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Chapter 12

The Psychology and Pedagogy of Reading Processes

P. David Pearson and Gina Cervetti

As we approach the monumental task of living up to the standard imposed by our predecessor, the late Michael Pressley, in writing the reading chapter for this, the seventh volume in the series of *Handbooks of Psychology*, we are both privileged and humbled by the opportunity of continuing the legacy of providing a comprehensive account of new theoretical and empirical contributions to reading research. Respectful of the cross-age approach that Pressley took in the last volume (account for progress of beginning readers, adolescent and adult readers—and along the way highlight some pedagogical processes that are salient at all levels, such as word recognition, vocabulary, and comprehension), we took a different approach.

We decided to focus on reading as a fundamentally cognitive process that can be influenced by contextual forces at many levels, most notably for education, schools, and policy environments. Thus we deal with the fundamental psychological aspects of reading—*word level processes* (including subword processes such as phonological awareness and decoding, word reading, and vocabulary, with all of its entailments), and *text-level processes* as they are grounded in structures, genres, and disciplinary knowledge pursuits. After the account of these cognitive processes, we turn to a *setting-level analysis*, in which we examine word- and text level processes within schooling (including instruction in English language arts and the subject matters of history and science) and policy contexts.

As we unpack each element in our review, our goal is to answer the question: How has what we have learned in the last decade advanced the knowledge base available to us? As we move to setting level analysis, we meet head on practices that have emerged less to understand and more to improve the acquisition of those processes among students in our schools (though not always with positive effects!). We end intentionally with what might be considered an anomaly in the *Handbook of Educational Psychology*—a section on the policy context in which debates about the science of reading, especially reading pedagogy, occur. Reading has, for better or worse, always been contested ground.

And even the very act of reading—whether for gist, enjoyment, or critique—is never free of ideology.

Our method for locating research relevant to our charge was to rely first on highly regarded syntheses and analyses of the research base, most notably in our case (a) the 2006 handbook, *The Science of Reading* (Snowling & Hulme, 2005), (b) Volume IV of the *Handbook of Reading Research* (Kamil, Pearson, Moje, & Afflerbach, 2011), and (c) seminal reviews, including meta-analyses, appearing in national initiatives (e.g., *Preventing Reading Difficulties* and the *National Reading Panel*) and in other outlets. From there we worked our way back to individual research articles that were important in their own right and/or typical of a large class of studies. And, in areas in which we were ourselves work, we relied on our professional knowledge of the most important reviews and research studies.

A review such as this, in which we try to capture in a handful of pages what has taken others a full tome to unpack, is necessarily selective. We could not hope to convey either the breadth or depth of scholarship of the field, not even the past decade. So we apologize in advance to all of our colleagues whose work we did not cite and all users whose favorite topics are omitted. All we can hope for is that we have chosen, in our selection process, important and relevant (if not *the* most important and *the* most relevant) topics to guide readers who want to know what matters most in the psychological foundations of basic processes and instructional practices in reading.

One final introductory comment: We come close, in the chapter title, to plagiarizing another of our heroes, Edmund Burke Huey in the title of his landmark 1908 book, *The Psychology and Pedagogy of Reading*. The similarity is intentional. Huey was a remarkable scholar who reflected both the issues and understandings of the day and anticipated phenomena and insights that would not appear in the research until five decades after his career had ended. That we could achieve either of those goals for these times—reflecting the present and anticipating the future—would please us enormously. But even if we cannot achieve either of those goals, at least we have our "titled" brush with history.

Examining Basic Reading Processes

For our purposes, basic processes include those processes that enable to us perceive, pronounce, and understand words and those that enable us to build models of meaning for—and use information and insights from—sentences, paragraphs, and entire passages of text.

Word Level Processes

Word level processes are defined as those entailed in word recognition, either as component or prerequisite skills. Specifically, we discuss word recognition and its acquisition, phonological awareness, and vocabulary.

Expert Word Recognition

Over the past 40 years, we have learned a great deal about the complex nature of word recognition among skilled readers, in particular about the manner in which recognition is conditioned by a range of lexical and semantic structures—some promoting bottom-up and others top-down processing—that interact with one another in the word recognition process (see Lupker, 2005). These advances notwithstanding, a central (perhaps *the* central) debate in word recognition is whether the pathway from the orthographic representation in print to lexical representation in memory is mediated by a phonological representation prior to recognition. The data (see Van Orden & Kloos, 2005, for a systematic review) are, at best, ambiguous. Some evidence points to phonological mediation; for example, the categorization of a homophone like *brake* as part of a car, an obvious clue for *break*, occurs with some frequency. Other evidence points to a direct access from print to lexical representation; for example, semantic categorization errors occur often for low frequency homophones, like *peek*, but rarely for high frequency homophones like *break*, implying that with greater exposure, access even for ambiguous words is direct and automatic. These sorts of ambiguous findings have led many scholars to posit various versions of a dual route model (Coltheart, 2005; Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001; Davis, 2010). Dual route models posit that readers go directly from print to lexical representation when words are highly familiar and unambiguous, but interpose a phonological representation on the way from print to lexical representation when words are unfamiliar and opaque. The movement in modern theories of expert word recognition is toward highly contextualized models of word recognition, models in which feedback between graphemic, phonemic, and lexical levels of analysis, implying dual if not more routes to meaning, are the order of the day (Van Orden & Kloos).

Acquiring Word Reading Skills

There are numerous accounts of the ways in which students develop as word readers, most of them organized into "stages" or "phases" in which certain approaches to reading words are statistically dominant over others (see Ehri, 2005b, for a thorough comparison of the various stage theories). We will avoid

entering into the debate on the precise boundaries between stages, opting instead for "general" dispositions toward word reading that seem to hold across stages.

In order to read the words that appear before them in text, readers have several choices (Ehri, 2005a). They can read a word by *decoding*—converting the constituent letters into sounds, blending the sounds together, and pronouncing the word. They can read a word by *memory*—calling up a trace of its form and pronunciation from memory, otherwise known as sight word reading. They can read a word by *analogy*—inferring its pronunciation because of its similarity to a known word (e.g., brother is like mother except at the beginning). Finally, they can *predict* its pronunciation by relying on contextual features such as clues in the text (this must be "bark" because the text mentions a dog) or pictures, at least in the earliest stories.

Students go through a predictable set of phases in their word reading repertoire—from pre-alphabetic reading (recognizing monkey by the tail) to partially alphabetic (using salient clues such as initial letters or word families) to full alphabetic (sequentially decoding letters into sounds) to consolidated alphabetic (dynamically orchestrating all four word reading strategies). The progression is from single to multiple approaches, where students are increasingly empowered to use all four of these word-reading processes. Furthermore, they use the processes in synergistic and complementary ways. For example, once they reach the full alphabetic stage, they can decode words readily. Once decoded, they can transfer the visual and auditory traces of a word to memory so that, after a few successful exposures, the word enters their sight word repertoire. Note that this repertoire is not limited to irregularly spelled words that must be recognized as units, but it consists of all of the words, including decodable words, that are immediately apprehended as units, without the need for arduous analysis. This "self-teaching" mechanism (see Share, 1995) is crucial in early reading development because the more words that readers can move into their sight word repertoire, the more cognitive energy they can allocate to the really challenging tasks of reading, such as inferring the meanings of obscure words, text comprehension. A similar phenomenon happens with reading by analogy, usually in the latter part of grade one to early grade two. At this fairly advanced point in the development of their phonological recoding repertoire, readers are chunking letters into groups, such as prefixes (inter-, pre-, post-), suffixes (-est, -tion), and word families (-at, -eet, - ough). Once they have those chunks under control, they can recognize the chunks as units and transform even longer and more complex words into immediately recognizable sight words. Again, evidence of the self-teaching mechanism at work.

Phonological Awareness

A consistent finding in early reading development research, both correlational and experimental, of the past 25 years is that attention to the patterns of sounds that operate at the subword level matter (Adams, 1990; National Early Literacy Panel, 2008; National Institute of Child Health and Human Development, 2000; Snow, Burns, & Griffith, 1998). Whether we define it as awareness of the words that make up a compound (sword + fish = swordfish), the syllables within a word (tay + buhl = table), the onset-rime structure of monosyllables (buh + ad = bad), or the phonemic components of a word (buh + ah + duh = bad), phonological awareness both predicts and improves later reading achievement.

Various measures of phonological awareness are strong predictors of later reading achievement, at least through grade one and into grade two. With respect to early indicators of later success, the NELP (2008), in an extensive meta-analysis, identified 11 variables that have proven to be moderate to strong predictors of later literacy proficiency. Six of these variables, the panel concluded, served as the "best" (i.e., strongest and most consistent) predictors. Of these six, two—alphabet knowledge (which the panel defined to include letter-sound as well as letter-name correspondences) and phonological awareness—proved to be the best of the best. This combination appears to be quite durable, having been reported as part of federal initiatives for more than 40 years, beginning with the First-Grade Studies (Bond & Dykstra, 1967), and even earlier in the work of Durrell and Murphy (1953) and extending into the 1990s and early 2000s (Adams, 1990; NICHD, 2000; Snow et al., 1998). Interestingly, an equally important finding in the predictive research is that subword factors like alphabet knowledge and phonemic awareness predict achievement for the early stages of learning to read (Grade 1 into 2), but it is early measures of language and vocabulary that predict achievement beyond the early stages (Snow et al, 1998). A more important, and equally consistent, finding about subword level factors is that, when they are taught systematically in the early stages of learning to read, they lead to an advantage over other sorts of instruction in overall reading achievement, particularly on word reading tasks (Adams, 1990; Ehri et al., 2001); NELP, 2008; NICHD, 2000; Snow et al., 1998)—but that is a matter for a later section of this review.

Several meta-analyses looking both at the impact of phonological awareness (PA) and its relationship to other early reading indicators have been published in the past decade, and they lead to somewhat different conclusions than those conducted in the previous decade. For example, Swanson, Trainin, Necoechea, and Hammill (2003) examined the relationships among PA, rapid naming (of colors, pictures, letters, numbers or words), and word reading. Looking across 35 studies, they found that phonemic awareness was no better at predicting later word reading than other variables, such as pseudoword reading, IQ,

vocabulary, orthography, spelling, or memory. One result of these later syntheses has been to cast doubt on the preeminence of phonological awareness as a predictor of reading. These studies position phonological processing as only one contributor to word reading skill, and several recent analysis have pointed, in particular, to the contribution of orthographic processing (Badian, 2001; Blaiklock, 2004; Hagiliassis, Pratt, & Johnston, 2006). Cunningham, Nathan, and Raher (2010) point out that, while phonological processing accounts for significant variance in word recognition ability, there is variance left unaccounted for, which may be attributable to orthographic processing. That additional explained variance may help account for why some children who have adequate phonological awareness fall behind in their word recognition skills. We are left with the conclusion that has characterized most reviews of phonological processing and reading—that it is a necessary but not a sufficient condition for reading success.

Vocabulary

We had difficulty deciding whether we should consider vocabulary acquisition as a "high-level" word level process or a "low-level" text level process. Vocabulary is, at least at a surface level, all about words and their meanings, but words, from the perspective of meaning, are only incidentally about words; they are better thought of as fundamentally conceptual entities. Thus we could just as easily located this review as the first part of the text level processes section.

This progress we report notwithstanding, we still have not unambiguously settled the question of why vocabulary and comprehension are so closely related, a question unpacked by Anderson and Freebody in 1981. Does learning new word meanings cause comprehension (what Anderson and Freebody label the *instrumentalist hypothesis*)? Or is vocabulary knowledge an alias for some other factor that is the real cause of comprehension—either a store of important conceptual information about the world and the various disciplines (the knowledge hypothesis) or general verbal ability (the aptitude hypothesis).

One thing is certain: The decades preceding the new millennium brought considerable research that both underscored the significance of vocabulary knowledge for success in reading—and in school more generally—and that established fundamental understandings about how vocabulary words are learned. It is well-established, for example, that vocabulary knowledge is multidimensional and incrementally acquired through repeated exposure. That is, to know a word is to know more than its definition, and knowledge of a word's definition alone is not sufficient to enhance reading comprehension (Stahl & Fairbanks, 1986). When children are exposed to words in different contexts through repeated encounters, each encounter provides new information about the word, such as contexts-of-use

and aspects of the word's meaning (S. Stahl & K. Stahl, 2004). Exposures over time and in varied contexts, then, allow for refinement and differentiation in word knowledge. In addition, repeated encounters seem to ensure that words are known well enough to be accessed quickly during reading. McKeown, Beck, Omanson, and Pople (1985) famously found that 12 encounters with a word reliably improved understanding, but four encounters did not.

It is also well understood that active interaction with words enhances vocabulary acquisition. Nagy (1988) synthesized research suggesting that meaningful processing of words is an important factor in learning new words, a finding that was later affirmed by the National Reading Panel (National Institute of Child Health & Human Development, 2000). Not surprisingly, then, studies have documented that, while many words are acquired incidentally through extensive and wide reading (e.g., Nagy, Anderson, & Herman, 1987; Nagy, Herman, & Anderson, 1985), instruction of word meanings produces stronger word learning than encounters with words through reading alone (e.g., Beck, Perfetti, & McKeown, 1982; Paribakht & Wesche, 1997; Stahl & Fairbanks, 1986).

By the turn of the century, research had also established the significance of vocabulary knowledge for comprehension (Beck & McKeown, 1990; Cunningham & Stanovich, 1997) and had documented significant discrepancies in vocabulary knowledge between high- and low-socio-economic status (SES) students (Hart & Risley, 1995).

In spite of all that we now know about vocabulary acquisition, the vexing issue of the volume of words to be taught continues to be the biggest dilemma in the instruction of vocabulary. Nearly three decades ago, Nagy and Anderson (1984) estimated that, excluding proper names, there were more than 88,500 word families represented in printed school English—far too many to teach through direct instruction. They suggested that other methods should be used to enable and encourage students to learn new words on their own. In essence, they were advocating a "self-teaching" mechanism for vocabulary.

The problem of volume is exacerbated by concerns about the discrepancy between vocabulary knowledge of low- and high-SES students, and the significance of vocabulary knowledge for literacy development. Interventions have been effective at advancing students' vocabulary knowledge, but they have so far failed to close the gap. Higher SES students tend to start school with larger vocabularies, and interventions tend to benefit students who start with more word knowledge. Marulis and Neuman (2010) conducted a meta-analysis of vocabulary intervention studies for pre-K and kindergarten children. While the overall impact of vocabulary instruction was strong, middle- and upper income-children benefited most from the instruction.

In recent years, several lines of work have arisen in part to address the problem of volume. Foremost among these has been the attempt to identify a core vocabulary as a way of focusing attention on a smaller number of important words. There have been a number of recent attempts to identify a corpus of "academic vocabulary" words—words worth teaching because they appear frequently in school texts (Baumann & Graves, 2010). A number of taxonomies (Beck, McKeown, & Kucan, 2002; Fisher & Frey, 2008; Harmon, Wood, and Hedrick, 2008; Hiebert & Lubliner, 2008), and instructional approaches have been built on the idea of a general academic that includes high-utility, cross-disciplinary words, none more popular than Beck, McKeown, and Kucan's (2002) tiered scheme. Beck et al. developed a widely used vocabulary selection scheme that advises teachers to select a narrow band of useful general academic words, or tier two words, for instruction from the texts students encounter. Tier two words are words that are uncommon in life outside of school, but common in school texts. Beck et al. estimate that there are only about 7,000 tier two word families, so that teaching just a few hundred each year could contribute to students verbal functioning and reading comprehension in school.

As yet, there is little research to support the efficacy of using academic vocabulary selection schemes to guide vocabulary instruction; the work, which we report later in a section on vocabulary pedagogy, of Snow and her colleagues on word generation (Snow, Lawrence, & White, 2009) serves as a notable exception. Some researchers have questioned the idea that there is a single core vocabulary needed for academic study. For example, Hyland and Tse (2009) asked how well the words found on the widely used Academic Word List (Coxhead, 2000), which includes 570 word families, account for the words in texts that university students encounter across disciplines. They found that the Academic Word List (AWL) in combination with the 2,000 words on the general service list covered about 85% of the words in the corpus they studied, but that this distribution was uneven. Areas that require a more specialized vocabulary, such as science, were not well-covered by the AWL. They conclude that disciplinary words are shaped for highly specialized uses, undermining attempts to construct a core academic vocabulary.

In summary, a number of word level processes are known to underlie the meaningful reading of connected text, including the ability to manipulate sounds in speech, the ability to leverage a range of strategies for efficiently identifying words, and the ability to associate those words with information about their meaning and uses. Although the community of reading researchers has made significant progress over the past several decades in identifying these processes and understanding how they are learned, questions remain regarding individual variations among learners that impede some from becoming fluent word readers and how to contend with the multitude of words that students must read and understand in order to access school texts.

Text Level Processes

We turn now to the core of reading processes—text understanding. We deal with several key constructs: construction integration models of comprehension, the role of context, knowledge and comprehension, and disciplinary perspectives on reading comprehension.

Construction-Integration Models

If word recognition and word meaning are the point of word level processes, then comprehension is the point of text level processes—and comprehension is infinitely more complex, partially because it entails all of the word level processes. Successful reading comprehension depends on the proper execution and combination of a large number of cognitive processes. Despite differences in details, the theoretical cognitive models of reading comprehension are rather consistent in many respects (e.g., Goldman, Graesser & van den Broek, 1999; Ruddell & Unrau, 2004), so we adopt the language and constructs of Kintsch's (1998) Construction-Integration Model to illustrate the general principles of this class of models.[1] Central to comprehension of a text is the construction of a coherent mental representation of the text (van den Broek, 2010). A text can be represented at different levels: a *surface form*, a *text-base*, and a *situation model* (Kintsch, 1998). The surface form representation captures the actual words and phrases of the text. It tends to be short-lived and not strongly related to comprehension per se, as it contains little semantic information. The text-base representation includes the individual propositions/words in the text, together with the referential and other semantic relations that obtain between those propositions. The coherence of the text base depends on the quality of the original text, the reader's accuracy at encoding that text (Cote, Goldman, & Saul, 1998), and the generation of local "bridging" inferences (e.g., those that resolve anaphoric reference and create cohesive ties, such as causal or time links, among propositions). Finally, the situation model representation captures the information provided by the text, independent of its particular expression, and integrated with the reader's background knowledge. The situation model representation is the most relevant for educational purposes because it constitutes a generalizable and applicable knowledge base. Successful comprehension and the construction of a coherent representation require the development of a highly elaborated situation model (Trabasso, Secco, & van den Broek, 1984). Precisely how much and what prior knowledge becomes integrated in the situation model depends on the text and

1. This description of construction-integration models is based on an account co-constructed by Pearson and Paul van den Broek in a research proposal to the Institute of Education Sciences in 2009 (Wilson & Pearson, 2009).

the reader's prior knowledge but also on the task or purpose of comprehension (van den Broek, Fletcher, & Risden, 1993; van den Broek, Lorch, Linderholm & Gustafson, 2001). The properties of readers' mental representations can be determined through various outcome tasks, for example, tasks that assess memory for what was presented, others that identify inferences that are warranted by the text in conjunction with general world knowledge, and still others require the application of the information in the text to new situations (Goldman, 1997; Graesser, Gernsbacher, & Goldman, 1997; Kintsch, 2004; van den Broek, 1994). Included in this family of theories are models that characterize text processing and knowledge representations in terms of semantic networks (Anderson, 1983; Trabasso et al., 1984), schemas, frames, and scripts (Anderson & Pearson, 1984; Rumelhart & Ortony, 1977), mental models (Johnson-Laird, 1983; McNamara, Miller, & Bransford, 1991), and dual-coding in verbal and nonverbal systems (Paivio, 1990; Sadoski & Paivio, 2001).

The construction of a mental representation occurs primarily online as the text is read—rather than after reading has been completed. And it is inherently iterative and dynamic, with the situation model changing as new information from the text and new knowledge sources from memory are instantiated moment by moment (Linderholm, Virtue, van den Broek & Tzeng, 2004). For this reason, much research has been dedicated to identifying the processes, strategies, skills, and background knowledge that readers must have to arrive at a coherent situation model of the text. Using a variety of methods, including speeded responses, reading rate, verbal think-aloud protocols, computer simulations, and, recently, eye tracking and neuro-imaging techniques— considerable insights have been gained in the online process of comprehension. One such insight is that "each new piece of linguistic information is understood in terms of the information it evokes from memory" (Gerrig & McKoon, 1998, p. 69). A crucial aspect of the reading process as it runs its course during reading is that the reader has to achieve a balance between the severe limitations of his/her working memory, or attentional capacity, on the one hand and his/her need to achieve coherence (Kintsch, 2004; van den Broek, Young, Tzeng, & Linderholm, 1998/2004). As a result of limited working memory capacity, only a small subset of the textual information and of background knowledge can be processed by the reader at any particular instant during reading. The selection of information for retention in working memory is a critical determinant of the eventual representation of the text as a whole. Such selection is partly the result of automatic processes (once certain lexical items make it into memory, strong evocations are sure to follow), and partly that of strategic (i.e., reader-controlled and deliberate) processes (e.g., searching for a plausible fit among items in memory) (Thurlow & van den Broek, 1997)

Kintsch's Construction-Integration model (Kintsch, 1988, 1998) captures the interaction between text and knowledge in a two-phase process model. The construction phase is text-based and bottom-up; in that phase, textual information

activates background knowledge in an associative and relatively uncontrolled, almost automatic, manner (see also the memory-based model; Gerrig & O'Brien, 2005). The initial activation is followed by a second phase in which activated knowledge and the concepts/ideas in the text are integrated into a coherent mental representation; the product of this integration phase is the situation model. During integration, background knowledge supports connections between and to ideas from the texts, and provides the foundation for inferences. This balancing act by the reader implies that the complex cognitive processes require coordination and regulation: Readers may strategically search and reactivate information from the preceding text (from memory or by reinspecting the actual text) and/or strategically search and activate background knowledge (van den Broek, 1990). Effective readers know when their efforts at comprehension require such strategic interventions and what constitutes appropriate, corrective steps (Baker & Brown, 1984; Cote et al., 1998).

Coordinating Cognitive Processes

These examples illustrate the extent to which reading comprehension requires the coordination of various cognitive processes and skills. Individuals can differ considerably in these processes and skills. As noted, they depend on efficient attention allocation strategies that select information that is likely to serve as an appropriate context for the integration of new information in a text. They depend on the availability of working memory capacity to hold the selected information until it has been processed adequately. They depend on rapid, automatic access to long-term memory so that connections are recognized between currently processed information and relevant information encountered much earlier in a text, or to make connections between information presented by the author and relevant background knowledge possessed by the reader (van den Broek, Bohn-Gettler, Kendeou, Carlson, & White, 2011).

Moderating Contextual Effects

To some extent, the skills and processes required for successful reading in these illustrations apply to all contexts in which reading takes place. However, their implementation is strongly influenced by the context—for example, the text genre, the subject area of the text (history versus physics or literature), and the reader's goals (Kintsch, 1998). Moreover, readers must apply context-appropriate strategies. For example, different types of text invite different purposes, possess different structures and features, and revolve around different types of information: Narratives revolve around characters in specific situations and with specific goals, whereas exposition revolves around the development of topics that may be related in many different ways. Moreover, they differ in the kind of

background knowledge that may be helpful in comprehending the text. In this sense, discipline-specific background knowledge includes both *content* knowledge (i.e., background knowledge about the topics in the text) and *strategic* knowledge (which standards of coherence are appropriate to this discipline and its default reading goals, what processes are appropriate given the particular text genre/structure, how this influences effective allocation of attention and processes such as memory search, what text-processing signals are present in this discipline). An important implication is that a reader's background knowledge, understanding of a specific text genre, knowledge of situation-dependent strategies, and other considerations all influence the extent to which the reader will be able to construct a coherent representation. Thus, the reading comprehension skills of a reader vary and then converge to allow her to construct an understanding while reading a particular text for a particular purpose (van den Broek et al., 2011).

In addition to the cognitive processes enacted during reading comprehension, a reader needs to possess basic language and reading skills such as letter- and word-identification, syntactic knowledge. A certain level of mastery of these skills is necessary for comprehension to occur; such mastery allows for automatic, or at least facile, translation of the symbols in the text into the propositions that will constitute the basis for constructing models at all three levels—the surface form and the text base and situation model. In addition, if the basic language and reading skills consume considerable working memory capacity, then the capacity available to the comprehension processes themselves will be severely limited (Perfetti, 1999), rendering the construction of the situation model in particular more difficult. However, these skills are themselves not enough to produce comprehension of the text as a whole. Thus, word and sentence level skills are necessary but insufficient for adequate comprehension. Recent investigations of the developmental trajectories of language comprehension skills and basic language skills, respectively, confirm this view (Gough & Tunmer, 1986; Kendeou, Savage, & van den Broek, 2009; Whitehurst & Lonigan, 1998). In longitudinal studies, the two sets of skills—those pertaining to basic language and language comprehension skills, respectively have been found to develop relatively independently from preschool into the early primary grades and, then, combine to predict reading comprehension in the later grades (Kendeou, van den Broek, White, & Lynch, 2007; Kendeou, van den Broek, White & Lynch, 2009; Oakhill, Cain, & Bryant, 2003; van den Broek, White, Kendeou & Carlson, 2009). As a matter of practice, then, monitoring and teaching both sets of skills and strategies in their own right seems necessary; indeed, the research on pedagogy reviewed in other parts of this chapter suggests exactly that.

Knowledge—A Multilayered Construct

Knowledge, as represented in long-term memory, is key to the comprehension process. Its role in integration phase of building a situation model is transparent, as the ideas from the emerging text-base trigger or instantiate precisely those schemata from long-term memory required to build that coherent representation of text we call the situation model. Many of the schemata that are triggered in this process will be ideas about the topic, domain, or discipline in which the text resides. But many other kinds of knowledge are also implicated. For example, knowledge about language at virtually every level of analysis—phonological, morphological, lexical, semantic, syntactic, and pragmatic—can and will be engaged in building both a situation model and, equally as important, in establishing the cohesion among sentences (e.g., resolving anaphora or logical relations among sentences) that distinguishes a text-base from the mere surface form of a text.

But also important will be knowledge about text—what it is and how it works. Text knowledge includes everything from (a) the conventions of a particular orthography and how they map onto the phonological code required for accessing the lexicon to (b) knowledge of the genres that typify a subject matter like geography—what they are how they work to (c) small but significant matters such as text features—headings, visual displays, lists, captions, indexes, and the like.

Strategic Knowledge

One type of knowledge plays a very special role in reading comprehension—strategy knowledge. As we suggested earlier, readers use strategies throughout the comprehension process as they engage in intentional searches of the text-base and their knowledge structures at points in the process of building a situation model. Most commonly, strategies are invoked precisely when the automatic processes of constraint satisfaction (making sure that the current version of the situation model satisfies the informational constraints coming from the text-base and the knowledge base) are not working well (van den Broek et al, 2011). Many readers develop these strategies for "free" in the sense that they pick them up along the way by just reading a lot. Other readers require more intentional efforts on the part of schools and teachers in order to use strategies effectively; Kintsch (2004) discusses the high likelihood that many if not most novice readers will require explicit instruction and modeling in using these strategies. But strategy use is not solely the province of novice or poor readers. To the contrary, expert readers are highly competent strategy users; it is just that their strategy use is so fluent, so "skilled" in the sense of having reached an automatic level of operation, that we do not see it in action very easily or often. But put those expert

readers in a situation where they are forced to use them (a really difficult or unfamiliar text) or ask to use them (as in a think-aloud protocol), and a well-elaborated, well-articulated strategy infrastructure is readily revealed (Alexander, 2003, 2005). This does not mean that these strategies are necessarily a normal part of the everyday reading process for them (i.e., when readers are experiencing nothing but the automatic "clicks" of comprehension), but it does mean that they are always there to assist in case a comprehension "clunk" (Klinger & Vaughn, 1999) has just been or is about to be experienced.

Disciplinary Perspectives on Reading

In recent years, the dominant view of reading as a set of general skills that can be applied to a variety of texts, purposes, and disciplines has been challenged by research and theory suggesting instead that reading is dependent on the nature of texts and disciplinary practices in which it is situated. This shift in perspectives on reading is attributable in part to the genre movement discussed below. However, it has also been precipitated by concerns that a decade-long focus on "basic" reading skills, including generalizable comprehension skills and strategies, failed to produce a generation of students who were prepared in adolescence or adulthood for the demands of discipline-based reading.

Several recent reports on reading and adolescent literacy have called for attention to text- and discipline-specific reading practices (e.g., Alliance for Excellent Education, 2010; Heller & Greenleaf, 2007; Rand Reading Study Group, 2002). In fact, it can be argued that the recently developed Common Core Standards privilege just such an approach with the inclusion of separate standards strand for literature, history, and science (and technical subjects). These reports point to the need not only to continue to support students' development of literacy skills beyond the early elementary years, but also to support students in learning to read and write in ways that will specifically foster involvement in disciplinary learning (Alliance for Excellent Education, 2010; Common Core Standards, 2010; Heller & Greenleaf, 2007; T. Shanahan & C. Shanahan, 2008).

Texts

The most obvious difference in reading as students move into different disciplinary context concerns the nature of the texts (van den Broek, 2010). Texts that students encounter in history are quite different from those than they encounter in chemistry (Carnegie Corporation of New York's Council on Advancing Adolescent Literacy). Lee and Spratley (2010) note that scientific reports and textbooks include vocabulary and syntactic forms that can be difficult for inexperienced readers (see also Snow, 2010). In addition, these texts often include features, such as abstracts, headings, and diagrams, which can support

understanding if students are taught to use them. The recent reports on adolescent literacy generally express concern that the emphasis on generic reading comprehension strategies may lead students to conclude that all content-area texts can be approached the same way such that reading in math is identical to reading in history (Heller & Greenleaf, 2007). The authors of the Carnegie report, *Time to Act* (2010), conclude that students should be taught skills and strategies for reading texts in each content-area. The Rand Reading Study Group (2002) goes further, suggesting that discipline specific reading comprehension tasks must be learned in the context of learning the content of the discipline and participating in disciplinary inquiry.

Skills and Processes

Although systematic variations in text content and organization are the most visible difference in reading across content areas, T. Shanahan and C. Shanahan (2008) point out that the move into disciplinary reading involves more than the application of generalized reading skills to new texts; it involves the use of more sophisticated and specialized skills and practices. Interest in the lexical, syntactic, and organizational characteristics of content area texts and the challenges that these present to students is not new (Osborne, 2010; Snow, 2010). What has come to the fore in recent decades is interest in discipline-specific inquiry practices and methods of communication, and how these are reflected in uses of language, the organization of texts, and the relationships between texts and ways of developing knowledge (Heller & Greenleaf, 2007; Moje, 2008). The turn toward a disciplinary view of literacy also reflects a recognition that literacy is an essential part of any disciplinary practice rather than merely a means of improving students' reading of content-area textbooks (Moje). Heller and Greenleaf point out that:

> To become competent in a number of academic content areas requires more than just applying the same old skills and comprehensions strategies to new kinds of texts. It also requires skills and knowledge and reasoning processes that are specific to particular disciplines. (p. 10)

Empirical and theoretical work in disciplinary literacy has started to identify how literacy practices differ across disciplines and how these differences are related to the nature of the disciplinary practices. For example, T. Shanahan and C. Shanahan (2008) examined the reading processes of disciplinary experts as they read and thought about texts in their areas. The researchers found that the experts in each discipline approached texts differently and leveraged a different set of reading strategies. For example, whereas historians attended to possible sources of bias, mathematicians engaged in close examination and rereading of the text qua text, to ensure they understood the contribution of each word to the meaning,

and scientists tended to examine the credibility of the work that lay behind the text (who produced, where, and for what purpose).

T. Shanahan and C. Shanahan (2008) suggested that differences in the reading practices of disciplinary experts are related to the values, norms, and methods of scholarship within each discipline. That is, historians read for the author's perspective, because historical scholarship is characterized by retrospective analysis of source documents and thus risks selective analysis and biased interpretation. Because chemists build knowledge through experimentation, they read to understand the procedures used to obtain particular results.

Leinhardt and Young (1996) asked three expert historians to read and interpret two historical documents, one of which was close to and one far from their area of expertise. The researchers found that historians engaged in classification (identifying the type of document), corroboration (checking the accuracy of a document by looking for consistency across the text and with other texts), sourcing (identifying things like authorship, publication date, and location to uncover the nature and influence of the bias that is assumed to be part of every historical document), and contextualization ("asking what else was happening when and where the document was written by locating it historically in terms of prior, coincident, and consequential events").

Wineburg (1991) examined the reading practices of historians and high school students as they read a set of historical documents about the American Revolution. He found that historians, unlike high school students, move beyond a literal reading of history texts to approach them as both rhetorical artifacts and as human artifacts. When approaching texts as rhetorical artifacts, historians consider authors' purposes, intentions and goals, and the ways that the authors use language for persuasive purposes. In approaching texts as human artifacts, historians examine how texts reveal information about authors' views and beliefs. The historians also engaged in conversations with the texts that extend beyond the author-reader dialogue to include different reader stances and audiences. Wineburg attributed differences in the ways historians and students read the texts to different epistemological beliefs about historical inquiry. Students approached texts as the bearers of information and approaches reading as a process of information gathering, whereas historians viewed the texts as human creations and social exchanges. For students, the connection between the author and the text was scarcely a consideration in their reading.

In this section, we have discussed the many factors—from knowledge and reparative strategies to text and context—that influence a reader's ability to make meaning as they read. Taken together with the underling word level processes, a picture of the complexity of reading, and by implication the complexity of learning to read, begins to emerge. In the next section, we transition to the learning to read perspective by examining the research on the role of instruction in helping

students gain mastery of the many processes and understandings that comprise expert reading.

Instructional Contexts for Reading Development

We turn now from research about processes to research about the intentional acquisition of those processes, namely curriculum and pedagogy. The sections within this section parallel those in the previous section on basic processes.

Word Level Instruction

An important benchmark in shaping instructional practices for word level processes—and for early reading instruction more generally—was Marilyn Adams' 1990 book, *Beginning to Read: Teaching and Learning about Print*. It provided a complete synthesis of our pre-1990 knowledge base about basic reading processes and the processes of reading acquisition. Sponsored by the then Office of Educational Research and Improvement, it was the third in a long line of national syntheses about how best to teach the basic components of early reading, preceded historically by Chall's 1967, *Learning to Read: The Great Debate*, and Anderson, Hiebert, Wilkinson, and Scott's 1984, *Becoming a Nation of Readers*. It is a benchmark because it appeared in the field at the height of the surge of constructivist reforms of the era, most notably whole language and literature based reading (see Pearson, 2004, for a detailed summary of this era) and preceded the return to an early emphasis on the code that began about a half decade later. While causal inferences are unwarranted, it is certainly likely that Adams' book provided a ready and credible knowledge base for those wishing to move back to an earlier and more consistent early code emphasis.

In 1998, another national synthesis, this time commissioned by the National Academy of Science, resulted in Snow, Burns, and Griffith's *Preventing Reading Difficulties*. It is distinguishable from Adams' synthesis in taking on a much broader research and policy agenda (e.g., mainstream instruction, instruction for struggling students, preschool, early reading, teacher education, and professional development) but to a somewhat narrower end (i.e., preventing reading difficulties through early interventions of various sorts). The past decade ushered in two additional syntheses, the 2000 National Reading Panel Report (NICHD, 2000) and the National Early Literacy Panel of 2008.

Code-Focused Instruction, and More

Across the last four syntheses, beginning with Adams' book, a remarkably consistent message has emerged, based on the then available research. The conclusions and recommendations differ only in particular details, which are driven most likely by additional research insights undergirding each report. All four reports, for example, converge on an early emphasis on the code, opting for systematic phonics instruction (of no particular variety—analytic and synthetic are not privileged over one another) early in K-1. That phonics instruction should be accompanied by instruction in phonemic awareness (hearing the separate sounds in spoken words), with a nod going approaches that link phonemic awareness to specific letter sound correspondences and do not dally for too long on the process). And all of these word-level skills, according to all of these reports, should be situated within a language rich, balanced literacy program that promotes word-level and text-level expertise and general language competence and world knowledge. We mention these latter recommendations because these reports, especially the National Reading Panel (NRP), often get labeled as *code-based* or at least *skill-based* policy documents when, in fact, their recommendations tend to be much more balanced than their public reputation.

The National Early Literacy Panel

The review of interventions in the National Early Literacy Panel (2008) deserves elaborated consideration because it is quite comprehensive and, in comparison to earlier syntheses, comes with the added benefit of research conducted in the era of No Child Left Behind (NCLB). In a nutshell, the NELP identified five interventions that achieved moderate to large effects on student literacy outcomes. Like earlier reports, NELP found strong effects for code-focused instruction, both phonemic awareness training and early phonics instruction on a range of early literacy outcomes. Like the Preventing Reading Difficulties (PRD) report of 1998, it also found enduring effects for language-enhanced programs, primarily on oral language development. But unlike earlier syntheses, it found additional effects for book-sharing programs (on print knowledge and oral language), home and parent programs (on oral language and general cognitive abilities), and comprehensive preschool and kindergarten programs (on spelling and reading readiness skills). In other words, NELP expanded beyond the traditional word and within word foci to include a range of contextual variations in pedagogy, with the result that both word level (e.g., alphabet knowledge, phonemic awareness, and letter sound correspondences) and meaning level (oral language and cognitive abilities) were enhanced.

Earlier national syntheses identified most of these categories of interventions as useful in developing students' literacy background and capacity

for benefiting from instruction (Adams, 1990; Snow et al., 1998). However, no previous effort had collected *all* of the available evidence on *all* of these programs and examined it through the lens of meta-analyses. It is encouraging to early literacy experts to know that this range of interventions make a consistent difference in profiles of student achievement on valued early literacy outcomes. Pearson and Hiebert, in reviewing NELP in 2010, noted that another unique finding from NELP was these five general programmatic categories tended to influence different sorts of outcomes, suggesting a kind of "specificity" of effects, a phenomenon that often influences instructional research in general (see Moran, Ferdig, Pearson, Wardrop, & Blohmeyer, 2008, for a vivid example of this specificity phenomenon).

Vocabulary Instruction

A wealth of instructional studies during the 1980s and 1990s demonstrated that the meanings of words can be taught through a wide assortment of approaches. In 2000, the National Reading Panel (NRP) emphasized the importance of vocabulary instruction, but did not find sufficient evidence to recommend some methods of instruction over others. The NRP's analysis did synthesize the findings of previous research to identify *characteristics* of successful vocabulary instruction, including opportunities for students to encounter target words multiple times in meaningful contexts and to use the words actively. A decade earlier, Stahl and Fairbanks (1986) had famously found that instruction of word meanings in context is more effective than no-context instruction of word meanings. The NRP also confirmed the effectiveness of direct instruction of at least some words as a supplement to exposure through wide reading.

Many vocabulary instruction experts recommend a multicomponent approach to developing vocabulary knowledge. For example, Graves (2000) has advocated a four-part program that includes:

1. Teaching individual, high-utility words.
2. Wide reading.
3. Teaching word-learning strategies, including morphology.
4. Fostering word consciousness, an interest in words.

A significant recent development in vocabulary research has concerned instruction of generative word learning strategies that allow students to more readily acquire knowledge of new words. In part as a response to the aforementioned volume problem in vocabulary instruction has been interest in identifying effective practices for supporting students' incidental learning of new vocabulary from reading and listening. While in the past there has been a tendency to think about vocabulary knowledge as "consisting of isolated, memorized information about the meanings of specific words," this conception has been come

to be seen as inadequate (p. 29). Vocabulary researchers are seeking ways to teach knowledge and dispositions that increase the likelihood that children will learn new words on their own. The most notable of these is the work on instruction about the morphological structure of words.

Morphology

A growing line of work on generative word knowledge has considered the role of morphological knowledge—knowledge of small, meaningful units of language, including roots and affixes—in acquiring knowledge of new words. The question underlying this work is whether students are able to infer the meanings of new words through the analysis of the words' meaningful parts. Morphological knowledge has long been identified as part of the explanation for how students acquire new vocabulary knowledge (Carlisle, 2007; Nagy & Anderson, 1984). It has also been known for some time that morphological awareness is related to size of vocabulary and reading comprehension. Morphological awareness has recently been associated with several additional components of literacy development, including decoding and spelling, vocabulary, and reading comprehension (Carlisle, 2010).

The research on the utility of teaching morphological analysis has been limited (Baumann, Bradley, Edwards, Font, & Hruby, 2000), but in recent years, there has been an interest in whether morphological instruction can support word learning (Carlisle, 2010), and a growing body of evidence that students can use knowledge of meaningful word parts to solve the meanings of novel words containing the same parts.

Several studies have explored the efficacy of instruction in morphological analysis. Baumann, Edwards, Boland, Olejnik, and Kame'enui (2003) compared the effects of morphemic and contextual analysis instruction (MC) with textbook vocabulary (TV) instruction on fifth-grade students' vocabulary learning and reading comprehension. Students in the TV group were taught specific words from the textbook, while MC students received instruction in morphemic and contextual analysis strategies using example words from the textbook. Students who were directly taught the vocabulary words made stronger growth on a test of those words, but students who received the MC intervention made stronger growth in their abilities to decipher the meaning of new morphemically decipherable words in isolation and (on a delayed but not immediate posttest) in context. There were no differences in comprehension growth.

Bowers and Kirby (2010) examined the impact of an intervention focused on teaching morphological word structure to fourth and fifth graders. Students who received the morphological instruction were better able to identify base words

in new words and better able to define taught and new words as long as the new words were within taught morphological families.

Teaching Academic Vocabulary

One recent instructional program of direct teaching of target words that has demonstrated effectiveness in middle school is the Word Generation program (Snow et al., 2009). Snow et al. describe the program as it was implemented with students in grades six through eight. The program, which focused on teaching high-utility academic words, involved students in encountering words repeatedly in semantically rich and varied contexts. It also offered opportunities for students to use the words actively in talk and writing. Students in the word generation classrooms made greater gains in their knowledge of the instructed academic vocabulary words than students in control classrooms, and there was some evidence that participation also positively impacted students' standardized state English language arts test scores.

Text-Level Instruction

Beginning in the 1970s, research on improving text level comprehension has been an active area of pedagogical scholarship, with a wide range of synthetic reviews and meta-analyses (e.g., Duke & Pearson, 2002; Duke, Pearson, Strachan, & Billman, 2011; Murphy, Wilkinson, Soter, Hennessey, & Alexander, 2009; Pearson & Fielding, 1991; Pressley, 2000; Tierney & Cunningham, 1984; Wilkinson & Son, 2011). Looking across the substantial body of research and at the key syntheses, several consistent findings emerge, although none of them comes with what would be judged a strong evidence base (e.g., as defined by the What Works Clearninghouse). Consistently emerging in these reviews are several interventions that could be labeled comprehension fostering (after Palincsar & Brown, 1984, and recently reinvoked by Duke, et al., 2011) to capture a set of practices that are less about direct instruction of comprehension processes, skills, or strategies and more about facilitating comprehension though other activities in the school environment—practices such as numbers 2, 3, 6, 8, 9, and 10 in this list from Duke et al., 2011) in the list below. The others (4, 5, 7, and perhaps 1) come closer to what we have in mind when we talk about direct comprehension instruction, but even building disciplinary knowledge and promoting vocabulary growth have as much of a *fostering* as they do a *teaching* patina to them.

1. Build disciplinary and world knowledge.
2. Provide exposure to a volume and range of texts.
3. Provide motivating texts and contexts for reading.
4. Teach strategies for comprehending.
5. Teach text structures.

6. Engage students in discussion.
7. Build vocabulary and language knowledge.
8. Integrate reading and writing.
9. Observe and assess.
10. Differentiate instruction

For our purposes, we have divided this research into four categories: (1) discussion as a medium for promoting text comprehension; (2) reading strategy instruction; (3) instruction in text structures, including genres; and (4) instruction embedded in the pursuit of acquiring disciplinary knowledge. It should be noted that the evidence for comprehension instruction, be it fostering or teaching, is not limited to the intermediate and secondary levels of schooling. To the contrary, Shanahan et al. (2010) were able to document five practices with various levels of empirical evidence to support their efficacy: (1) strategy instruction, (2) using text structure to organize learning, (3) discussion, (4) selecting texts to support comprehension, and (5) establishing an engaging and motivating classroom context for supporting comprehension. Only strategy instruction earned a strong evidence rating, while text structure and providing an engaging context earned a moderate evidence rating. Discussion, and text selection earned a weak evidence rating. A weak evidence rating is a bit misleading in this context because these practices, while not possessing anything like randomized field trial evidence to assess their efficacy, at least (and unlike a host of highly recommended and widely implemented practices with absolutely no evidence to evaluate their efficacy) have been evaluated in either correlational or nonrandomized experimental studies.

Talk About Text

Reading comprehension instruction has been heavily influenced by understandings about the role of social interaction in learning. Following in the tradition of Vygotsky (1934/1978), who suggested that higher order cognitive functions develop first in the social sphere, many approaches to comprehension instruction focus on discussion of text as a key aspect of learning to develop the cognitive habits of highly skilled readers. Discussion-oriented approaches reflect the idea that talk not only helps students to internalize expert ways of interacting with text, but also helps readers to clarify and consolidate their learning from text.

The positive effects of thoughtful and cognitively challenging discussion on reading achievement have been documented in a wide array of studies (e.g., Gambrell & Morrow, 1996; Kong & Pearson, 2003; Raphael & McMahon, 1994; Taylor, Pearson, Peterson, & Rodriguez, 2003). In addition, numerous instructional routines for text-based discussion have been described in the reading research and practice literatures. These include Book Club (Raphael, Florio-Ruane, & George, 2001; Raphael & McMahon, 1994); Questioning the Author (Beck & McKeown, 2006); Instructional Conversations (Goldenberg, 1993;

Rueda, Goldenberg, & Gallimore, 1992; Tharp & Gallimore, 1991); and Collaborative Reasoning (see Clark et al., 2003)

These instructional routines can all be described as a set of strategies, or moves, which can be used flexibly by teachers to encourage talk that invites students to share their reasoning and grapple with cognitively challenging ideas. In all of these frameworks it is expected that students will assume a degree of control over their own learning over time, and that they will work toward improving their peer conversations through intentional reflections.

In addition, these approaches generally share a focus on teacher as coach and guide. The teacher's role is not to provide answers but instead to model the language of academic discussion for students through clarifying, mediating turn taking when necessary, and probing students to think even more deeply about relevant aspects of the text.

Soter et al. (2008) reported the results of a study designed to evaluate the relative efficacy of nine discussion routines. In addition to those mentioned above, Soter et al. examined Grand Conversations (Eeds & Wells, 1989), Literature Circles (Short & Pierce, 1990) Junior Great Books (Great Books Foundation, 1987), Philosophy for Children (Sharp, 1985), and Paedia Seminar (Billings & Fitzgerald, 2002). Soter et al. identified features of classroom discourse that indicate high-level thinking and comprehension. These included the posing of authentic questions by teachers and students; students' elaborated responses, questions, and reasoning language; and the presence of uptake by teacher and students. The researchers then used the features to analyze samples of student discourse resulting from each of the nine discussion routines. The researchers found that critical-analytic approaches, such as Collaborative Reasoning and Philosophy for Children, and the expressive approaches, such as Book Club and Grand Conversations, invited the most high-level thinking and reasoning by students. These approaches involved a high incidence of authentic questions, elaborated explanations, and uptake.

In a related meta-analysis, Murphy et al. (2009) found that the impacts on students' comprehension were inconsistent. In particular they found that, while many of the discussion routines promoted students' literacy and inferential comprehension, there was great variability in the degree to which different routines promoted high level comprehension of text (e.g., critical thinking, reasoning, and argumentation). Only a few of the routines (Collaborative Reasoning, Philosophy for Children, and Junior Great Books) were effective at increasing both literacy comprehension and higher-level comprehension in multiple-group design studies.

Although Soter et al. (2008) looked only at discussions of literature, there is some evidence that involvement in discussions about text supports content-area learning by, for example, supporting conceptual understanding in science

(Palincsar & Magnusson, 2001), inviting all readers to employ reading strategies (Chinn, Anderson, & Waggoner, 2001), and even increasing the efficacy of comprehension strategy instruction (Berne & Clark, 2008).

Comprehension Strategy Instruction

Reading comprehension in U.S. classrooms is largely taught through instruction and practice with comprehension strategies, such as predicting, clarifying, activating prior knowledge, summarizing, and questioning. The rise of comprehension strategy instruction in recent decades has been grounded in substantial research demonstrating that high-achieving readers use more strategies than low-achieving readers (Block & Pressley, 2001; Dole, Duffy, Roehler, & Pearson, 1991; Rapp, van den Broek, McMaster, Kendeou & Espin, 2007)). Strategy instruction emerged from the understanding that good readers are thoughtful about their own understanding (or lack of understanding) and skilled in developing plans for fixing comprehension when it goes awry.

In addition, the ascendancy of strategy instruction in the reading curriculum has been bolstered by a vast body of correlational and intervention studies that have supported the value of comprehension strategies. These studies have consistently demonstrated that students who are explicitly taught to use comprehension strategies can apply them with the result of improved comprehension and can transfer the strategies to the comprehension of new texts (Brown, Pressley, Van Meter, & Schuder, 1996; Paris, Lipson, & Wixson, 1994; see also Dole, et al, 1991; Duke et al., 2011; Duke & Pearson, 2001, 2002; Pressley, 2000; Rosenshine & Meister, 1994).

The particular configuration of cognitive and metacognitive strategies for reading varies across studies and research syntheses, but the list from the National Reading Panel (NICHD, 2000) report is a good representation of the core set of strategies. This list includes: comprehension monitoring, cooperative learning, graphic organizers, story structure, question answering, question generation, and summarization. There are also several major strategy "suites" in reading instruction, which combine multiple strategies into a coherent approach. These include Reciprocal Teaching (Palincsar & Brown, 1984; Rosenshine & Meister, 1994) and Transactional Strategies Instruction (Brown et al., 1996).

In response to the question of how to teach strategies, Duke and Pearson (2002) offer a set of steps that typically occur in effective explicit strategy instruction across scores of instructional studies:

Naming and describing the strategy—why, when, and how it should be used.
Modeling the strategy in action—either by teacher or student, or both.
Using the strategy collaborative—in a sort of group think-aloud.
Guiding practice using the strategy with gradual release of responsibility.

Using the strategy independently, with no teacher guidance, either individually or in small student-led groups.

For more than two decades there has been broad consensus that strategies should be taught, along with agreement about which strategies matter most (Duke & Pearson, 2002). In the past few years, and in light of the emergence of attention to nonfiction text genres, cracks have emerged in the consensus around comprehension strategy instruction. For example, most studies of strategy instruction have focused on comprehension of fictional texts and has been conducted in the context of English language arts instruction, but Vitale and Romance (2007) suggest that research on comprehension strategy instruction lacks ecological validity for science reading because it fails to situate comprehension in forms of content-area learning that require cumulative meaningful understanding. Likewise, Fisher and Frey (2008) express concern that the preoccupation with strategies is making strategies, rather than texts, the focus of reading instruction. While not faulting strategy instruction itself, Pearson (2011) points out that the dynamic and responsive character of strategy use has sometimes been lost as it is encoded in commercial reading programs. That is, strategy use has sometimes become an end unto itself, rather than a set of tools for achieving and repairing comprehension. McKeown, Beck, and Blake (2009), in a direct comparison with of strategy instruction with content focused instruction (what might be construed as a "rich talk about ideas in the text" approach), found that content treatment resulted in better performance on narrative recall and expository learning probes. The strategy instruction group was indistinguishable from a basal driven control group (and the control group actually exceeded the strategy group on a couple of measures given along the way). In addition, Wilkinson and Son (2011) point out, while we know that comprehension strategy instruction improves comprehension, two decades of research has failed to identify the optimal set of strategies or even the optimal number of strategies. The most obvious explanation for the efficacy of strategy instruction is that instruction increases the use of strategies, and strategies increase understanding of text (Pressley, Brown, El-Dinary, & Afflerbach, 1995). However, it may simply be that strategic (focused and intentional) behavior in general, rather than any set of particular strategies, matters most. Following W. Kintsch and E. Kintsch (2005), Wilkinson and Son note that a common feature of all comprehension strategies is that they support students in actively constructing meaning as they read and invite readers to connect texts with their prior knowledge. It may be that that these underlying activities, rather than any particular strategies, are key ingredients of comprehension.

Genre and Text Structure Instruction

In the 1990s interest in text genre began to take hold in North America, although it had been alive and well in Australia (see Cope & Kalantzis, 1993) since at least the early application of functional systemic linguistics (Halliday,

1961) to pedagogy and curriculum. Some reading educators in the United States had become concerned about the emphasis on "authentic" fictional literature had excluded attention to other text genres, particularly nonfiction text genres. Motivated in part by suspicions that literature-based programs were failing to support vocabulary development, and that reading instruction was failing to prepare students for the texts and tests of later schooling (Rand, 2002), advocates of greater emphasis on informational text argued that the balance of texts in early reading should reflect the balance of texts that students will encounter as they continue in school and the texts that they will read in their lives outside of school—contexts dominated by nonfiction text genres (e.g., Duke & Bennett-Armistead, 2003).

At the same time, the rise of standards-based education and the increased emphasis on annual testing in reading heightened educators' interest in expository reading and writing, particularly as concern surfaced that the "fourth grade slump" might be attributable in part to lack of preparation for informational reading in grades K-3 (Moss, 2005). The rapid rise of in interest in the use of informational text in the elementary grades at the turn of the century is evident in professional publications for teachers. Moss (2005) analyzed the topics of articles appearing in the most prominent practitioner-oriented reading journal, *The Reading Teacher*, between 2000 and 2004. Moss found that, unlike during preceding decades, most articles clustered around two topics, one of which is the uses of informational trade books.

The new movement to include a greater diversity of genres, especially informational genres, in early reading instruction was accompanied by a move away from a generalist view of reading, in which reading is understood as a set of skills that can be applied to any text (T. Shanahan & C. Shanahan, 2008). As a result, advocates of informational text wanted not only to change the relative balance of text genres in elementary classrooms, they also wanted to reshape instruction to reflect the fact that different genres of texts should be read differently—that reading comprehension is dependent, in part, on an understanding of genre characteristics, such as text structure and text features. Reading educators came to believe that different types of texts required different understandings, skills, and strategies, and, therefore, required different forms of instruction. The 2002 Rand report, *Reading for Understanding*, reflected this view, noting that "the features of text have a large effect on comprehension" (p. 14). Research has supported the idea that some text genres are more difficult to comprehend than others. For example, Best, Floyd, and McNamara (2008) examined decoding and world knowledge as factors in third graders' comprehension of narrative and expository texts. They found that students' comprehension scores (multiple choice, free recall, and cued recall) were lower for an expository science text than for a narrative story. Scores on all three comprehension measures were predicted by world knowledge for the expository

text, but decoding ability was a more consistent predictor of comprehension for the narrative text.

Although genre is more appropriately thought of as a set of functional distinctions than organizational ones, much of the instructional work has focused on two salient organizational aspects of text genre—text structures and text features. As such, we address each of these separately, starting with text structure. Research has also supported the idea that some students are more aware of some text structures than others (Englert & Hiebert, 1984) and that this awareness is related to students' comprehension of text (e.g., Taylor & Samuels, 1983). Richgels, McGee, Lomax, and Sheard (1987), for example, found that sixth-grade students demonstrated better awareness of comparison/contrast, collection, and problem/solution text structures than causation structures. Meyer, Brandt, and Bluth (1980) found that ninth-grade students' awareness of and use of text structure in organizing a recall from text was strongly related to the amount of information that the students recalled.

Given the role of text structure awareness in comprehension of expository texts, it stands to reason that providing instruction in text structures might improve students' comprehension. Evidence on this score is mounting. Historically, in the late 1970s and 1980s, there was a short-lived but powerful burst of research on text structure instruction (see Pearson & Camparell, 1981, for an extensive review). More recently, attention to text structure has resurfaced with a resurgence in interest prompted, at least in part, by the Rand Report (2002) and, even more recently, by the What Works practice guide on reading comprehension in the primary grades (Shanahan et al., 2010). The conclusions of the What Works panel suggested that teaching students to use story maps while reading narratives (Baumann & Bergeron,1993; Morrow, 1984, 1996; Reutzel, Smith, & Fawson, 2005; Williams et al., 2007) or particular expository structures, such as cause-effect (Reutzel et al., 2005; Williams et al., 2007), while reading expository texts yields moderate effects on reading comprehension. The text structure instructional research typically pairs text structure instruction with other instructional practices, such as comprehension strategies that are tailored to the text structure or discussion focused on the content. This sort of practice undoubtedly strengthens the pedagogical package, but such confounding makes it impossible to isolate the variable or variables in the package that might be serving as the *active ingredient(s)*. Thus we can conclude only that text structure instruction, when offered in concert with X, or Y, or Z, has a positive impact on text comprehension.

A study by Williams, Hall Lauer, Stafford, DeSisto, and deCani (2005) serves as a typical and well-designed example of text structure instructional research. They tested an instructional program for second graders designed to teacher them to comprehend compare-contrast expository texts. Compared with a content-focused condition and a no-instruction control, second graders who

received the compare-contrast instruction improved in their ability to comprehend novel compare-contrast texts based on novel content.

The evidence regarding another aspect of text genre, text features, is less clear. Common features of expository texts include things like photographs with captions, tables of contents, timeless verbs, and bolded specialized vocabulary words. While a whole host of recent articles in practice-oriented reading journals advocate the teaching of expository text features (e.g., Bluestein, 2010; Fisher, Frey, & Lapp, 2008; Kelley & Clausen-Grace, 2010), more research is needed regarding the efficacy of this approach on reading. Purcell-Gates, Duke, and Martineau (2007) examined the role of explicit explanation of genre functions and features on second- and third-graders' reading and writing of the genres. Neither access to explicit explanation or explicitness impacted students' reading growth. However, having authentic purposes for the use of reading and writing—reading to learn or investigate; writing to record and communicate—supported students' growth in reading and writing informational text genres.

One promising approach to exploring genre-related text features with teachers and students follows a systemic functional linguistics perspective (SFL; Schleppegrell & de Oliveira, 2006). SFL views the construction of texts and their grammars as related to contextual expressions of meaning. Schleppegrell and colleagues (Schlepegrell & de Oliveira, 2006; Fang & Schleppegrell, 2010) have applied this perspective to the teaching of content-areas as a means for helping teachers recognize the linguistic challenges of content-area texts.

Text Accessibility

A growing body of scholarship centers on the construct of *text accessibility*, that is, the factors that allow readers to read with accuracy, fluency, and comprehension. Scholarship around the construct has accelerated in recent years, driven at least in part by the central role played by text complexity in the recently developed and soon to be implemented Common Core Standards for English language arts (2010). Two major approaches have emerged for gauging a text's accessibility: readability formulas (Klare, 1984) and leveling systems (e.g., Chall, Bissex, Conrad & Harris-Sharples, 1996)—and a third, more multidimensional approach involving several more nuanced linguistic features is on the horizon (see Graesser, McNamara, & Kulikovwich, 2011).

Readability Formulas

A variety of readability formulas are in wide use by educators and publishers as a means of selecting or guiding the development of accessible texts for particular readers. To this end, a long tradition of research has identified factors that can influence the success a particular reader may have with a

particular text (see Klare, 1984, for a review). The most robust of these factors—those that appear in nearly all readability formulas—are an index of word difficulty and an index of sentence complexity. For words, word length often serves as an alias for a deeper index of difficulty, for example, frequency of use in the language or conceptual complexity. For sentence complexity, sentence length often serves as an alias for a deeper index of complexity, for example, number of embedded clauses or propositions per sentence. (Chall & Dale, 1995; Fry, 1977; Smith, Stenner, Horabin, & Smith, 1989; Spache, 1953).

Readability formulas have the benefit of being objective, highly replicable, and correlated with outcomes on reading achievement tests (Fry, 2002). The Lexile approach (Smith et al., 1989), currently quite prevalent in schools, has the further advantage of being applied to an extremely large corpus of texts. Moreover, it purports to place both text difficulty and student achievement (as measured by standardized tests) on the same underlying Lexile scale (Stenner, Burdick, Sanford, & Burdick, 2006). However, as with other readability formulas, the Lexile approach fails to take into account any linguistic aspects of text beyond word frequency and sentence length, or any nonlinguistic features (e.g., illustrations or graphics) that tend to be prevalent in books, especially informational texts, for children. Moreover, like other quantitative indices of text accessibility, predicting difficulty is a less stable enterprise at the low end of the difficulty scale—where small variations in word or sentence difficulty can yield large differences in the prediction measures for very short texts (MetaMetrics, 2007; Stenner et al., 2006).

Leveling Systems

Leveling systems, which involve collective professional judgment, have been developed to address the lack of attention to more qualitative aspects of difficulty (e.g., a sense that the conceptual load of a book is high or that its engagingness is low) in readability formulas. There are two types of leveling systems: those that rely on a set of criteria applied to the text, and those that compare any given text to anchor passages that have already been assigned levels (e.g., Chall et al., 1996). The most widely used leveling system (Fountas & Pinnell, 1996, 1999) consists of a set of criteria that human judges, usually teachers, apply in assigning levels to texts. These criteria take into account the complexity of the language as indexed by readability formulas, as well as more qualitative factors, such as (a) the degree of connection between the text and the illustrations, (b) the arrangement of text on the page, (c) the length, repetition, or predictability of the text, and (d) the complexity of the subject matter. Leveling systems can be useful for teachers when applied strategically to the selection of books for instruction; however, in contrast to readability formulas, they rely on qualitative judgments (Fry, 2002) and thus are subject to all of the biases involved

in any aspect of human judgment. To date, guided reading levels have not been validated by empirical research that examines their potential to predict students' ability to comprehend texts, and there is some concern about the reliability of leveling systems, as well as their over-application in classrooms (Dzaldov & Peterson, 2005; Pitcher & Fang, 2007).

Multidimensional Approaches

Graesser, McNamara, and colleagues have been refining a multidimensional portfolio of linguistic indicators of text difficulty (e.g., Duran, Bellissens, Taylor, & McNamara, 2007). The multidimensional character of their work sets it apart from most other measures. Specifically, it allows examination of the compensatory nature of linguistic factors (i.e., if you have more of X, you can get by with less of Y. For example, while narratives tend to have low co-referential cohesion (e.g., words in Sentence 1 tend not to be repeated in Sentence 2)—a situation that normally promotes difficulties in comprehension—narratives tend to have high causal and temporal cohesion (plots tend to be strung out along a causal-temporal chain), allowing readers to build a coherent mental model in the face of low co-referential cohesion. Recently, the Coh-Metrix group (Graesser et al., 2011) conducted a Principal Components Analysis of a large body of K-12 texts (the TASA corpus) varying in difficulty according to conventional formulas. They determined that eight components accounted for 67% of the variance across texts. The eight are grouped into five theoretically meaningful indices.

1. **Narrativity** (genre) indexes storiness, with all its entailments of characters, events, and places. It is characterized by emphases on everyday language, familiar words, and common world knowledge.
2. **Syntactic simplicity** ranges from shorter, less syntactically complex, more familiar structures to longer, more complex structures with multiply embedded clauses.
3. **Word concreteness** reduces to something like the "imagability" of the average word in a sentence, and ranges from concrete to abstract.
4. **Referential cohesion** (textbase) assesses the degree of lexical/semantic overlap among sentences (how repetition and close lexical associations form explicit semantic threads).
5. **Deep cohesion** (situation model) is an index of the degree to which the causal, intentional, and temporal relationships among ideas are explicitly cued by connectives.

A rich body of research on accessibility notwithstanding, an even richer line of inquiry lies ahead of us, especially if we take seriously the challenge imposed by Common Core State Standards (2010) for a dramatic increase in the level of text complexity required of all students at every grade level. Two dilemmas stand out in this inquiry: (a) finding a valid and reliable way in which to

scale difficulty at the lower levels—where readability formulas, including lexiles, yield woefully unstable indices of difficulty, and (b) figuring out how to scaffold this increase in text complexity for a population of students who experience enormous difficulty with the current level of text challenge.

Embedding Text Level Instruction Within Disciplinary Learning

As yet, empirical work on the instruction of disciplinary literacies is limited but growing. A body of work on content-area reading and writing does exist, but much of it is only peripherally linked to the idea of disciplinary participation; that is, it is more closely related to supporting students in reading content-area textbooks than to taking on the reading and reasoning practices of the disciplines. In addition, in recent years there has been a preponderance of work on cross-disciplinary integration of instruction that has focused on science and literacy, particularly at the elementary level. In the main, this work had focused more on using science instruction to support comprehension of and engagement with multi-genre texts (e.g., Guthrie & Ozgungor, 2002) and using literacy instruction to support science conceptual understandings and inquiry skills (e.g., Guzzetti & Bang, 2011) than involving students in authentic forms of disciplinary reading. Nevertheless, this work has demonstrated positive effects for the joining of science and literacy.

In particular, the Concept-Oriented Reading Instruction (CORI) project has yielded powerful evidence that connecting reading comprehension instruction to firsthand experiences in can engage students and support their reading growth. CORI researchers have demonstrated across a series of studies with elementary students that subject-matter connections and firsthand experiences results in more motivated and strategic literacy behavior and improves reading comprehension (Guthrie, Anderson, Alao, & Rinehart, 1999; Guthrie et al., 2006; Guthrie et al., 2004). In addition, Romance and Vitale (1992, 2001) have consistently demonstrated positive effects for the In-Depth Expanded Applications of Science (IDEAS) model, which replaces the time allocated for traditional literacy instruction with a 2-hour block of science instruction that includes attention to discussion, reading, concept mapping, and journal writing. Romance and Vitale have documented through a long program of research that IDEAS students across the elementary grades outpace students receiving their regular language arts and science programs on nationally normed standardized measures of science knowledge and reading comprehension.

Very recently, a few studies have taken a more disciplinary approach to reading and writing, with promising results. For example, De La Paz and Felton (2010) taught a historical reasoning strategy to 11th-grade students as a way of supporting their ability to write argumentative texts on historical topics. The

researchers conceptualized reading and writing as closely linked, and part of the instructional intervention, therefore, involved reading historical texts using reading practices that reflect those of historians as described by Wineburg (1991). For example, students engaged in *sourcing* by using a set of "Consider the Author" questions, such as, "What do you know about the author? When was the document written? and How does the author's viewpoint have an effect on his argument?" (De La Paz & Felton, 2010, p. 182). Students who participated in this instruction produced historical writing that was better elaborated and more persuasive than students in a control group.

Greenleaf et al. (2011) examined the effects of the Reading Apprenticeship instructional framework on high school science students' reading and content understanding. The Reading Apprenticeship framework is intended to help teachers integrate disciplinary literacy practices into high school science teaching. While the approach is dedicated, in part, to helping student crack the code of content-area textbooks, it also focuses on the ways that scientists make sense of science texts and use them to inform investigations. The Reading Apprenticeship model is focused on the "metacognitive conversation," in which teachers model and discuss how to read science texts, why people read science texts in these ways, and the content of the texts. The students use complex science texts as they engage in the intellectual work of science inquiry. Greenleaf et al. found that students in the Reading Apprenticeship classrooms made greater gains on standardized tests in reading and biology than students in control classrooms.

At the elementary level, the Seeds of Science/Roots of Reading (Seeds/Roots) program has demonstrated positive effects for an integrated approach on students' reading, writing, and science understanding. The Seeds/Roots model positions literacy in support of students' involvement in science inquiry. Students read to deepen their involvement in investigations in ways that are similar to the ways that scientists read, that is, to inform their inquiry methods and situate their investigations within the work of other scientists (Cervetti & Barber, 2008). Across two studies with second through fifth grade students (Cervetti, Barber, Dorph, Pearson, & Goldschmidt, in press; Wang & Herman, 2005), the Seeds/Roots approach has shown advantages for treatment students on measures of science understanding, science vocabulary acquisition, and science writing, with a less consistent advantage for reading comprehension.

Examining Policy Contexts for Reading Research and Practice

As we asserted at the outset of this chapter, reading pedagogy has always been contested territory, with one version or another of a debate between progressive versus traditional, or child-centered versus curriculum-centered, or transmissionist versus constructivist perspectives (some would call them ideologies) playing out in virtually every decade of the past 100 plus years—7 score if one goes back Horace Mann and the Common School movement in Boston (Mathews, 1967). Whether it is labeled as analytic versus synthetic phonics (as it was in the 1890s), phonics versus look-say (as it was around the time of WWI), code versus meaning (as it was in the 1960s), skills versus whole language (as it was in the 1980s), or common standards for all versus the accommodation of individual differences (which is what it really has come down to in the NCLB era), protagonists line up on one side or another of the line in the sand, on the lookout for cracks in the curricular framework or flaws in the pedagogical tools of their adversaries. Both sides seek the moral high ground of doing what is right and best for children and their families.

Over the past decade the debate was intensified because the pedagogical argument became completely entangled with a parallel debate about the character of research required to validate the efficacy of instructional approaches (see Pearson, 2004, for an elaborate account of the issues and policy initiatives surrounding the research debate). The science card was first played at the federal level in the second term of the Clinton administration when the bill authorizing the Reading Excellence Act (REA), which allocated $240,000,000 for staff development to promote reading reform, required that both state and local applications for funding base their programs on research that meets scientifically rigorous standards. The *scientifically rigorous* phrase was a late entry; in all but the penultimate version of the bill, the phrase was *reliable, replicable research*, which had been interpreted as a code word for experimental research. In last days of the Clinton administration, the term scientifically rigorous research was morphed into scientifically based reading research, and defined as research that meets four standards. It must:

1. Employ systematic, empirical methods that draw on observation or experiment.
2. Involve rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn.
3. Rely on measurements or observational methods that provide valid data across evaluators and observers and across multiple measurements and observations.

4. Have been accepted by a peer-reviewed journal or approved by a panel of independent experts through a comparably rigorous, objective, and scientific review.

As of early 1999, "phonics bills" (bills mandating either the use of phonics materials or some sort of teacher training to acquaint teachers with knowledge of the English sound-symbol system and its use in teaching) had been passed or were pending in 36 states (e.g., United States Department of Education, 1999). The No Child Left Behind legislation of 2002 made this goal of "evidence-based practice" even more explicit, with the phrase *scientifically based reading research* appearing more than 110 times in the Reading First portion of this act reauthorizing Title I. The NCLB made this goal of evidence-based practice even more explicit, with the phrase *scientifically based reading research* appearing more than 110 times in the Reading First portion of this act reauthorizing Title I.

The problem in reading is that there was a natural confounding between the curricular position people took (whether they came down on highly structured approaches such as systematic early phonics or highly constructivist approaches such as literature-based reading or whole language) and their preferred epistemological and methodological approach to research. Constructivists tended to opt for ethnographic or other forms of qualitative research whereas those who favored systematic approaches tended toward experimental or at least quantitative approaches (see Pearson, 2004, or Pearson, 2007, for more elaborate accounts of the phenomenon). The net effect of this confounding has been, as it seems to be also in national politics in the early years of this decade of the teens, to close off the conversation between folks on either side of the line in the sand, with few opportunities for open debate and even fewer for rapprochement.

What has become difficult in this volatile context is to argue for the complementarity of methods and epistemologies in ways in which they exist in other fields in the basic sciences. Even the foremost research design methodology of the past half century, Donald Campbell recognized this need, arguing in 1984 that qualitative and quantitative approaches must be complementary:

> To rule out plausible rival hypotheses we need situation-specific wisdom. The lack of this knowledge (whether it be called ethnography, program history, or gossip) makes us incompetent estimators of program impacts, turning out conclusions that are not only wrong, but are often wrong in socially destructive ways. . . . There is the mistaken belief that quantitative measures replace qualitative knowledge. Instead, qualitative knowing is absolutely essential as a prerequisite for quantification in any science. Without competence at the qualitative level, one's computer printout is misleading or meaningless. (pp. 141–142)

We suspect that reading is not the only curricular landscape in which these tensions and these curricular/epistemological/methodological confounds are being

enacted. In fact, based on a chapter that one of us wrote with a mathematics education colleague (Schoenfeld & Pearson, 2009), we know that mathematics is as contested as reading on these matters. So we hope that a rapprochement can occur on the research front across several areas of scholarship so that we can disentangle our curricular from our epistemological perspectives and methodological preferences. That would be a good step in determining on what we do and do not agree. And that might even lead to a situation in which we can see the virtue in complementary and converging approaches to examining and solving the vexing educational problems that plague all research scholars regardless of their preferences for understanding and conducting research (Shavelson &Towne, 2002).

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