + VOC); however, at higher FSIQ, children in the in-text strategy condition outperformed those using the in-text strategies. Contrasting the two in-text strategies (see Figure 3.4), children with lower FSIQ showed similar performance across the VOC and KNOW conditions; however, as FSIQ increased, there was an advantage of the VOC over the KNOW condition, suggesting that much of the VOC effect was being driven by higher FSIQ children. Results suggest that the type of in-text instruction had a significant effect on vocabulary learning during reading, particularly in children with higher FSIQ. To achieve significant vocabulary gains, it is important that the in-text instruction focus on new vocabulary. It was also notable that vocabulary gains in the VOC condition did not come at the expense of knowledge gains.

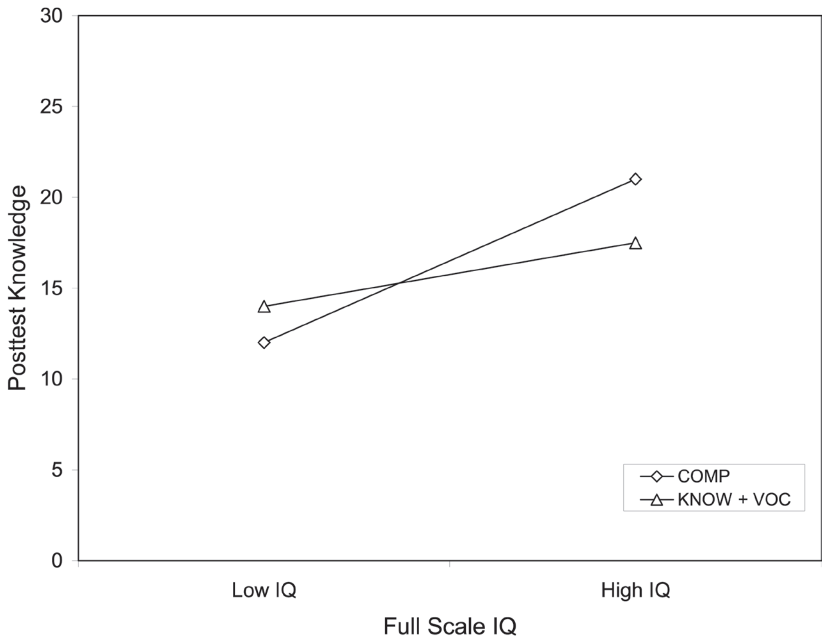

FIGURE 3.2. Moderating effects of Full-Scale IQ on posttest knowledge performance in the comprehension (COMP) and combined knowledge and vocabulary (KNOW + VOC) groups: Study 2.

TABLE 3.5. Prediction of Posttest Vocabulary Knowledge Using Treatment Condition, Pretest Vocabulary Knowledge, and FSIQ: Study 2

Fixed effects	γ	*SE*	*p*
β_0 intercept posttest vocabulary			
γ_{00} mean	18.82	0.65	.000
γ_{01} treatment versus control (D_1)	0.85	0.90	.360
γ_{02} VOC versus KNOW (D_2)	1.95	0.80	.030
β_1 pretest vocabulary			
γ_{10} mean	0.72	0.12	.000
β_2 FSIQ			
γ_{20} mean	0.15	0.02	.000
γ_{21} treatment versus control (D_1)	0.10	0.03	.004
γ_{22} KNOW versus VOC (D_2)	0.08	0.02	.032

Note. FSIQ = Full-Scale IQ; KNOW = reciprocal teaching; VOC = vocabulary instruction.

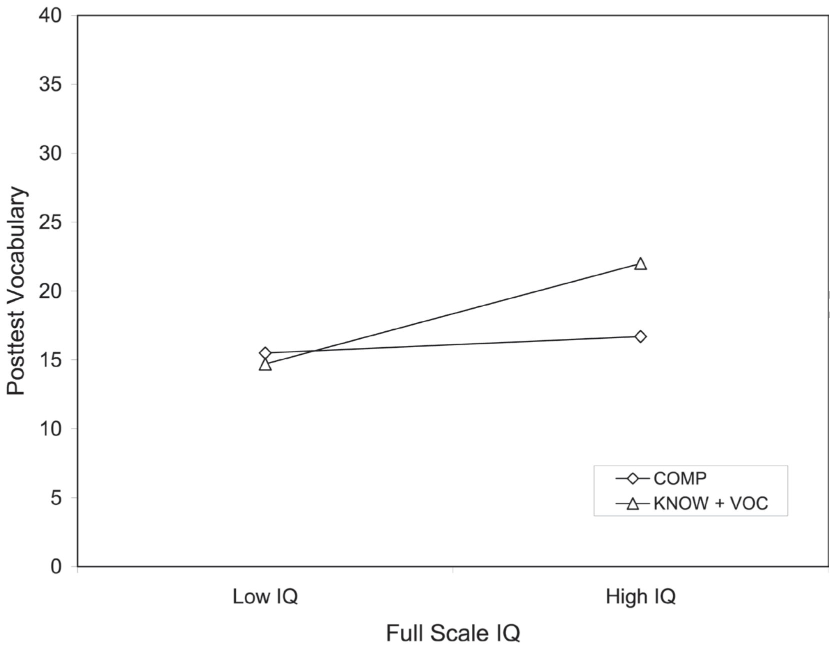

FIGURE 3.3. Moderating effects of Full-Scale IQ on posttest vocabulary performance in the comprehension (COMP) and combined knowledge and vocabulary (KNOW + VOC) groups.

CONCLUSIONS

Results from the two studies seem to converge in several important ways. In both studies we found significant treatment effects associated with in-text strategy use. In Study 1 we found that adding a metacognitive component to strategy training improved children's ability to retain declarative knowledge encountered in text. In Study 2 a vocabulary strategy improved children's ability to derive the meaning of unfamiliar words while not affecting the ability to retain declarative knowledge. However, in both studies, these treatment effects were moderated by child-level FSIQ. In addition, the moderating effect of FSIQ tended to favor children with higher FSIQ. We speculate that cognitive demands of our interventions may be too high for struggling readers with lower FSIQs to easily implement and automatize. Further, we wonder whether providing greater practice with each of the strate-

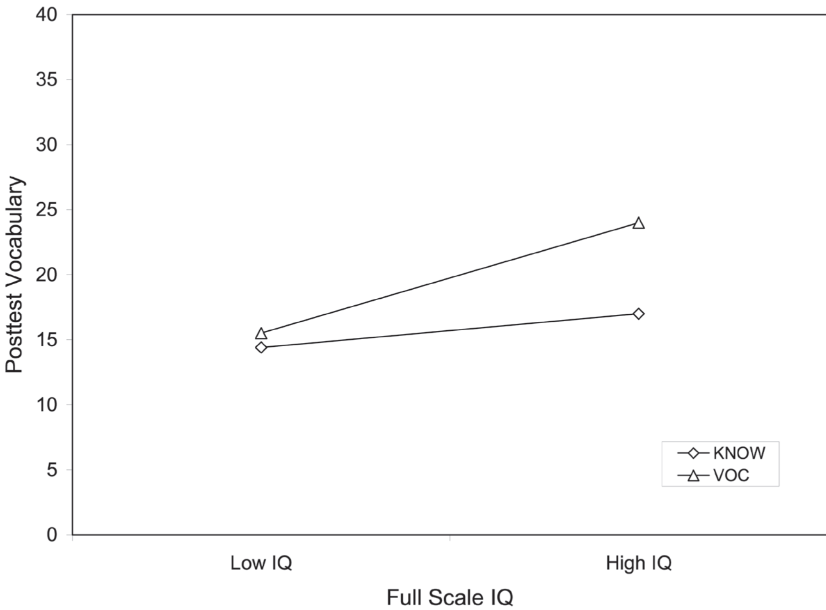

FIGURE 3.4. Moderating effects of Full-Scale IQ on posttest vocabulary performance in the vocabulary (VOC) and knowledge (KNOW) groups.

gies and longer periods of scaffolding might lessen the overall cognitive demands of the interventions and reduce the effects of FSIQ as a moderator of effectiveness. Additional work is needed before we conclude that the beneficial effects of the interventions should be reserved for struggling readers with elevated FSIQs. We encourage further research examining the role of IQ in moderating struggling readers' response to in-text strategy use.

ACKNOWLEDGMENTS

This research was supported in part by Grant No. H324D0100003 from the U.S. Department of Education, Office of Special Education Programs; Grant No. R305G050101 from the U.S. Department of Education, Institute of Education Sciences; and Core Grant No. HD15052 from the National Institute of Child Health and Human Development to Vanderbilt University. Statements do not reflect the position or policy of these agencies, and no official endorsement by them should be inferred.

REFERENCES

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Anderson, R. C., & Freebody, P. (1985). Vocabulary development. In H. Singer & R. B. Rudell (Eds.), *Theoretical models and processes of reading* (pp. 343–371). Newark, DE: IDA.

Anderson, R. C., & Pearson, P. D. (1984). A schemata–theoretic view of basic processes in reading. In P. D. Pearson, R. Barr, M. L. Kamil, & P. Mosenthal (Eds.), *Handbook of reading research* (pp. 255–291). New York: Longman.

Anderson, R. C., Reynolds, R. E., Schallert, D. L., & Goetz, E. T. (1977). Frameworks for comprehending discourse. *American Educational Research Journal, 14*, 367–381.

Anderson, R. C., Spiro, R. J., & Anderson, M. C. (1978). Schemata as scaffolding for the representation of information in connected discourse. *American Educational Research Journal, 15*, 433–440.

Baker, L. (1979). Comprehension monitoring: Identifying and coping with test confusion. *Journal of Reading Behavior, 11*, 365–374.

Baker, L., & Anderson, R. I. (1982). Effects of inconsistent information on text processing: Evidence for comprehension monitoring. *Reading Research Quarterly, 22*, 281–294.

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In P. D. Pearson, R. Barr, M. L. Kamil, & P. Mosenthal (Eds.), *Handbook of reading research* (pp. 353–394). New York: Longman.

Baker, S. K., Simmons, D. C., & Kame'enui, E. J. (1995). *Vocabulary acquisition: Curriculum and instructional implications for diverse learners* (Technical Report No. 14). Eugene: University of Oregon, National Center to Improve the Tools of Educators.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Baumann, J. F., & Kame'enui, E. J. (1991). Research on vocabulary instruction: Ode to Voltaire. In J. Flood, J. J. D. Lapp, & J. R. Squire (Eds.), *Handbook of research on teaching the English language arts* (pp. 604–632). New York: Macmillan.

Beck, I. L., McKeown, M. G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction*. New York: Guilford Press.

Beck, I. L., Perfetti, C. A., & McKeown, M. G. (1982). The effects of long-term vocabulary instruction on lexical access and reading comprehension. *Journal of Educational Psychology, 74*, 506–521.

Berninger, V. W., Abbott, R. D., Vermeulen, K., & Fulton, C. M. (2006). Paths to reading comprehension in at-risk second-grade readers. *Journal of Learning Disabilities, 39*, 334–351.

Blachowicz, C. L., & Fisher, P. (2000). Vocabulary instruction. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Vol. III* (pp. 503–524). Mahwah, NJ: Erlbaum.

Bransford, J. D., Stein, B. S., Shelton, T. S., & Owings, R. A. (1981). Cognition and adaptation: The importance of learning to learn. In J. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 92–110). Hillsdale, NJ: Erlbaum.

Cain, K., & Oakhill, J. (1999). Inference making ability and its relation to comprehension failure in young children. *Reading and Writing, 11*, 489–503.

Carnine, D. W., Silbert, J., & Kameenui, E. J. (1997). *Direct instruction in reading*. Columbus, OH: Merrill.

Chiesi, H. L., Spilich, G. J., & Voss, J. F. (1979). Acquisition of domain-related information in relation to high and low domain knowledge. *Journal of Verbal Learning and Verbal Behavior, 18*, 257–274.

Cunningham, A. E., & Stanovich, K. E. (1991). Tracking the unique effects of print exposure in children: Associations with vocabulary, general knowledge, and spelling. *Journal of Educational Psychology, 83*, 264–274.

Cunningham, A. E., & Stanovich, K. E. (1998, Spring/Summer). What reading does for the mind. *American Educator*, pp. 8–15.

Deshler, D. D., Ellis, E. S., & Lenz, B. K. (1996). *Teaching adolescents with learning disabilities: Strategies and methods* (2nd ed.). Denver, CO: Love.

Dole, J. A., Valencia, S. W., Greer, E. A., & Wardrop, J. L. (1991). Effects of two types of prereading instruction on the comprehension of narrative and expository text. *Reading Research Quarterly, 26*, 142–159.

Fuchs, D., & Young, C. L. (2006). On the irrelevance of intelligence in predicting responsiveness to reading instruction. *Exceptional Children, 73*, 8–30.

Gajria, M., Jitendra, A. K., Sood, S., & Sacks, G. (2007). Improving comprehension of expository text in students with LD: A research synthesis. *Journal of Learning Disabilities, 40*, 210–225.

Garner, R. (1987). *Metacognition and reading comprehension*. Norwood, NJ: Ablex.

Gaskins, I. W., Downer, M. A., & Gaskins, R. W. (1986). *Introduction to the Benchmark School Word Identification/Vocabulary Development Program*. Media, PA: Benchmark School.

Gold, B. (1999). *Chasing tornadoes*. Tucson, AZ: Good Year Books.

Gough, P. B. (1996). How children learn to read and why they fail. *Annals of Dyslexia, 46*, 3–20.

Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education, 7*, 6–10.

Graves, M. F., Cooke, C. L., & LaBerge, C. L. (1983). Effects of previewing short stories. *Reading Research Quarterly, 18*, 262–276.

Hacker, D. J., & Tenent, A. (2002). Implementing reciprocal teaching in the classroom: Overcoming obstacles and making modifications. *Journal of Educational Psychology, 94*, 699–718.

Hamilton, T. (2001). *Young pioneers*. Lebanon, IN: Modern Curriculum Press.

Hayes, D. P., & Ahrens, M. (1988). Vocabulary simplification for children: A special case of "motherese"? *Journal of Child Language, 15*, 395–410.

Hiebert, E. H. (2003). *QuickReads: A research-based fluency program*. Parsippany, NJ: Modern Curriculum Press.

Jenkins, J. R., Matlock, B., & Slocum, T. A. (1989). Two approaches to vocabulary instruction: The teaching of individual word meanings and practice in deriving word meaning from context. *Reading Research Quarterly, 24*, 216–235.

Kamil, M. L. (2004). Vocabulary and comprehension instruction: Summary and implications of the National Reading Panel findings. In P. McCardle & V. Chhabra (Eds.), *The voice of evidence in reading research* (pp. 213–234). Baltimore, MD: Brookes.

Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. Cambridge, UK: Cambridge University Press.

Landauer, T. K., & Dumais, S. T. (1996). How come you know so much? From practical problems to new memory theory. In D. J. Herrmann, C. McEvoy, C. Hertzog, P. Hertel, & M. K. Johnson (Eds.), *Basic and applied memory research theory in context, volume 1* (pp. 105–126). Mahwah, NJ: Erlbaum.

Langer, J. (1984). Examining background knowledge and text comprehension. *Reading Research Quarterly, 19*, 469–481.

Langer, J., & Nicolich, M. (1981). Prior knowledge and its relationship to comprehension. *Journal of Reading Behavior, 13*, 373–379.

Leach, J. M., Scarborough, H. S., & Rescorla, L. (2003). Late-emerging reading disabilities. *Journal of Educational Psychology, 95*, 211–224.

Lovett, M. W., Lacerenza, L., & Borden, S. (2000). Putting struggling readers on the PHAST track: A program to integrate phonological and strategy-based remedial reading instruction and maximize outcomes. *Journal of Learning Disabilities, 33*, 458–476.

Mastropieri, M. A., & Scruggs, T. E. (1997). Best practices in promoting reading comprehension in students with learning disabilities 1976 to 1996. *Remedial and Special Education, 18*, 197–213.

McCormick, S. (1989). Effects of previews on more skilled and skilled readers' comprehension of informational text. *Journal of Reading Behavior, 21*, 219–239.

Meyers, E. (1999). *Secrets of the rain forest*. Parsippany, NJ: Modern Curriculum Press.

Nagy, W., Anderson, R., & Herman, P. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal, 24*, 237–270.

National Center for Learning Disabilities. (1999). *Two decades of research in learning disabilities: Reading comprehension, expressive writing, problem solving, self-concept keys to successful learning. A National Summit on Research in Learning Disabilities*. New York: Author.

Neuman, S. B. (1988). Enhancing children's comprehension through previewing. *National Reading Conference Yearbook, 37*, 219–224.

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel* (NIH Publication No. 00-4754). Washington, DC: U.S. Government Printing Office.

Oakhill, J. (1984). Inferential and memory skills in children's comprehension of stories. *British Journal of Educational Psychology, 54*, 31–39.

Oakhill, J., Cain, K., & Yuill, N. (1998). Individual differences in children's comprehension skill: Toward an integrative model. In C. Hulme & R. M. Joshi

(Eds.), *Reading and spelling: Development and disorders* (pp. 343–368). Mahwah, NJ: Erlbaum.

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-foster and comprehension-monitoring activities. *Cognition and Instruction, 1*, 117–175.

Paris, S. G., & Oka, E. R. (1989). Strategies for comprehending text and coping with reading difficulties. *Learning Disability Quarterly, 12*, 32–42.

Pazzaglia, F., Cornoldi, C., & DeBeni, R. (1995). Knowledge about reading and self-evaluation in reading disabled children. In T. E. Scruggs & M. A. Mastropieri (Eds.), *Advances in learning and behavioral disabilities* (Vol. 9, pp. 91–118). Greenwich, CT: JAI Press.

Pearson, P. D., Hanson, J., & Gordon, C. (1979). The effect of background knowledge on young children's comprehension of explicit and implicit information. *Journal of Reading Behavior, 9*, 201–209.

Perfetti, C. A., Marron, M. A., & Foltz, P. W. (1996). Sources of comprehension failure: Theoretical perspectives and case studies. In C. Cornoldi & J. Oakhill (Eds.), *Reading comprehension difficulties: Processes and interventions* (pp. 137–165). Mahwah, NJ: Erlbaum.

Pressley, M. (2000). What should comprehension instruction be the instruction of? In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Vol. III* (pp. 545–562). Mahwah, NJ: Erlbaum.

RAND Reading Study Group. (2002). *Reading for understanding: Toward a R&D program in reading comprehension*. Santa Monica, CA: RAND Corporation.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. London: Sage.

Recht, D. R., & Leslie, L. (1988). Effect of prior knowledge on good and poor readers memory of text. *Journal of Educational Psychology, 80*, 16–20.

Schatschneider, C., Harrell, E. R., & Buck, J. (2007). An individual-differences approach to the study of reading comprehension. In K. R. Tannenbaum, R. K. Wagner, & A. E. Muse (Eds.), *Vocabulary acquisition: Implications for reading comprehension* (pp. 249–275). New York: Guilford Press.

Smith, M. K. (1941). Measurement of the size of general English vocabulary through the elementary grades and high school. *Genetic Psychological Monographs, 24*, 311–345.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academic Press.

Spilich, G. J., Vesonder, G. T., Chiesi, H. L., & Voss, J. F. (1979). Text processing of domain related information for individuals with high and low domain knowledge. *Journal of Verbal Learning and Verbal Behavior, 18*, 275–290.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*, 360–406.

Stanovich, K. E. (2000). *Progress in understanding reading*. New York: Guilford Press.

Stanovich, K. E., & Cunningham, A. E. (1993). Where does knowledge come from? Specific associations between print exposure and information acquisition. *Journal of Educational Psychology, 85*, 211–229.

Stanovich, K. E., Cunningham, A. E., & West, R. F. (1998). Literacy experiences and the shaping of cognition. In S. Paris & H. Wellman (Eds.), *Global prospects of education: Development, culture, and schooling* (pp. 253–288). Washington, DC: American Psychological Association.

Stanovich, K. E., & West, R. F. (1989). Exposure to print and orthographic processing. *Reading Research Quarterly, 24*, 402–433.

Stanovich, K. E., West, R. F., Cunningham, A. E., Cipielewski, J., & Siddiqui, S. (1996). The role of inadequate print exposure as a determinant of reading comprehension problems. In C. Cornoldi & J. Oakhill (Eds.), *Reading comprehension difficulties: Processes and interventions* (pp. 15–68). Mahwah, NJ: Erlbaum.

Sternberg, R. J. (1985). *Beyond IQ: A triarchic theory of human intelligence*. Cambridge, UK: Cambridge University Press.

Sternberg, R. J. (1987). Most vocabulary is learned from context. In M. G. McKeown & M. E. Curtis (Eds.), *The nature of vocabulary acquisition* (pp. 89–105). Hillsdale, NJ: Erlbaum.

Swanborn, M. S. L., & de Glopper, K. (1999). Incidental word learning while reading: A meta-analysis. *Review of Educational Research, 69*, 261–285.

Tomesen, M., & Aarnoutse, C. (1998). The effects of an instructional program for deriving word meanings. *Educational Studies, 24*, 107–128.

Torgesen, J. K. (1998, Spring/Summer). Catch them before they fall: Identification and assessment to prevent reading failure in young children. *American Educator*, pp. 32–40.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1997). *Test of word reading efficiency*. Austin, TX: PRO-ED.

Weiderhold, J. L., & Bryant, B. R. (2004). *Gray Oral Reading Test—Fourth edition (GORT-4)*. San Antonio, TX: Pearson.

Weschler, D. (1999). *Wechsler Abbreviated Scale of Intelligence*. San Antonio, TX: Psychological Corporation.

West, R. F., Stanovich, K. E., & Mitchell, H. R. (1993). Reading in the real world and its correlates. *Reading Research Quarterly, 28*, 34–50.

White, T. G., Graves, M. F., & Slater, W. H. (1990). Growth of reading vocabulary in diverse elementary schools: Decoding and word meaning. *Journal of Educational Psychology, 82*, 281–290.

Woodcock, R.W. (1998). *Woodcock Reading Mastery Test—Revised/normative update*. Circle Pines, MN: American Guidance Service.

Yuill, N., & Oakhill, J. (1991). *Children's problems in text comprehension*. Cambridge, UK: Cambridge University Press.