In this chapter, we review research on the process of reading and what happens as children become readers. First, we outline how children develop language and literacy skills before they begin formal reading instruction. We then describe skilled reading as it is engaged in by adults and continue by describing how children develop to become readers.

READING AND LITERACY

In focusing in this report on preventing reading difficulties among young children in the United States, we take a limited view of reading, putting aside many issues and concerns that would belong to a full consideration of literacy in various societies inside and outside the United States. Acts of literacy vary a great deal--for example, reading a listing in a phone book, reading a Shakespearean play, and reading a dissertation on electromagnetic force. As different as these are, there are commonalities among them. For most texts in most situations, understanding what the text means is, if not the end goal of the reader, at least an important intermediate step. If someone has difficulty understanding, the problem could be a matter of limited knowledge; in
In our sense, literacy is both broader and more specific than reading. Literate behaviors include writing and other creative or analytical acts and at the same time invoke very particular bits of knowledge and skill in specific subject matter domains (e.g., history, physics, mathematics, etc.) (Anderson and Pearson, 1984). The reading difficulties that we are considering are those that impede what virtually all literacy activities have in common—the use of the products and principles of the writing system to get at the meaning of a written text.

We recognize that reading-related development can start in infancy or with toddlers. Many very young children are surrounded by written language products and are exposed to the importance and functions of reading in society. A child's reading-related development is interwoven and continuous with development that will lead to expertise in other spheres of life.

There is, however, a point in a child's growth when we expect what many, including young children, often refer to as "real reading" to start. Children are expected, without help, to read some unfamiliar texts, relying on the print and drawing meaning from it. What starts at this point is referred to in a variety of ways in the literature: independent reading (Holdaway, 1979), the alphabetic principle (Ferreiro and Teberosky, 1982), the alphabetic stage (Frith, 1985), the cipher stage (Gough and Hillinger, 1980), fully or truly productive reading (Perfetti, 1985), and conventional reading (Sulzby, 1994). We use the term conventional reading to encompass the common meanings of these different terms.

Moving toward being a good reader means that a child has gained a functional knowledge of the principles of the culture's writing system—the English alphabetic writing system for children in the United States—and details of its orthography. But the foundations start earlier. Prior to real reading, young children gain functional knowledge of the parts, products, and uses of the writing system and the ways in which reading and oral language activities complement each other and diverge from each other.
does not have much of an impact on the ease of learning to read (Stanovich et al., 1984). The capacity to learn to read and write is related to children's age-related developmental timetables, although there is no clear agreement on the precise chronological or mental age nor on a particular developmental level that children must reach before they are "ready" to learn to read and write.

Children gain an increasingly complex and decontextualized understanding of the world as their brains develop during their first years of life. As they grow and gain experience, new neural connections are established at irregular rates, with spurts and plateaus (Peterson, 1994). Although this process is orderly, it is variable among individual children due to differences in both biological and experiential influences.

Children who become successful readers tend to exhibit age-appropriate sensory, perceptual, cognitive, and social skills as they progress through the preschool years. Through the interaction of maturation and experience, they become increasingly adept at mastering physical dexterity and locomotion, at categorizing and constructing relationships between physical objects, at remembering facts and events over time, at engaging in imaginative play, at forming social relationships, and so forth.

Of course, many factors in an infant's life can affect development, ranging from maternal mental and physical health to conditions of housing, temperament, nutrition, and emotional stress and support. Although all these can have an impact on later literacy development via their impact on general development, we focus in this chapter on factors that differentially affect reading. Counting, number concepts, letter names and shapes, phonological awareness, interest in literacy, and cooperation with peers are some of the preschool accomplishments that are of particular relevance to later academic challenges.

For instance, children grasp the notion that one object or event may stand for another quite young (Marzolf and DeLoache, 1994). Learning that the alphabet is a symbol system for sounds fits into this stream of development. The ability to use symbols is gradually acquired during the first years of life as children interpret and create first iconic and then graphic representations. At age 3, most children in the United States recognize that golden arches "stand for" MacDonald's. But the fact that most 3-year-olds are able to use symbols in one context or domain does not mean that they can apply this ability across all contexts and domains without specific practice. Young children also begin to learn how symbols work, for instance, using both hash marks and numerals to represent numerical information, noting the differences between numerals and letters, comparing the way letters work in their own and their friends' written names, and understanding that letters symbolize sound segments within words.
Children's concepts about literacy are formed from the earliest years by observing and interacting with readers and writers as well as through their own attempts to read and write (Sulzby and Teale, 1991). In each situation they encounter, their understanding is both increased and constrained by their existing models of written language. In other words, while these existing models mediate and enable understanding, the knowledge and beliefs of which these models are composed are modified with use as the child explores language, text, and meaning. Beyond incremental learning, certain changes in perspective and reorganizations of concept are also necessary. In this way, the breadth, depth, and nature of children's engagement with text determines a great deal of literacy learning.

The interplay between elaboration and reorganization of children's mental models has been well documented in the domain of orthographic development (Ehri, 1991; Gough and Juel, 1991). Visual word recognition can flourish only when children displace the belief that print is like pictures with the insight that written words are comprised of letters that, in turn, map to speech sounds. Even as children begin to learn about spellings, they must also develop more sophisticated understandings of the forces beyond pictures and individual words that direct text meaning. These include, for example, the nature of word, sentence, paragraph, and text structures and the sorts of thinking and devices that hold them all together. Whereas each such type of learning depends on experience and exploration, it must also depend on certain conceptual insights.

For the child, Downing (1979:27) suggests, language is not an object of awareness in itself but is "seemingly like a glass, through which the child looks at the surrounding world, . . . not [initially] suspecting that it has its own existence, its own aspects of construction." To become a mature reader and writer, charged with constructing and corroborating the message of an author, this perception must change. Moreover, each such change must be guided by the metalinguistic insight that language invites inspection and reflection. Indeed, literacy growth, at every level, depends on learning to treat language as an object of thought, in and of itself (Halliday, 1982; Olson, 1995). See Box 2-1 for definitions of metacognition and metalinguistic.
For most children, growing up to be a reader is a lengthy process that begins long before formal instruction is provided in school or elsewhere. The following sections offer a brief sketch of what is learned, when it is learned, and in what kinds of situations learning takes place during the course of successful language and literacy development in early childhood.

**Language Development**

Children with intact neurological systems, raised by caring adults in a speech community, fairly effortlessly acquire the spoken language of that community, exhibiting abilities within the domains of phonology, morphology, syntax, semantics, pragmatics, and lexicon or vocabulary (see Box 2-2).

**BOX 2-2**

**Key Definitions of the Components of Language**

"Phonology" refers to the way sounds of the language operate.
"Morphology" refers to the way words are formed and are related to each other.
"Semantics" refers to the ways that language conveys meaning.
"Pragmatics" refers to the ways the members of the speech community achieve their goals using language.
"Lexicon" or vocabulary refers to stored information about the meanings and pronunciation of words.

Knowing a language, however, does not require a conscious awareness of the various systems involved in that language, nor does it necessitate an ability to articulate the underlying principles.
or components of the systems. Metalinguistic insights about some language domains typically emerge in the preschool years, however, as discussed later in this section.

Practically from birth, infants are able to distinguish all the sounds of any human language, and within a short time their perceptual abilities become tuned to their native language, even though their productive repertoire remains limited to nonspeech sounds and babbling for much of the first year of life (e.g., Werker and Lalonde, 1988). Phonological development continues well beyond the first year and probably continues to be refined even in the early school years (e.g., Nittouer, 1992; Gerken et al., 1994; Fowler, 1991).

It has been argued that children's perception of speech undergoes a shift from holistic (based on overall prosodic or acoustic shapes of syllables and words) to truly segmental (based on small phonemic units) during the late preschool period (Jusczyk et al., 1993; Studdert-Kennedy, 1986; and other studies reviewed in Gerken et al., 1994). This issue could be important for alphabetic reading, in which the letters correspond roughly to phonemes, especially if, as has been suggested by some speech researchers (Walley, 1993), it is not until the early school years that a child's lexicon becomes large enough to force the shift from holistic to segment-based strategies. It also points to one possible basis for the well-documented link between vocabulary size and early reading ability: the development of fine within-word discrimination ability (phonemic representation) may be contingent on vocabulary size rather than age or general developmental level. The potential immaturity of some children's phonological encoding/representation systems at the time formal reading instruction begins may impede their achieving a level of phonemic awareness for spoken words related to fluent decoding of written words.

Comprehension of words emerges somewhat before the ability to produce words, at around the time of a child's first birthday (Huttenlocher and Smiley, 1987; Nelson, 1973), and many children exhibit a sharp increase in the size of their working vocabularies during the second year of life (Bates et al., 1988). Vocabulary growth is rapid throughout the preschool and school years, and it is highly variable among individual children. Although there have been many attempts to estimate the size of children's vocabularies, problems arise because of definitions (e.g., what it means to know a word) and differences in the procedures used to estimate vocabulary size (Beck and McKeown, 1991; Nagy and Anderson, 1984). Despite this imprecision, individual differences have been shown to be reliably related to demographics; for example, one study found that first graders from higher-income backgrounds had about double the vocabulary size of those from lower-income ones (Graves and Slater, 1987).

Vocabulary size continues to increase with schooling and beyond. It is estimated that students acquire around seven words per day (2,700-3,000 words per year) during the elementary through high school years (Just and Carpenter, 1987; Nagy and Herman, 1987; Smith, 1941). A review of this research points out that it may be more correct to say that children become aware of seven
words per day but that a longer learning process is necessary for these words to affect the child's comprehension and use of language (Beck and McKeown, 1991).

Another perspective on vocabulary growth stresses that new words are not simply added in a serial fashion to a static and established vocabulary. Rather, the exposure to new words alters and refines the semantic representations of words already in the child's vocabulary and the relationships among them (Landauer and Dumais, 1997). Word counts, then, may be a very imprecise measure of vocabulary development.

Research on grammatical development in young children suggests a very rapid acquisition of the basic syntactic structures of the native language (e.g., Brown, 1973; Pinker, 1984; other studies reviewed in Bloom et al., 1994). For example, children under two years of age show the kind of knowledge of word order in English that allows them to appreciate that "Big Bird is tickling Cookie Monster" means something different from "Cookie Monster is tickling Big Bird" (Hirsh-Pasek et al., 1987; see Golinkoff and Hirsch-Pasek, 1995, for a review). Some time after they are able to comprehend simple sentences, children begin to combine words so as to express some structural and/or syntactic relationship between them. The child's sentences grow in length and complexity from two to three to four or more words, on average, over the remainder of the preschool period. By the time of school entry, most children produce and comprehend a wide range of grammatical forms, although some structures are still developing.

Children's increasing linguistic sophistication allows them to use language as a means of engaging in more complex information exchanges with adults and older children. During book sharing with an adult, for instance, children progress from just focusing on the names of objects in the pictures to asking questions about the content of the text. The child's ability to produce and comprehend complex sentences (with appropriate vocabulary and accurate pronunciation) then enables him or her to discuss abstract ideas ("What if . . . ?"), absent objects, and past events. This decreased reliance on immediate context as a support for communication is a developmental accomplishment that may ease the transition to school, where decontextualized language is highly valued.

Throughout the preschool period and well into adulthood, individuals learn the pragmatics of their language, that is, how to use language appropriately and effectively in social contexts (see Ninio and Snow, 1996, for a review). During the preschool years, the development of these abilities occurs in three domains: (1) production of conventional speech acts, such as requesting, attention getting, and describing (Dore, 1974, 1975, 1976; Snow et al., 1996); (2) use of conversational skills, including turn taking, topic contingency, and topic development (Bloom et al., 1976; Dorval and Eckerman, 1984; Schley and Snow, 1992; Snow, 1977); and (3) production of extended autonomous discourse such as narratives, explanations, definitions, and other socially defined genres (Donaldson, 1986; Peterson and McCabe, 1983; Snow, 1990).

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Much of the work in the field of pragmatics describes how children learn the rules for using language in specific situations, such as book reading (Ninio and Bruner, 1978; Snow and Ninio, 1986; Snow and Goldfield, 1983), sharing time (Michaels, 1991), and dinner table talk (Beals, 1993; Blum-Kulka, 1993). One avenue for introducing and refining new pragmatic functions is through experience with books and other literacy activities. For instance, in time, children begin to appreciate stories in which characters use language to deceive or pretend, to understand the point of fables and other texts that include metaphors and other figurative devices, and to grasp the differences between narrative, expository, poetic, and other varieties of texts that books can contain.

As proficiency in the forms and functions of language grows, children also gain "metalinguistic" skills. These involve the ability not just to use language but to think about it, play with it, talk about it, analyze it componentially, and make judgments about acceptable versus incorrect forms (e.g., Pratt et al., 1984). Metalinguistic insights are applied in all language domains (phonology, syntax, semantics, pragmatics), such that pronunciation, word usage, and sentence and text forms can all be thought about in this new way by the child. It was originally thought that this aspect of language development did not begin to emerge until about school age, but more recent research has demonstrated that some children exhibit rudimentary metalinguistic skills by age 3 or even younger and that many children acquire a considerable degree of metalinguistic insight about sentences, words, and speech sounds by age 4 to 5 years, before they enter school. It is also clear that metalinguistic skills continue to improve throughout the school years.

One interesting metalinguistic development is the child's growing appreciation of what a word is. Although even very young children understand the idea that things have "names," the more abstract concept of words as the building blocks of phrases and sentences, and as linguistic units whose sounds are arbitrarily related to their meanings, is only gradually attained during the preschool years (e.g., Tunmer et al., 1984; Chaney, 1989; Papandropoulou and Sinclair, 1974). These studies revealed that young children initially are unable to make a distinction between the word itself and the object or action it refers to and cannot break sentences into their component words. When asked to judge the length of words, for instance, "snake" is typically deemed to be a "long" word, and "caterpillar" a "short" one, until the child begins to understand words as distinct from their referents. Likewise, when asked to segment sentences (e.g., on the pretext of saying it slowly enough for the examiner to write it down), young children rarely isolate single words but instead break the sentence into phrases (e.g., The little girl / was eating / an ice cream cone.) Gradually, nouns, then verbs and modifiers, and finally function words (such as articles, conjunctions, and prepositions) come to be understood as individual linguistic units, even though the boundaries between them may sometimes be mistaken (e.g., "a / nambulance" rather than "an / ambulance").
Another aspect of metalinguistic development is the child's ability to attend to and analyze the internal phonological structure of spoken words.

**Phonological Awareness**

This sketch of language development and of initial metalinguistic accomplishments applies quite universally to all children learning to read. For children learning an alphabetic language, like English, there is an important additional ingredient: *phonological awareness* and, in particular, *phonemic awareness*. As discussed in Chapter 1, in English, the printed symbols (letters or graphemes) systematically represent the component sounds of the language. Understanding the basic alphabetic principle requires an awareness that spoken language can be analyzed into strings of separable words and words, in turn, into sequences of syllables and phonemes within syllables (see Box 2-3).

**BOX 2-3**

**Key Definitions of Some Terms That Are Often Confused**

The terms *phonology* and *phonological* refer to the sound structure of speech and, in particular, to the perception, representation, and production of speech sounds. As such, the phonological aspects of language include its prosodic dimensions--intonation, stress, and timing--as well as its articulatory units, including words, syllables, and phonemes.

*Phonemes* are the speech phonological units that make a difference to meaning. Thus, the spoken word *rope* is comprised of three phonemes: /r/, /o/, and /p/. It differs by only one phoneme from each of the spoken words, *soap*, *rode*, and *rip*.

*Phonemic awareness* is the insight that every spoken word can be conceived as a sequence of phonemes. Because phonemes are the units of sound that are represented by the letters of an alphabet, an awareness of phonemes is key to understanding the logic of the alphabetic principle and thus to the learnability of phonics and spelling.

*Phonological awareness* is a more inclusive term than phonemic awareness and refers to the general ability to attend to the sounds of language as distinct from its meaning. Phonemic awareness generally develops through other, less subtle levels of phonological awareness. Noticing similarities between words in their sounds, enjoying rhymes, counting syllables, and so forth are indications of such "metaphonological" skill.

*Speech discrimination*, including *phonemic discrimination*, is distinguished from phonemic awareness because the ability to detect or discriminate even slight differences between two spoken words does not necessarily indicate an awareness of the nature of that difference. Moreover, the study of the phonetics indicates that, both within and between speakers, there
are many variations in the acoustic and articulatory properties of speech, including phonemes, that are not functionally significant to meaning. The term phonics refers to instructional practices that emphasize how spellings are related to speech sounds in systematic ways. The term phonological decoding or, more simply, decoding, refers to the aspect of the reading process that involves deriving a pronunciation for a printed sequence of letters based on knowledge of spelling-sound correspondences.

The assessment of phonemic awareness typically involves tasks that require the student to isolate or segment one or more of the phonemes of a spoken word, to blend or combine a sequence of separate phonemes into a word, or to manipulate the phonemes within a word (e.g., adding, subtracting, or rearranging phonemes of one word to make a different word).

Spoken words can be phonologically subdivided at several different levels of analysis. These include the syllable (in the word protect, /pro/ and /tEkt/); the onset and rime within the syllable (/pr/ and /o/, and /t/ and /Ekt/, respectively); and the individual phonemes themselves (/p/, /r/, /o/, /t/, /E/, /k/, and /t/). The term phonological awareness refers to a general appreciation of the sounds of speech as distinct from their meaning. When that insight includes an understanding that words can be divided into a sequence of phonemes, this finer-grained sensitivity is termed phonemic awareness.

For most children, an awareness of the phonological structure of speech generally develops gradually over the preschool years. Among the first signs of awareness that spoken words contain smaller components are monitoring and correcting speech errors and "playing" with sounds (e.g., "pancakes, cancakes, canpakes"), both of which even 2- to 3-year-olds have been observed to do occasionally in naturalistic conversational settings. Appreciating rhymes (for instance, that light rhymes with kite) has also been noted in young preschoolers. The entry to phonemic awareness typically begins with an appreciation of alliteration, for instance, that boy and butterfly begin with /b/. Even so, many children initially find it difficult to separate the component phonemes of a complex onset, reporting for example that the first sound of play is /pl/ rather than /p/ or failing to represent both sounds of such initial blends in their independent spelling. Many books geared toward this age group appropriately include rhyming and alliterative texts, and this may be one avenue by which children's attention is drawn to the sounds of speech (Bryant et al., 1990). In a sample of 3- and 4-year-olds, Chaney (1992) found that 91 percent of the children could judge correctly whether a "Martian" puppet said English words correctly, 37 percent could be induced by the examiner to engage in sound play, and 26 percent could reliably identify rhyming words. Identifying words that began with a particular phoneme, however, was accomplished only by 14 percent of the children, and we know from other studies that not until age 5 or 6 are such segmentation skills exhibited by a majority of children (e.g.,

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Calfee et al., 1973; Liberman et al., 1974). Hence, phonological awareness is correlated with age (Chaney, 1992; Hakes, 1980; Smith and Tager-Flusberg, 1982).

Chaney (1992) also observed that performance on phonological awareness tasks by preschoolers was highly correlated with general language ability. Moreover, it was measures of semantic and syntactic skills, rather than speech discrimination and articulation, that predicted phonological awareness differences. Correlations between metalinguistic and more basic language abilities have similarly been reported by others (e.g., Bryant et al., 1990; Bryant, 1974; Smith and Tager-Flusberg, 1982). These findings indicate that the development of phonological awareness (and other metalinguistic skills) is closely intertwined with growth in basic language proficiency during the preschool years.

True phonemic awareness extends beyond an appreciation of rhyme or alliteration, as it corresponds to the insight that every word can be conceived of as a sequence of phonemes. Children with phonemic awareness are able to discern that camp and soap end with the same sound, that blood and brown begin with the same sound, or, more advanced still, that removing the /m/ from smell leaves sell.

Because of the physical and psychological nature of phonemes as well as the nature of human attention, few children acquire phonemic awareness spontaneously (Adams et al., 1998). Rather, attaining phonemic awareness is difficult for most children and far more difficult for some than others. Still, because phonemes are the units of sound that are represented by the letters of an alphabet, an awareness of phonemes is key to understanding the logic of the alphabetic principle. Unless and until children have a basic awareness of the phonemic structure of language, asking them for the first sound in the word boy, or expecting them to understand that cap has three sounds while camp has four, is to little avail.

In terms of acoustics, the syllable is an indivisible entity. By extension, unless and until children have come to conceive of syllables in terms of the underlying sequence of elementary speech sounds of which they are comprised, their only option for learning to read or spell words is by rote memorization.

The theoretical and practical importance of phonological awareness for the beginning reader relies not only on logic but also on the results of several decades of empirical research. Early studies showed a strong association between a child's ability to read and the ability to segment words into phonemes (Liberman et al., 1974). Dozens of subsequent studies have confirmed that there is a close relationship between phonemic awareness and reading ability, not just in the early grades (e.g., Ehri and Wilec, 1980, 1985; Perfetti et al., 1987) but throughout the school years (Calfee et al., 1973; Shankweiler et al., 1995). Furthermore, as we discuss in Chapter 4, even prior to formal reading instruction, the performance of kindergartners on tests of phonological
Phonological and phonemic awareness should not be confused with speech perception, per se. Speech perception is the natural ability to detect and discriminate the sounds of one's language, for instance, to be able to tell the difference between spoken stimuli that have many elements in common, such as mail and nail, back and bag. (The term auditory discrimination is sometimes incorrectly applied to this skill, but that broader label also encompasses the ability to perceive other nonspeech sounds, such as tones, environmental noises, music, and so forth.)

Because speech perception involves some of the same sensory and neural circuits as are used for hearing generally, children with hearing impairments generally also have poor speech discrimination. Other children have intact hearing but are selectively impaired in making discriminations among speech sounds. Not surprisingly, children who, for whatever reason, possess poor speech discrimination skills are likely to have difficulty acquiring phonological awareness. Nevertheless, many young children who perform satisfactorily on tests of speech discrimination exhibit weak phonological awareness.

Furthermore, whereas good phonological awareness in young children is a strong predictor of reading success, good performance on speech discrimination measures is not (see Chapter 4). In short, when administering a test of phonological awareness, it is always prudent to assess also the accuracy of the child's perception of the stimuli (e.g., by having the child repeat items aloud before performing the desired manipulation of the sounds). The research is clear, however, in showing that phonological awareness is different from and much more closely related to reading than speech perception itself.

It is also important to clarify the difference between phonological awareness and phonics. Phonics is the term that has long been used among educators to refer to instruction in how the sounds of speech are represented by letters and spellings, for instance, that the letter M represents the phoneme /m/ and the various conventions by which the long sounds of vowels are signaled. Phonics, in short, presumes a working awareness of the phonemic composition of words. In conventional phonics programs, however, such awareness was generally taken for granted, and therein lies the force of the research on phonemic awareness. To the extent that children lack such phonemic awareness, they are unable to internalize usefully their phonics lessons. The resulting symptoms include difficulties in sounding and blending new words, in retaining words from one encounter to the next, and in learning to spell. In contrast, research repeatedly demonstrates that, when steps are taken to ensure an adequate awareness of phonemes, the reading and spelling growth of the group as a whole is accelerated and the incidence of reading failure is diminished. These results have been obtained with normal as well as various at-risk populations (see Chapter 5).
Despite some confusion in the media and in some educational circles, phonemic awareness and phonological awareness are not just new terms for speech discrimination or for traditional phonics instruction. Instead, they are terms that emphasize the importance of sensitive and informed early literacy support and assessment that take account of the cognitive elusiveness of the insights and observations on which learning an alphabetic script depend. In addition, they are terms that serve to remind us of the fact that, no less than for higher-order dimensions of literacy growth, productive learning about decoding and spelling necessarily builds on prior understanding.

One of the most interesting findings from research on the development of phonological awareness is that its relationship to learning to read appears to be bidirectional, involving reciprocal causation (Ehri and Wilce, 1980, 1986; Perfetti et al., 1987). In other words, on one hand, some basic appreciation of the phonological structure of spoken words appears to be necessary for the child to discover the alphabetic principle that print represents the sounds of the language. Moreover, as we discuss in later chapters of this report, numerous studies have shown that learning to read can be facilitated by providing explicit instruction that directs children's attention to the phonological structure of words, indicating that phonological awareness plays a causal role in learning to read (see Chapter 6). On the other hand, instruction in alphabetic literacy, particularly regarding the correspondences between letters and phonemes, in turn appears to facilitate further growth in phonological (especially phonemic) awareness. That is why adults from nonliterate societies and students who learn to read nonalphabetic languages exhibit much weaker levels of phonological awareness than do readers of alphabetic languages (Morais et al., 1986; Read et al., 1986).

Not surprisingly, therefore, the correlation between reading and phonological awareness, which is already substantial by the start of school, becomes stronger during the early grades. This strong correlation appears to be strengthened by the association between phonemic awareness and children's ability to sound out (or phonologically decode) pronounceable nonwords and unfamiliar printed words. Theorists such as Share (1995) have argued that becoming skilled in phonological decoding provides the child with a self-teaching mechanism that, along with oral vocabulary knowledge and context, is useful for learning to read words that they have not previously encountered. After a few such correct decodings, these words can be recognized quite automatically. In thinking about the process of learning to read and about how best to frame early reading instruction, it is important to bear in mind these powerful reciprocal influences of reading skill and phonological awareness on each other.
Children live in homes that support literacy development to differing degrees. Optimal development occurs through interactions that are physically, emotionally, socially, and cognitively suited to the changing needs of the infant through toddler years. Late in the first year, when babies begin to purposively grasp and manipulate various objects, books and writing implements enter their exploratory worlds. Parents negotiate with children about how books are to be handled (Snow and Ninio, 1986; Bus and van Ijzendoorn, 1995, 1997). Infants between about 8 and 12 months who are read to by their parents typically show monthly progress from grabbing and mouthing books, to "hinging" the covers, to turning the pages. Much of this reading-like behavior is accompanied by babbling.

In years two and three, children advance from babbling to producing understandable speech in response to books and to markings that they themselves create. Late in the second year or early in the third, many children produce reading-like as well as drawing-like scribbles and recognizable letters or letter-like forms (see Box 2-4). Two- and three-year-olds are often introduced by adults to models of letters and related sounds, drawing attention to sources such as Sesame Street on television. Many of these children are also in child care settings where teachers and caregivers expose them to models of reading and writing.

**BOX 2-4**

*Goodnight Moon*

"Goodnight Moon, by Margaret Wise Brown," proclaims a three-year old girl, who pretends to read the cover page and author's name. With great relish, she opens the book and faithfully recites each word from memory.

The mother knows that the girl is not really reading but encourages her just the same. Intuitively, she suspects what has been found by research to be true: that children who pretend to read at this early age are more likely to become successful later.

"...and a picture of the cow jumping over the moon," continues the girl. She lifts the book close to her eyes and scrutinizes the print on the page.

"A-B-A-B-Z," she recites while pointing to the word *cow*. This is an important connection. Already, she knows that words are made of letters that can be named.

She resumes the story word for word, turning pages slowly. "Goodnight noises everywhere," she whispers, and then pronounces, "The end," proudly snapping the book shut.

Parents assist in their children's literacy development with sensitivity to culturally specific social routines in book reading (Snow and Goldfield, 1982; Snow and Ninio, 1986; Teale and Sulzby, 1986; 1987; Kaderavek and Sulzby, 1998a, 1998b; Sulzby and Kaderavek, 1996). Research conducted by Taylor and Dorsey-Gaines (1988) and Gadsden (1994) reveals that literacy resources are available in the homes of even very poor and stressed families, although different

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in quantity and variety than in moderate- or higher-income families (Baker et al., 1997). It is clear that during this period children develop expectations that certain kinds of intonations and wording are used with books and other written materials. Those who are read to frequently and enjoy such reading begin to recite key phrases or longer stretches of words specific to certain books.

Late in this period, many children label and comment about pictured items, describe pictured actions, and engage in some question-and-answer dialogue and/or create voices for characters in pictures (Kaderavek and Sulzby, 1998a, 1998b; Sulzby and Kaderavek, 1996; Sulzby and Teale, 1987; Whitehurst et al., 1988).

Between the ages of 3 and 4, children show rapid growth in literacy (as in other domains), as they experiment with writing by forming scribbles, random strings of letters, and letter-like forms. Some children begin to identify salient sounds within words, and some 4-year-olds are even able to demonstrate this knowledge in their writing by beginning to use invented spelling, at least with initial consonants (in English, many Spanish-speaking children tend to use vowels first). These children may spend time with toys and manipulatives that include letters, numerals, and playful representations of letter sounds and other symbol systems. More and more such toys contain mechanisms that "say" letters or words in response to a child's action. *Sesame Street* on television and CD-ROMs also provide meaningful stimuli at the letter, sound, word, and text level, and children at this age often control the repeatability of these stimuli using VCRs and computers.

Children who are frequently read to will then "read" their favorite books by themselves by engaging in oral language-like and written language-like routines (Sulzby and Teale, 1987, 1991). For most children at this age, emergent reading routines include attending to pictures and occasionally to salient print, such as that found in illustrations or labels. A few begin to attend to the print in the main body of the text, and a few make the transition into conventional reading with their favorite books (Anbar, 1986; Backman, 1983; Bissex, 1980; Jackson, 1991; Jackson et al., 1988; Lass, 1982, 1983; Sulzby, 1985a).

During this time, children tend to create many and varied texts and display different kinds of writing systems. Clay's (1975) title, "What did I write?" came from a child query to a parent and captures part of children's writing development during this period. Clay examined children's early nonconventional writings and found that, even with scribble and nonphonetic letter strings, children appear to be exploring features that they abstract about print, such as its linearity and use of recursive features. Read (1971) and Chomsky (1975) were among the first to examine the writing of children whose untutored spellings reflected phonetic and phonological analysis of speech. Read (1975) demonstrated that children at these ages have already developed conceptual categories for consonant and vowel sounds in spoken English and that these categories, which
were linguistically sound, appeared to underlie the invented spellings found in the children's writing.

Although it appears that children are hard at work as scholars of language, observations of children engaging in literacy activities in homes and preschools depict them as playful and exploratory in most of these activities.

Table 2-1 shows a set of particular accomplishments that the successful learner is likely to exhibit during the preschool years. This list is neither exhaustive nor incontestable, but it does capture many highlights of the course of literacy acquisition that have been revealed through several decades of research. Needless to say, the timing of these accomplishments will to some extent depend on maturational and experiential differences between children.

**TABLE 2-1 Developmental Accomplishments of Literacy Acquisition**

**Birth to Three-Year-Old Accomplishments**
- Recognizes specific books by cover.
- Pretends to read books.
- Understands that books are handled in particular ways.
- Enters into a book-sharing routine with primary caregivers.
- Vocalization play in crib gives way to enjoyment of rhyming language, nonsense word play, etc.
- Labels objects in books.
- Comments on characters in books.
- Looks at picture in book and realizes it is a symbol for real object.
- Listens to stories.
- Requests/commands adult to read or write.
- May begin attending to specific print such as letters in names.
- Uses increasingly purposive scribbling.
- Occasionally seems to distinguish between drawing and writing.
- Produces some letter-like forms and scribbles with some features of English writing.

**Three- and Four-Year-Old Accomplishments**
- Knows that alphabet letters are a special category of visual graphics that can be individually named.
- Recognizes local environmental print.
- Knows that it is the print that is read in stories.
- Understands that different text forms are used for different functions of print (e.g., list for groceries).

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• Pays attention to separable and repeating sounds in language (e.g., Peter, Peter, Pumpkin Eater, Peter Eater).
• Uses new vocabulary and grammatical constructions in own speech.
• Understands and follows oral directions.
• Is sensitive to some sequences of events in stories.
• Shows an interest in books and reading.
• When being read a story, connects information and events to life experiences.
• Questions and comments demonstrate understanding of literal meaning of story being told.
• Displays reading and writing attempts, calling attention to self: "Look at my story."
• Can identify 10 alphabet letters, especially those from own name.
• "Writes" (scribbles) message as part of playful activity.
• May begin to attend to beginning or rhyming sound in salient words.

CHARACTERISTICS OF SKILLED READING

Skilled readers can be compared with less skilled readers on their comprehension (meanings of words, basic meaning of text, making inferences from text) and on the accuracy and speed of their identification of strings of letters as words (decoding familiar, unfamiliar, and pseudo-words). The same set of cognitive skills distinguishes skilled from unskilled readers at the adult level as at the middle grade level (Bell and Perfetti, 1994; Bruck, 1990; Daneman and Carpenter, 1980; Haenggi and Perfetti, 1992; Jackson and McClelland, 1979; Palmer et al., 1985; Cunningham et al., 1990). We present an overview of the capacities of the skilled reader in comprehension and in word decoding.

Comprehension

Skilled readers are good comprehenders. They differ from unskilled readers in their use of general world knowledge to comprehend text literally as well as to draw valid inferences from texts, in their comprehension of words, and in their use of comprehension-monitoring and repair strategies.

Comprehension research has demonstrated clearly the importance of the reader's background knowledge for understanding texts (Anderson and Pearson, 1984; Anderson et al., 1977; Bransford and Johnson, 1972). Knowledge of the content addressed by a text plays an important role in the reader's formation of the text's main ideas (Afflerbach, 1990) and can be traded off to some extent against weak word recognition skills (Adams et al., 1996; Recht and Leslie, 1988).
When studies have assessed the role of both basic processes and stores of relevant knowledge at a sufficiently fine grain, the two seem to make separable contributions to comprehension (Haenggi and Perfetti, 1994).

Recent research accommodates the role of world knowledge in a comprehensive account of text comprehension that focuses on encoding the basic meaning of the text sentences (Kintsch, 1988; Mannes and St. George, 1996). Both the basic comprehension of literal text meanings and the use of knowledge necessary to go beyond the literal (propositional meaning) are accounted for. In combining the importance of the linguistic forms of the text with the importance of the reader's background knowledge, the research makes a distinction between the reader's understanding of what the text says, the text base, and what the text is about, the situation model (van Dijk and Kintsch, 1983). In fact, text research has increasingly focused on the fact that a reader may understand several levels of text information, including information about text genre and communication contexts, as well as the text itself and the referential situation (Graesser et al., 1997). To consider just one level for illustration, understanding the situation described in storylike texts typically requires understanding the narrative and the temporal-causal structures, even when the causal relations between text elements are only implicit (Trabasso and van den Broek, 1985; van den Broek, 1994). Because texts cannot be fully explicit, situation models require the use of knowledge and inferences (see Fletcher et al., 1994, for a review).

An important part of comprehension is concept development and knowledge of word meanings. Vocabulary knowledge has long been known to be a major correlate of comprehension ability, as measured by standardized tests (e.g., Davis, 1944, 1968). Research has found that comprehension is diminished by lack of relevant word knowledge (Anderson and Freebody, 1983; Kame'enui et al., 1982; Marks et al., 1974). Mezynski (1983) and Stahl and Fairbanks (1986) reviewed a series of studies that trained subjects for word/concept development to improve comprehension scores and found that, when certain conditions of instruction were met, the gain in comprehension was attained.

Of course, some comprehension of passages is possible, even when a few of the words are unknown to the reader (Anderson and Freebody, 1983; Kame'enui et al., 1982). Reading itself can provide one with meanings for unfamiliar words, although readers also fail to learn much about most of the unfamiliar words they encounter (Jenkins et al., 1984; Nagy et al., 1985; Shu et al., 1995; Stahl et al., 1989).

Comprehension monitoring is the ability to accurately assess one's own comprehension (Baker and Anderson, 1982; Garner, 1980; Otero and Kintsch, 1992; Vosniadou et al., 1988). To study this, an inconsistency is introduced into a short text, to see whether the reader detects it either during recall or when explicitly questioned. A typical result is that some readers do and some do not detect these inconsistencies, and those who do tend to be either older readers (compared with
preventing reading difficulties in young children:
the process of learning to read

younger readers) or more skilled (compared with less skilled) readers. A less skilled reader may fail to detect the contradictions in texts because they have misconceptions about high-level reading goals (Myers and Paris, 1978). An alternate explanation is that less skilled readers have difficulties with the component processes of representing a text (i.e., word identification and basic comprehension) and that this difficulty rather than an independent failure to employ a monitoring strategy is the source of the problem. There is some evidence supporting the latter explanation (Kintsch, 1992; Vosniadou et al., 1988). Whatever the explanation, however, training in metacognitive skills has been shown to be effective for improving comprehension (Brown et al., 1984; Paris et al., 1984; Gambrell and Bales, 1986; Palincsar and Brown, 1984).

Many basic cognitive processes are shared during reading and listening. Syntactic and inferential processes as well as background and word knowledge play a role in both. The correlations between listening comprehension and reading comprehension are high for adult populations (Gernsbacher et al., 1990; Sticht and James, 1984) and for older children (Carlisle, 1989). A large number of studies have compared listening to a text and reading one at different grade levels (Sticht et al., 1974; Sticht and James, 1984). The correlation between reading and listening across these studies rose from grades 1 through 6 and tended not to show further increases. Sticht et al. (1974) further noted that studies tended to find reading comprehension to exceed listening comprehension for college-age students but not younger students. Using their analysis as an approximation, "mature" reading comprehension might be said to begin when the advantage of listening over written comprehension disappears, in seventh or eighth grade.

Three observations are important in interpreting data on the relationship between listening and reading comprehension. First, such data come from studies that control message content across listening and reading. They do not address the question of whether fundamental differences between typical speech exchanges and typical written texts might play a significant role in comprehension. We know there are differences between written and oral language in terms of their social processes. The differences and similarities between written and oral language have been discussed by numerous researchers (Kamhi and Catts, 1989; D.R. Olson, 1977; Tannen, 1982; Sulzby, 1985a, 1987; Perfetti, 1985; Rubin, 1980; Galda et al., 1997).

Second, the high correlations between reading and listening comprehension occur after the child has learned how to decode. Third, correlations inform us about variability across a population, not within specific individuals. Thus, on the basis of the correlations among adults, the shared variance between listening and reading comprehension may be as much as 80 percent. For children, the shared variance may be somewhat smaller, for example, around 50 percent in fifth grade, approaching adult levels subsequently. This does not mean that a given individual reads as well as he or she listens. The gap between one's listening and reading comprehension can in fact be quite large, even when the correlation between the two is quite strong.
Word Identification

The identification of printed words has long been treated as a skill that is essential for novice readers, yet it remains important in skilled adult reading as well and is a necessary (but not sufficient) factor for comprehension. By "word identification," we mean that the reader can pronounce a word, not whether he or she knows what it means.

For a skilled reader, the identification of a printed word begins with a visual process that operates on the visual forms of letters that make up a word. The visual process is constrained by the sensitivity of the retina, such that visual forms are perceived sufficiently for identification only within a relatively narrow region (the fovea). Studies of eye movements suggest that readers can correctly perceive only 5 to 10 letters to the right of the fixation point (McConkie and Rayner, 1975; Rayner and Pollatsek, 1987). The effect of this limitation is that readers' eyes must come to rest (fixate) on many words.

Visual processes initiate word identification and immediately trigger other processes that complete it, including, most importantly, phonological decoding processes, which concern the correspondences between printed letters and the sounds of the language, especially phonemes, the small sound units within spoken and heard words. The research on reading in alphabetic writing systems has developed an important consensus that phonological decoding is a routine part of skilled word identification. How the phonological and visual-orthographic information gets combined for the identification of individual words has been the focus of much research, fueled in recent years by theoretical debates about how to conceptualize the cognitive mechanisms of word identification (Besner, 1990, in press; Coltheart et al., 1993; Paap and Noel, 1991; Plaut et al., 1996; Seidenberg and McClelland, 1989). The various models, although they appear dramatically different, can explain many of the same facts about reading and about reading failure (Plaut et al., 1996). Generally speaking, what we know about word identification and its development is based more on the common ground of these models than on their differences.

One thing that is especially clear from the research that underpins the models is that skilled readers develop both a knowledge of how spelling patterns correspond to possible word pronunciations and a sensitivity, based on experience, to the relative frequency of printed word and subword forms. The only issue is the extent to which sublexical phonology (pronouncing portions of words based on a string of letters within the word) actually plays a role in the retrieval of word meaning from memory. Some work suggests there is substantial phonological mediation (Berent and Perfetti, 1995; Lesch and Pollatsek, 1993; Lukatela and Turvey, 1990; van Orden et al., 1990); other paradigms generate findings suggesting that phonological mediation occurs only some of the time (Besner, 1990; Coltheart et al., 1991; Paap and Noel, 1991; Waters and Seidenberg, 1985). Even results suggesting that some word retrieval can occur without

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phonological mediation are consistent with the assumptions that (a) phonology is automatically activated during the identification process and (b) phonological word forms are retrieved along with meanings. In addition to supporting word identification, phonological processing during reading supports comprehension and memory for recently read text (Slowiaczek and Clifton, 1980; Perfetti and McCutchen, 1982).

Word identification research has provided information about how words are understood as well as how their phonological form is initially identified from print. Word meanings and sometimes their pronunciations are necessarily context dependent; for example, "spring" can refer to a season of the year or a coiled piece of metal, and "read" can be pronounced like "reed" or "red." Context is important in interpreting the meaning of a word in a sentence, and skilled readers do this more efficiently than less skilled readers (Gernsbacher, 1993). However, it is equally important to note the limits of context. Skilled readers do not skip many words when they read texts (Rayner and Pollatsek, 1989), despite the potential that context might provide for doing so. Indeed the percentage of words in texts that skilled readers look directly at is quite high, ranging from above 50 percent to 80 percent across a range of reading situations (Rayner and Pollatsek, 1989). The benefits of context seem to be mainly on the amount of time a reader spends on a given word—the duration of fixation—with only slight effects on the probability of a word fixation. And, although skilled readers are very good at using context to figure out the meaning of a word, it is less skilled readers who attempt to make the greater use of context to identify a word (Stanovich et al., 1981; Perfetti et al., 1979).

Finally, experience builds automaticity at word identification, and it appears to establish an important lexical-orthographic source of knowledge for reading (Stanovich and West, 1989). This lexical-orthographic knowledge centers on the letters that form the printed word and is tapped by tasks that assess spelling knowledge, as opposed to tasks that tap mainly phonological knowledge. It can be most easily indexed by the amount of reading a person has done (Stanovich and West, 1989). The phonological decoding and lexical-orthographic abilities are correlated, but each makes unique contributions to reading achievement. There are two complementary but overlapping kinds of knowledge that support the identification of words: one is grounded in knowledge of the phonological structure of spoken words and knowledge of how orthographic units represent these structures. The other develops with the experience (made possible by the first) of reading printed word forms. These two types of knowledge may derive from related kinds of learning, however, since theories of word identification include both single-process and dual-process accounts of how a reader can come to know both individual word forms and general procedures for converting letter strings into phonological forms.

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BEGINNING TO READ

Emerging Literacy in the Transition to School

When children go to school, they find a social, emotional, and intellectual structure different from the one at home. They join a group in which they have new rights and new responsibilities. There are over 20 others who are somewhat like them, with whom they can be compared for better or worse. There are routines and structures. There is only one adult, and there is talk that is separated from familiar routines. There are expectations--from the child, the child's family, the teacher, and the curriculum. In light of these many challenges, it is not surprising that the experience a child has during the first year of schooling has lasting impact on school performance (Alexander and Entwisle, 1996; Pianta and McCoy, 1997).

The acquisition of "real" reading typically begins at about age 5 to 7, after the child has entered kindergarten. Schools with greater concentrations of urban minority students may send approximately half of their students to second grade not yet reading conventionally, although these students may be memorizing and then recognizing some words as whole units (i.e., sight words).

The transition to real reading involves changes not only in the composition of skills but also in concepts about the nature of literacy (Chall, 1983). Adjusting to formal instruction in a school setting is mediated by the child's broadening of his or her concept of literacy, extending it to the new school culture. The purposes and practices of literacy and language in classrooms necessarily differ from those in any home, and all children entering school must adjust to the culture of the school if they are to become successful achievers in that milieu (Heath, 1983). This transition is likely to be less difficult for a child whose home literacy experiences and verbal interactions more closely resemble what goes on in the classroom than for a child whose prior conceptualization of the role of literacy has been attained through experiences of a much different sort. Gradually the curriculum emphasis shifts, and students find they are engaged in a wide range of literacy activities and are responsible for doing them well, all involving the common core of the reading on which they begin work in the early grades.

Most 5-year-olds from supportive literacy backgrounds continue to make rapid growth in literacy skills. Children who are, as Hiebert (1994) puts it, dependent on schooling for literacy, or who have spent four or more years without rich support for literacy, will tend to show patterns more like younger children. However, when such children are asked or enticed into doing tasks such as "reading your own way" or "writing your own way," they do respond in interpretable ways rather than showing no knowledge.
Children during this period will "read" from books that have been read to them frequently, increasingly showing the intonation and wording patterns of written language in their pretend readings (Purcell-Gates, 1991). Initially, they act as if pictures are what one looks at when reading aloud from familiar stories (Sulzby, 1985b, 1994). When watching an adult read silently, they may insist that something be said for reading to take place (Ferreiro and Teberosky (1982), but five-year-olds increasingly engage in intensive scrutiny of the pictures in a page-by-page fashion, as if reading silently before they begin to "read to" another aloud in an emergent fashion. Some of these emergent readings will focus on pictures as the source of the text, but increasing numbers will begin to attend to the print.

Print-focused emergent readings are significant in a number of ways. Children may temporarily refuse to read, saying that it is the print that is read and they do not know how to do that. Or they may temporarily read by focusing solely on an isolated feature of reading, such as sounding out real words or nonsense strings with signs of great satisfaction, picking out isolated strings of sight vocabulary words, or tracking the print while reciting text parts that do not match the print. These reading behaviors appear to indicate a period during which the child is bringing together to the text bits and pieces of knowledge about how print works from other contexts, such as play, writing, and environmental print (Sulzby, 1985b, 1994).

Children's writing also takes great strides forward during this period. Children appear to move across various forms of writing even up to grade 1, using scribble, nonphonetic letter strings, and drawing as forms of writing from which they subsequently read. They plan their compositions to various degrees and respond to adults who ask them what they plan to write. They tend to hold to a plan and then read back consistent with that plan at this age, even though the writing cannot be read by another conventionally. As children become more proficient writers, they also often go through a period or periods of insisting on "writing it the right way," asking for conventional spellings. Others simply show their growing awareness of the difference between invented and conventional spelling by the growing numbers and/or categories of words that they spell conventionally (Sulzby, 1996).

During this period, writing tends to become an active arena in which children practice their increasing ability to read conventionally, albeit from familiar texts. Children identify letters and learn letter-sound correspondences. Invented spelling signals an important breakthrough. The knowledge of letters, sounds, and words that has been developing from the earliest years appears to begin to make some conventional sense to children. During kindergarten and first grade, many, if not all children who are allowed to, begin to write using phonetically based invented or creative spelling (Read, 1971; Chomsky, 1970, 1972; Henderson, 1981; Sulzby et al., 1989; Clay, 1975, 1979; Bissex, 1980). An interesting phenomenon appears to take place: children seem to first encode phonetically in early invented spelling; then there is a lag, during which time they reread their own text without making use of their phonetic encoding. Soon, however,
they begin to decode phonetically as well (Kamberelis and Sulzby, 1988). Children's early writing shows the abstractions they are making about the writing systems of their culture--and reveals how children form new understandings and solve problems creatively in the process of becoming real readers.

Learning to Identify Words in Print

Beginning

Some research has demonstrated that 5-year-old children associate features of print with spoken word names without any indication that they are using the orthography of the word (Gough, 1993; Gough and Juel, 1991). Children learned, in one experiment, to "recognize" a word by use of a thumbprint placed on a card containing a printed word. When the thumbprint was absent, so was recognition. In another experiment, children were found to use selective parts of the printed word to associate to the spoken word. In fact, children who could "recognize" the word when only the first letters were presented were unable to recognize the word when only the final letters were presented, and vice versa. This study suggests that attending to all the letters of a word is not something that all children do at the beginning, at least when only selective attention is necessary for the task. The study does not imply that the child cannot use letter forms and associated speech forms at that age. It merely shows that, in the absence of reading instruction and knowledge of letter-sound correspondences, children can approach a reading task by solving the problem of memorizing words but without learning how the system works. Moving to productive reading requires more than this attempt to memorize on the basis of nonproductive associations between parts of printed words and their spoken equivalents.

Becoming Productive

Addressing the early stages of learning to read, researchers argue that children move from a prereading stage, marked by "reading" environmental print (logos, for example, such as MacDonald's or Pepsi), into true reading through an intermediate stage, referred to as phonetic cue reading (Ehri, 1980, 1991; Ehri and Wilce, 1985, 1987). In this intermediate stage, the child begins to use the phonetic values of the names of letters as a representation of the word. For example, children can learn to read the word "jail" by picking out the salient first and last letters, j and l, and associating the letter names, "jay" and "ell" with sounds heard when the word "jail" is pronounced. This kind of reading is viewed as a primitive form of decoding (or what Gough and Hillinger, 1980, called "deciphering")--decoding because it uses systematic relationships between letters and speech segments in words, and primitive because it is a strategy that ignores some of the letters and also because it maps letter names rather than the phoneme values of the letters. In the full decoding or deciphering stage, children begin to attend to all letters and to map
Frith (1985) has proposed a stage model that provided framework for both reading and spelling development. In this model, children first read and write "logographically," using images of whole words; they then adopt an alphabetic stance to both reading and spelling, using letter-to-sound correspondence in reading and sound-to-letter correspondence in spelling. Finally, they adopt an orthographic stance, recognizing that spellings often do not reflect pronunciations directly and that reading requires attention to word-specific orthographic information. Perhaps most important in Frith's framework is the idea that a stage change in reading drives a corresponding stage change in spelling and vice versa. Ellis (1997) has recently concluded that longitudinal research provides some support for the predictions of this model.

These early connections between print and speech forms can drive a rapid transition to real reading. Indeed, the combination of these print-sound connections along with phonological sensitivity are critical factors in reading acquisition (Bradley and Bryant, 1983; Ehri and Sweet, 1991; Juel et al., 1986; Share, 1995; Tunmer et al., 1988). Studies by Stuart and Coltheart (1988) and Stuart (1990) illustrate the importance of these early phonologically based approaches to reading. The extent to which children made phonological errors (e.g., "big" for "beg") in word reading early in the first grade predicted end-of-year reading achievement. Nonphonological errors--including errors that shared letters but not in-position phonemes (e.g., "like" for "milk")--were associated with low end-of-year achievement. The point at which phonologically similar errors became more common than nonphonological errors coincided with the child's attainment of functional phonological skill, measured by knowledge of at least half the alphabet and of success in at least some tests of phonological sensitivity. Stuart (1990) added to these results by finding that the level of a child's phonological sensitivity corresponded in some detail to the level of achievement in word reading.

The idea that errors can be useful in diagnosing a child's reading strategies as well as his or her skills is one developed by Goodman and Burke (1972) in pioneering work with children reading texts aloud. In miscue analysis, a child's omissions, substitutions, and additions and self-corrections in oral reading provide a window on the extent to which children are monitoring for meaning, attending to spelling-sound correspondences, etc. The pattern of miscues can be informative to teachers and researchers.

**Becoming Fully Productive**

Truly productive reading, the ability to read novel words, comes only from an increase in orthographic representations that include phonology. This requires attention to letter strings and...
the context-sensitive association of phoneme sequences to these letter strings. This is where phonological sensitivity should play its most important role. Children who have attained this level of reading can read pronounceable nonwords, and their errors in word reading show a high degree of phonological plausibility.

An important aspect of learning to identify words may be sensitivity to morphology. The morphological structure of English allows systematic changes in word forms to be associated with systematic changes in word meanings. For example, "dislike" is related to "like," and "undo" is related to "do." Most of the time, phonology (pronunciation) reflects spellings, so words that are morphologically related share spellings and pronunciations, as in the examples in the preceding sentence. Other times, however, the pronunciations change systematically with morphological changes, and the underlying morphology is preserved through spelling. For example, "national" preserves the root spelling of "nation" while altering the first vowel sound. Certainly readers, like speakers and listeners, develop some sensitivity to a wide range of morphological relations.

The research on word identification has explored whether words are identified based on their morphological structure, that is, whether some kind of morphological decomposition process accompanies printed word identification. One view is that words are represented as full forms without reference to their morphological constituents (Butterworth, 1983; Osgood and Hoosain, 1974). An alternative view, more widely held, is that morphemes contribute to word reading. Whether words are decomposed into morphological components before or after word recognition is a further question (e.g., Fowler et al., 1985; Feldman, 1994; Taft and Forster, 1975; Taft, 1992). Whether the morpheme is a unit of processing and mental organization is the question, and this question has proved difficult to answer in a simple manner.

How morphology is actually used in skilled word identification is probably less important for learning to read than the awareness of morphology that a child can use to support learning words. Along with syntax (the structure of sentences), morphology (the structure of words within a sentence) provides a grammatical foundation for linking forms and meanings in a systematic way. For reading words, morphology is especially important because it connects word form and meaning within the structure of sentences. For example, children learn that events that have already occurred are marked by morphological inflections such as -ed. For children, sensitivity to morphology may be an important support for skill in reading and spelling. Research by Nunes et al. (1997) has identified a series of stages that characterize the development of children's spelling of simple inflectional morphology, such as the -ed that signals past tense of regular English verbs. For words like "kiss" and "kissed," for example, children appear to progress from phonetic spelling of the past tense (kist) to a morphological spelling (kissed). Notice that phonetically, "kissed" and "soft" have identical endings. Children may learn the -ed spelling and overgeneralize it to produce "sofed" as well as "kissed," before learning to use ed specifically for
regular past tenses. The key development here may be an increased sensitivity to parts of speech, a "morphosyntactic awareness" that allows fuller use of the linguistic system in spelling (Nunes et al., 1997). Thus, although phonological sensitivity is critical for the discovery of the alphabetic principle (and is reflected in very early spellings), a fuller sensitivity to the syntactic system may be critical to a full mastery of English spelling.

**Progress in Fluency and Automaticity**

Gaining fluency in reading entails developing rapid and perhaps automatic word identification processes (LaBerge and Samuels, 1974). The main mechanism for gains in automaticity is, in some form or another, practice at consistent input-output mappings (Schneider and Shiffrin, 1977). In reading, automaticity entails "practice" at word identification, such as frequent retrievals of word forms and meanings from print. On a word-based account of reading acquisition, automaticity is a characteristic of words, not readers. Words move from the functional lexicon to the autonomous lexicon in this perspective (Perfetti, 1992). These gains from experience normally come from accumulating normal reading activity centered on reading text of increasingly greater complexity.

**Progress in Understanding**

For children learning to read, comprehension can take advantage of skills they have been using in their oral language: the shared basic language components (lexical, syntactic, and interpretive processes), cognitive mechanisms (working memory), and conceptual knowledge (vocabulary, topic knowledge). As mentioned earlier, reading comprehension skills are at first limited by unskilled decoding; later, comprehension when reading and when listening to a text are highly correlated; still later, the advantage of listening over reading disappears and, in some cases, for some kinds of texts and purposes, reverses (Curtis, 1980). But in the beginning, many tricks of the trade that children have as native speakers will help a great deal. Moreover, early books can be well designed to support the child's engagement and curiosity and keep the process going.

Theories of individual differences among both younger and older readers have emphasized, in one way or another, the dependence of higher levels of comprehension on high levels of skill in elementary word identification processes (Perfetti, 1985) and processes required to manage limitations in functional working memory (Just and Carpenter, 1992; Gernsbacher, 1993; Perfetti, 1985; Shankweiler and Crain, 1986). Of course, systematic differences between oral language and written language may produce some difficulties for learning to comprehend what one reads, and limits on background knowledge or a lean conceptual vocabulary can affect some text passages and not others. It is not clear that limits on inferencing processes for reading- and comprehension-monitoring strategies can be viewed as independent of the powerful effect of

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knowledge—background and word knowledge as well as knowledge of the features of written language that are not in the child's oral language repertoire.

Research on what young good comprehenders do is not as far along as research on children's word processing. Studies that contrast skilled and less skilled comprehenders have shown that skilled comprehenders are better at decoding (e.g., Perfetti, 1985), have superior global language comprehension (Smiley et al., 1977), and have superior metacognitive skills (Paris and Myers, 1981). As Stothard and Hulme (1996:95) note, though, many studies use measures of comprehension that "confound decoding and comprehension difficulties" and are less useful for identifying the crucial features of skilled comprehension in children. Few studies have been completely successful, however, in avoiding this confound. Some studies have matched subjects on decoding measured in oral reading by counting errors.

In a series of studies of 7- and 8-year-olds in English schools, Yuill and Oakhill (1991) compared children matched for chronological age and for reading accuracy but who differed significantly in reading comprehension on a standardized norm-referenced test that measures the two aspects of reading separately. The skilled comprehenders (at or slightly above the level expected for their chronological age in comprehension) were notable for the work they did with the words and sentences they encountered in texts. For example, they understood pronoun references, made proper inferences about the text from particular words, drew more global inferences from elements of the text that were not adjacent, detected inconsistencies in texts, applied background knowledge, and monitored their comprehension.

Stothard and Hulme (1996) compared similarly identified skilled and less-skilled comprehenders but included a comprehension age match for the less skilled as well and found an additional feature: skilled comprehenders (and the comprehension-age-matched children) had strong verbal semantic skills, whereas the less skilled comprehenders were better at performance IQ than verbal. Stothard and Hulme suggest that high verbal abilities facilitate vocabulary learning from context, so that children with high verbal ability know more words to begin with, can read them, and when they encounter unknown words in their reading can also learn from them.

Cain (1996), also comparing 7- and 8-year-olds who differed in comprehension while being matched on word errors in context, added comprehension age match in studying story knowledge in reading comprehension. In a study of story production, skilled comprehenders and the comprehension-age-matched children told stories with the events more integrated when the prompt was simply a title. When the prompt for the story was a sequence of pictures that provided an integrating structure, the less skilled comprehenders performed better and the difference between them and their comprehension-age matches disappeared. Cain also interviewed the children about the parts of stories that they encounter in reading. Skilled comprehenders had more formed ideas of the information that can be gleaned from a title and
definite expectations that the beginning of a story will provide information needed to understand characters, setting, and plot.

Up to and including third grade, children are learning to monitor their comprehension. It is clear that these skills can improve with training (e.g., Elliott-Faust and Pressley, 1986; Miller, 1985; Palincsar and Brown, 1984; Paris et al., 1984). Baker (1996) showed that providing information and examples about what kinds of difficulties might be encountered in a passage helped children to identify them, but that children in grade 3 worked with a smaller range of types of difficulty than did children in grade 5.

Tracing the development of reading comprehension to show the necessary and sufficient conditions to prevent reading difficulty is not as well researched as other aspects of reading growth. In fact, as Cain (1996) notes, "because early reading instruction emphasizes word recognition rather than comprehension, the less skilled comprehenders' difficulties generally go unnoticed by their classroom teachers." It may well be that relieving the bottleneck from poor word recognition skills will reveal, for some children, stoppages in other areas that create comprehension problems; more research is called for on factors related to comprehension growth from birth to age 8 that may produce problems as children read to learn in elementary school.

The "fourth-grade slump" is a term used to describe a widely encountered disappointment when examining scores of fourth graders in comparison with younger children (see Chall et al., 1990). Whether looking at test scores or other performance indicators, there is sometimes a decline in the rate of progress or a decrease in the number of children achieving at good levels reported for fourth graders. It is not clear what the explanation is or even if there is a unitary explanation. The most obvious but probably least likely explanation would be that some children simply stop growing in reading at fourth grade.

Two other explanations are more likely. One possibility is that the slump is an artifact; that is, the tasks in school and the tasks in assessment instruments may change so much between third and fourth grade that it is not sensible to compare progress and success on such different tasks and measures. It may be that the true next stage of what is measured in third grade is not represented in the fourth-grade data and that the true precedents for the fourth-grade data are not represented in the third-grade data.

A second possibility is that it is not so much a fourth-grade slump as a "primary-grade streak," that is, that some children have problems in the earlier years that are hidden while so much else is being learned, in the same way that a tendency to make errors in the outfield does not bother a ball club while the pitching staff is having a streak of strikeouts. Previously "unimportant" reading difficulties may appear for the first time in fourth grade when the children are dealing more frequently, deeply, and widely with nonfiction materials in a variety of school subjects and
when these are represented in assessment instruments. It may be that there had been less call for
certain knowledge and abilities until fourth grade and a failure to thrive in those areas might not
be noticed until then. It is, of course, this latter possibility that is important for preventing
reading difficulties, and more attention needs to be paid to research on the fourth-grade slump.

**CONCLUSION**

Table 2-2 shows a set of particular accomplishments that the successful learner is likely to
exhibit during the early school years. This list is neither exhaustive nor incontestable, but it does
capture many highlights of the course of reading acquisition that have been revealed through
several decades of research. Needless to say, the timing of these accomplishments will to some
extent depend on the particular curriculum provided by a school. For example, in many areas of
the country, the kindergarten year is not mandatory and little formal reading instruction is
provided until the start of first grade. The summary sketch provided by the table of the typical
accomplishments related to reading over the first years of a child's schooling presupposes, of
course, appropriate familial support and access to effective educational resources. At the same
time, there are enormous individual differences in children's progression from playing with
refrigerator letters to reading independently, and many pathways that can be followed
successfully.

**TABLE 2-2 Accomplishments in Reading**

**Kindergarten Accomplishments**

- Knows the parts of a book and their functions.
- Begins to track print when listening to a familiar text being read or when rereading own
  writing.
- "Reads" familiar texts emergently, i.e., not necessarily verbatim from the print alone.
- Recognizes and can name all uppercase and lowercase letters.
- Understands that the sequence of letters in a written word represents the sequence of
  sounds (phonemes) in a spoken word (alphabetic principle).
- Learns many, thought not all, one-to-one letter sound correspondences.
- Recognizes some words by sight, including a few very common ones (a, the, I, my, you,
  is, are).
- Uses new vocabulary and grammatical constructions in own speech.
- Makes appropriate switches from oral to written language situations.
- Notices when simple sentences fail to make sense.
- Connects information and events in texts to life and life to text experiences.
- Retells, reenacts, or dramatizes stories or parts of stories.

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- Listens attentively to books teacher reads to class.
- Can name some book titles and authors.
- Demonstrates familiarity with a number of types or genres of text (e.g., storybooks, expository texts, poems, newspapers, and everyday print such as signs, notices, labels).
- Correctly answers questions about stories read aloud.
- Makes predictions based on illustrations or portions of stories.
- Demonstrates understanding that spoken words consist of a sequences of phonemes.
- Given spoken sets like "dan, dan, den" can identify the first two as being the same and the third as different.
- Given spoken sets like "dak, pat, zen" can identify the first two as sharing a same sound.
- Given spoken segments can merge them into a meaningful target word.
- Given a spoken word can produce another word that rhymes with it.
- Independently writes many uppercase and lowercase letters.
- Uses phonemic awareness and letter knowledge to spell independently (invented or creative spelling).
- Writes (unconventionally) to express own meaning.
- Builds a repertoire of some conventionally spelled words.
- Shows awareness of distinction between "kid writing" and conventional orthography.
- Writes own name (first and last) and the first names of some friends or classmates.
- Can write most letters and some words when they are dictated.

First-Grade Accomplishments

- Makes a transition from emergent to "real" reading.
- Reads aloud with accuracy and comprehension any text that is appropriately designed for the first half of grade 1.
- Accurately decodes orthographically regular, one-syllable words and nonsense words (e.g., sit, zot), using print-sound mappings to sound out unknown words.
- Uses letter-sound correspondence knowledge to sound out unknown words when reading text.
- Recognizes common, irregularly spelled words by sight (have, said, where, two).
- Has a reading vocabulary of 300 to 500 words, sight words and easily sounded out words.
- Monitors own reading and self-corrects when an incorrectly identified word does not fit with cues provided by the letters in the word or the context surrounding the word.
- Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
- Shows evidence of expanding language repertory, including increasing appropriate use of standard more formal language registers.
- Creates own written texts for others to read.
- Notices when difficulties are encountered in understanding text.
- Reads and understands simple written instructions.
- Predicts and justifies what will happen next in stories.

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Second-Grade Accomplishments

• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
• Accurately decodes orthographically regular multisyllable words and nonsense words (e.g., capital, Kalamazoo).
• Uses knowledge of print-sound mappings to sound out unknown words.
• Accurately reads many irregularly spelled words and such spelling patterns as diphthongs, special vowel spellings, and common word endings.
• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
• Shows evidence of expanding language repertory, including increasing use of more formal language registers.
• Reads voluntarily for interest and own purposes.
• Rereads sentences when meaning is not clear.
• Interprets information from diagrams, charts, and graphs.
• Recalls facts and details of texts.
• Reads nonfiction materials for answers to specific questions or for specific purposes.
• Takes part in creative responses to texts such as dramatizations, oral presentations, fantasy play, etc.
• Discusses similarities in characters and events across stories.
• Connects and compares information across nonfiction selections.
• Poses possible answers to how, why, and what-if questions.

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Correctly spells previously studied words and spelling patterns in own writing.

Represents the complete sound of a word when spelling independently.

Shows sensitivity to using formal language patterns in place of oral language patterns at appropriate spots in own writing (e.g., decontextualizing sentences, conventions for quoted speech, literary language forms, proper verb forms).

Makes reasonable judgments about what to include in written products.

Productively discusses ways to clarify and refine writing of own and others.

With assistance, adds use of conferencing, revision, and editing processes to clarify and refine own writing to the steps of the expected parts of the writing process.

Given organizational help, writes informative well-structured reports.

Attends to spelling, mechanics, and presentation for final products.

Produces a variety of types of compositions (e.g., stories, reports, correspondence).

**Third-Grade Accomplishments**

- Reads aloud with fluency and comprehension any text that is appropriately designed for grade level.
- Uses letter-sound correspondence knowledge and structural analysis to decode words.
- Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
- Reads longer fictional selections and chapter books independently.
- Takes part in creative responses to texts such as dramatizations, oral presentations, fantasy play, etc.
- Can point to or clearly identify specific words or wordings that are causing comprehension difficulties.
- Summarizes major points from fiction and nonfiction texts.
- In interpreting fiction, discusses underlying theme or message.
- Asks how, why, and what-if questions in interpreting nonfiction texts.
- In interpreting nonfiction, distinguishes cause and effect, fact and opinion, main idea and supporting details.
- Uses information and reasoning to examine bases of hypotheses and opinions.
- Infers word meanings from taught roots, prefixes, and suffixes.
- Correctly spells previously studied words and spelling patterns in own writing.
- Begins to incorporate literacy words and language patterns in own writing (e.g., elaborates descriptions, uses figurative wording).
- With some guidance, uses all aspects of the writing process in producing own compositions and reports.
- Combines information from multiple sources in writing reports.
- With assistance, suggests and implements editing and revision to clarify and refine own writing.
- Presents and discusses own writing with other students and responds helpfully to other students' compositions.

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Ideally, the child comes to reading instruction with well-developed language abilities, a foundation for reading acquisition, and varied experiences with emergent literacy. The achievement of real reading requires knowledge of the phonological structures of language and how the written units connect with the spoken units. Phonological sensitivity at the subword level is important in this achievement. Very early, children who turn out to be successful in learning to read use phonological connection to letters, including letter names, to establish context-dependent phonological connections, which allow productive reading. An important mechanism for this is phonological recoding, which helps the child acquire high-quality word representations. Gains in fluency (automaticity) come with increased experience, as does increased lexical knowledge that supports word identification.

Briefly put, we can say that children need simultaneous access to some knowledge of letter-sound relationships, some sight vocabulary, and some comprehension strategies. In each case, "some" indicates that exhaustive knowledge of these aspects is not needed to get the child reading conventionally; rather, each child seems to need varying amounts of knowledge to get started, but then he or she needs to build up the kind of inclusive and automatic knowledge that will let the fact that reading is being done fade into the background while the reasons for reading are fulfilled.

Notes

¹Routines with cultural significance as powerful as that of book reading do not appear to be widespread in the area of writing, although this may be due to lack of relevant research (Burns and Casbergue, 1992; Anderson and Stokes, 1984; Teale, 1986).

²Indeed, it is becoming clear that, even in nonalphabetic systems, simple word identification brings about an activation of the phonology of the word form, even if the reader's task is to determine meaning (Perfetti and Zhang, 1995).