Chapter 2

Learning to Read Is Not Natural

Learner Objectives for Chapter 2

- Examine the ways that spoken and written language differ.
- Explain the special characteristics of "academic language."
- Contrast alphabetic writing with non-alphabetic writing.
- Experience "learning to read" with novel symbols.

Warm-Up: Listening to Forms of Language

1. First, listen to or role-play a typical cell phone conversation.
2. Next, listen to the following passages as your instructor reads them aloud.

Narrative text (from *Stuart Little*; White, 2005):

Stuart peered ahead into the gathering storm, but saw nothing except gray waves with white crests. The world seemed cold and ominous. Stuart glanced behind him. There came the sloop, boiling along fast, rolling up a bow wave and gaining steadily.

"Look out, Stuart! Look out where you're going!"

Stuart strained his eyes and suddenly, dead ahead, right in the path of the Wasp, he saw an enormous paper bag looming up on the surface of the pond. The bag was empty and riding high, its open end gaping wide like the mouth of a cave …

Expository text (from *World of Baby Animals*; Hodgson, 1995):

… Among canine predators, puppies get an early start. Adult wolves will playfully ambush youngsters, and then allow them to tag along on hunts at three months of age. Occasionally an adult will step on a pup and hold it down, a playful gesture which biologists feel may duplicate that used by adult males and females to affirm rank within the pack.

3. What are some obvious ways that these passages differ from a cell phone conversation?

Speaking Is Natural; Reading and Writing Are Not

Spoken language is "hard-wired" inside the human brain. Language capacity in humans evolved about 100,000 years ago, and the human brain is fully adapted for language processing. Any child, unless neurologically impaired or hearing impaired, will learn to talk. By the time a child is 10 months of age, he or she has already learned how to recognize the speech sounds (or phonemes) of the language spoken by caregivers (see *Table 2.1*). At the same time, the child has lost some of the capacity to distinguish and produce the phonemes of other languages (Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992).

Even 1-year-olds comprehend much of what is said by others. Most children generate simple sentences by the time they are 16 to 24 months of age. The few children known to scientists who did not learn to speak in early childhood, such as the French "Wild Boy of Aveyron" and the closet child, Genie (Curtis, 1977),[1] were almost totally isolated from other people during their critical early years.

Table 2.1 Progression of Typical Oral Language Development

(from American Speech-Language-Hearing Association [ASHA] Web site: http://www.asha.org/public/speech/development/01.htm)

0–3 months	4–6 months	7 months–1 year	1–2 years	2–3 years	3–4 years	4–5 years
Coos, cries, smiles	Babbles are more speech-like, includes many sounds such as /p/, /b/, /m/	Imitates different speech sounds, longer groups of sounds, begins saying words such as **bye-bye, mama, dada**	Uses more words each month, puts two words together into phrases, asks questions like "Where kitty?"	Has words for almost everything, uses two to three words together, is more easily understood, especially by those who know child	Says sentences with four or more words, talks about activities and/or people, is easily understood by all	Uses clear voice, detailed sentences, sticks to topic, uses appropriate grammar, says most sounds correctly

A related fact should be self-evident: Reading and writing are acquired skills for which the human brain is not yet fully evolved (Liberman, Shankweiler, & Liberman, 1989). Human brains are naturally wired to speak; they are not naturally wired to read and write. With teaching, children typically learn to read at about age 5 or 6 and need several years to master the skill. Sophisticated reading comprehension is the goal of 8 to 16 more years of schooling.

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Thus, for most students, reading and writing need to be directly taught!

In the United States, the federal government estimates that 14 percent of the adult population is "below basic" and unable to perform functional reading tasks (National Adult Literacy Survey, 2003). Another 29 percent are "at basic" but below "intermediate." Only 13 percent are classified as "proficient." The two lowest groups do not read with the fluency, accuracy, and comprehension necessary to decipher newspapers, health guidelines, schedules, or manuals. Although adults are constantly exposed to print in the environment, they may not learn to read. The myth (perpetuated as fact) that people learn to read naturally just by being immersed in print results in misguided instructional practices. Traces of the "natural" theory of reading acquisition continue to be visible in many publications and programs (Moats, 2000, 2006). However, current information about the prevalence, causes, and remedies for reading difficulty indicates beyond doubt that reading, spelling, writing, and language mastery are challenging for a substantial proportion of the U.S. population, and many students are dependent on systematic, direct teaching to become literate.

Teaching Tips

What can you do?

- Read your students' files. Interview parents to find instances of late oral language development.
- Identify potential red flags for literacy issues:
  - Ear infections?
  - Tubes in ears, delayed speech noted, illnesses, infections, etc.?
  - Family history of speech difficulties?
  - Receiving speech services?
  - English as a Second Language (ELL/ESL)?

Oral language is a foundational skill for reading and writing.

Language and Literacy

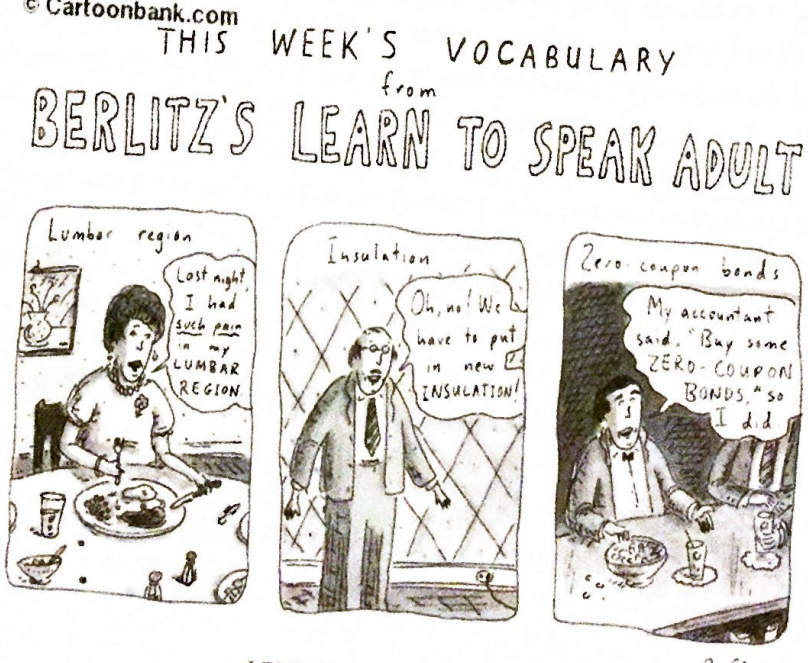
Language proficiency and reading, spelling, and writing achievement are strongly related to one another. A recent study of 1,350 children in 127 urban classrooms in grades 1–4 (Mehta, Foorman, Branum-Martin, & Taylor, 2005) examined the extent to which word-reading, spelling, and comprehension are related to one another and general language competence. The study also examined how teacher effectiveness and students' beginning skill levels predicted growth in reading achievement over the first four years of schooling. The results illustrated that literacy achievement and language levels were very closely correlated in these classrooms. Word-reading accuracy and fluency were shown to be very important factors in reading comprehension in the early grades. The literacy achievement levels of first- to fourth-grade classrooms, however, were perfectly predicted by the composite vocabulary and language proficiency scores of each classroom.

Visual perception, visual-motor skills, and visual-spatial reasoning (e.g., puzzle construction, the ability to draw) are surprisingly unrelated to reading and writing skill (Vellutino, Tunmer, Jaccard, & Chen, 2007). People who are very good in art, mechanics, dance, acting, or navigation may not be good at reading, spelling, writing, or using language. When individuals have nonverbal talents in the arts, spatial/mechanical reasoning, or athletics, those strengths may enable them to cope with reading or language difficulties, but they will still require explicit teaching of reading and language skills in order to become literate.

Given the importance of language to literacy, our approach to understanding reading and writing will frequently reference the structures of language. The structures, or systems, of language that will be explored throughout LETRS include:

Language System	Definition	Example
phonology	The rule system within a language by which phonemes can be sequenced, combined, and pronounced to make words	No English word begins with the sound /ng/; the sounds /p/ and /k/ are never adjacent in the same syllable.
orthography	A writing system for representing language	Every English word ending in /v/ is spelled with **-ve**.
morphology	The study of meaningful units in a language and how the units are combined in word formation	*Nat-* is a root. **Nature** is a noun; **natural** is an adjective; **naturalist** is a noun; **naturally** is an adverb.
semantics	The study of word and phrase meanings and relationships	The word **rank** has multiple meanings. The words **order** and **sequence** have similar meanings.
syntax	The system of rules governing permissible word order in sentences	"Our district recruits new teachers" is a sentence; "New teachers our district recruits" is not a sentence.
discourse	Organizational conventions in longer segments of oral or written language	Paragraph structure; cohesive ties; genre conventions such as story structure
pragmatics	The system of rules and conventions for using language and related gestures in a social context	To one person I say, "That is my seat!" To another, I say, "Excuse me, my ticket has that seat number."

Spoken and Written Language Differ



When we read, we usually read a special form of Standard English that differs from spoken, conversational language in many ways. Scholars call this academic language, book language, or literate language. It uses more stylistic formalities, is less repetitious, and is more carefully constructed. Phrases are not punctuated with "uh," "like," "you know," or repetitions of words. Vocabulary tends to be precise, unusual, descriptive, and topic-specific. Sentences may be long and complex, with embedded clauses or compounding of independent clauses. Sentences may be joined together with subordinating or coordinating conjunctions that indicate the logic of the ideas presented. Paragraphs—especially in expository text—have main ideas, details, and transition sentences. All meaning must be expressed in the words themselves because the person who reads cannot depend on the redundant cues (e.g., tone of voice, gestures, facial expressions) that are present during personal conversations.

That new forms of language must be mastered for reading and writing adds to the challenge. A reader encounters a different language from that of conversation—the language of books and of academic discussion. The literate person has also learned to decipher the writing system with which that language is represented.

Exercise 2.1 Comparing Spoken and Written Language

- Complete the comparison of spoken (conversational) and written (literate) language in the following chart. (Some of the boxes are started or completed for you.)
- More text excerpts are provided after the chart to help you describe literate language.

	Spoken (Conversational) Language	Written, Academic, or Literate Language
Speech Sounds (phonology)	• Sounds are blended together in spoken words (coarticulated).	• Sounds are represented by alphabet letters. • Letters are isolated units. • Letters must be matched with sounds and sequentially processed, left to right, in space as well as time.
Vocabulary (semantics)		

(continued)

Exercise 2.1 (continued)

	Spoken (Conversational) Language	Written, Academic, or Literate Language
Sentence Structure (syntax)	• Sentences tend to be incomplete, run-on, or otherwise ungrammatical in conversational speech.	
Paragraphs and Discourse Structure		• Paragraphs have a logical structure, especially in expository text. • Linking words, repeated phrases, and pronoun referents are used deliberately to make text "hang together." • Different paragraph organizations serve specific goals of logic. • Meaning must be clearly and completely put into words.
Overall Context for Use, and Feedback Available During Communication *(pragmatics)*	• Conversational speech is supported with gestures, facial expressions, tone of voice, and the presence of shared context or events.	

From *Animal Farm: A Fairy Story* (Chapter IX)

By George Orwell

New York: Harcourt Brace, 1996 (originally published 1945)

... Meanwhile life was hard. The winter was as cold as the last one had been, and food was even shorter. Once again all rations were reduced, except those of the pigs and the dogs. A too rigid equality in rations, Squealer explained, would have been contrary to the principles of Animalism. In any case he had no difficulty in proving to the other animals that they were not in reality short of food, whatever the appearances might be. For the time being, certainly, it had been found necessary to make a readjustment of rations (Squealer always spoke of it as a "readjustment," never as a "reduction"), but in comparison with the days of Jones, the improvement was enormous.

Exercise 2.1 (continued)

From *Abe Lincoln Grows Up* (Chapter XVI)

By Carl Sandburg

New York: Harcourt Children's Books, 1985 (originally published 1926)

... At the Pigeon Creek settlement, while the structure of his bones, the build and hang of his torso and limbs, took shape, other elements, invisible, yet permanent, traced their lines in the tissues of his head and heart.

From *Peter Pan and Wendy* (Chapter Three)

By J. M. Barrie

New York: Henry Holt and Co., 2003 (originally published 1924)

... There was another light in the room now, a thousand times brighter than the night-lights, and in the time we have taken to say this, it has been in all the drawers in the nursery, looking for Peter's shadow, rummaged the wardrobe and turned every pocket inside out. It was not really a light; it made this light by flashing about so quickly, but when it came to rest for a second you saw it was a fairy, no longer than your hand, but still growing. It was a girl called Tinker Bell, exquisitely gowned in a skeleton leaf, cut low and square, through which her figure could be seen to the best advantage. She was slightly inclined to *embonpoint.*

From *Calculus: Graphical, Numerical, Algebraic*

By Ross L. Finney, Franklin Demana, Bert K. Waits, and Daniel Kennedy

Upper Saddle River, NJ: Pearson Prentice Hall, 2002

... The development of integral calculus starts from calculation of areas by a technique that leads to a natural definition of area as a limit of finite sums. The limits used to define areas are special cases of a kind of limit called a definite integral. Presenting the properties of definite integrals, developing numerical methods of computing definite integrals, and applying the numerical methods with a graphing calculator are central goals of this chapter.

What Is Special About an Alphabet?

Writing systems evolved slowly over many thousands of years (Comrie, Matthews, & Polinsky, 1996; Sacks, 2003). Alphabetic writing, first generated less than 5,000 years ago, is a very recent achievement in human evolution. About nine-tenths of the world's 4,000 to 6,000 existing spoken languages have no indigenous, or native, written form, let alone an alphabet.

The first writing systems were pictograms that directly represented, or made pictures of, the intended meaning. More abstract symbolic systems evolved, but they continued to use

symbols to represent units of *meaning* (logographs) rather than units of *sound*. Mayan glyphs and ancient Chinese radicals were examples of logographic writing systems that did not employ an alphabet. Most early writing systems represented whole words, meaningful parts of words (morphemes), or syllables, rather than individual speech sounds.

Pictograms that directly represent meaning (hieroglyphics):

Logographs that abstractly represent meaning, not sound (Chinese radicals):

杠 糸 禾 言 木

Syllabic symbols that directly represent whole syllables (Cherokee):

Ꭴ Ꮞ Ꮟ Ꮣ Ꮪ Ꭱ

sa se si so su sʌ

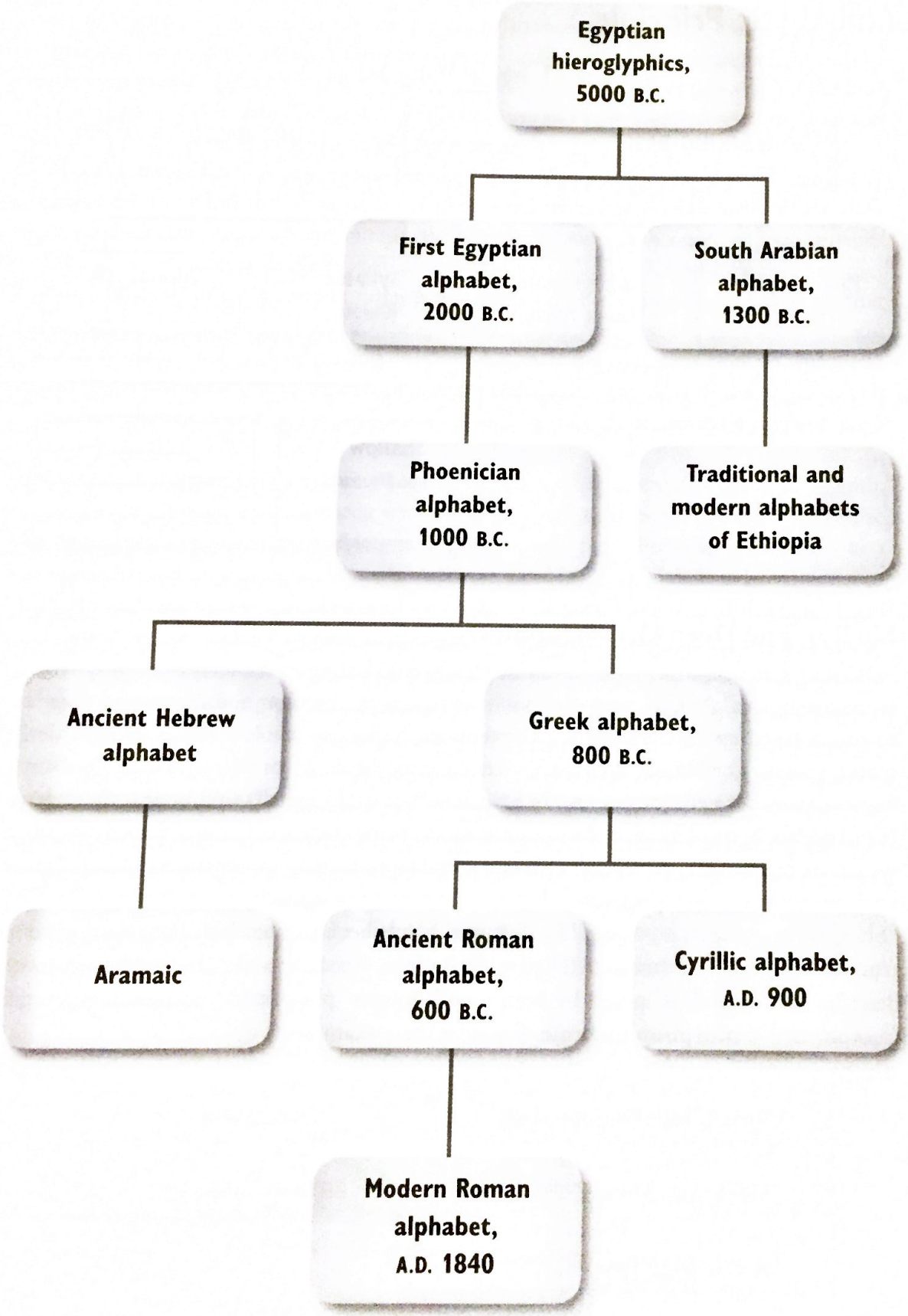
Alphabetic symbols that represent consonants and vowels, or individual phonemes (Greek, Russian):

α β χ δ ε φ γ η ι φ κ λ

б в г д е ж з и к л м н

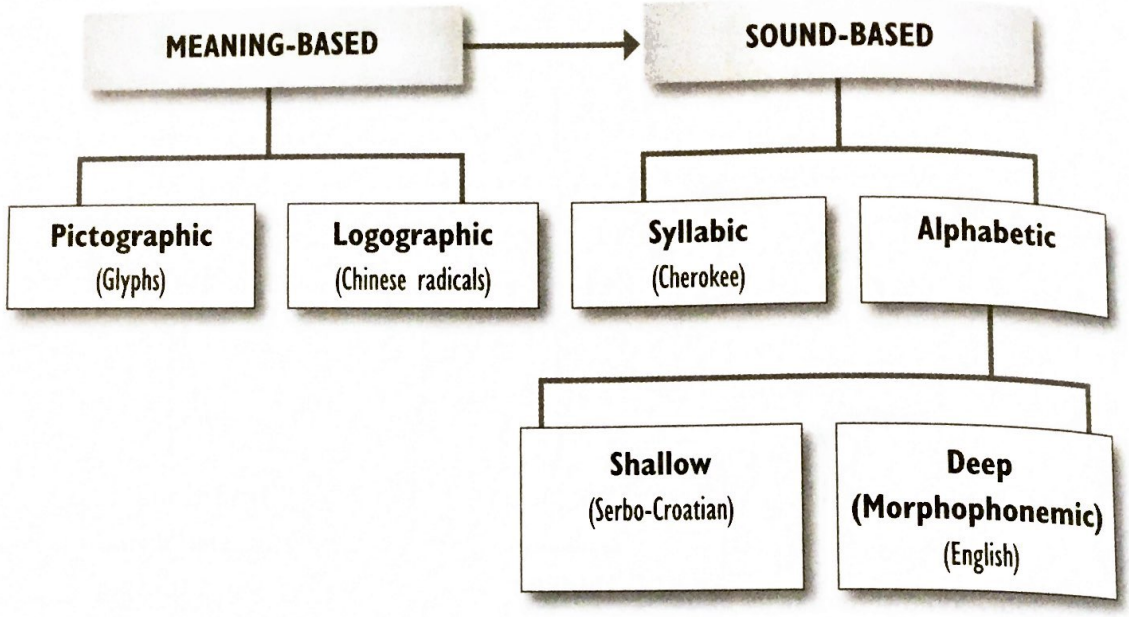
Remarkably, alphabets in use today descend from a "mother" alphabet (see *Figure 2.1*). Since the first group of letters was invented somewhere in or around Egypt, nearly every successive alphabetic system used recycled letters and adapted them to represent the new language. The Greeks took and modified the Phoenician alphabet; the Etruscans and Romans took and modified the Greek alphabet, and so on.

Figure 2.1. Flowchart of the Evolution of Alphabetic Writing



Awareness of Speech Sounds and the Alphabetic Principle

Figure 2.2. Types of Writing Systems



Shallow and Deep Orthographies

Writing systems (orthographies) can be classified according to the level of language they represent. *Figure 2.2* illustrates a continuum of representation, from meaning-based systems to sound-based systems. Sound-based systems can represent whole syllables or individual speech sounds. In addition, alphabetic systems can be "shallow" or "deep." (Note: These are *linguistic terms*, not value judgments.) In a "shallow" (or "transparent") alphabetic orthography (e.g., Finnish, Serbo-Croatian), the sound-symbol correspondences in the alphabetic writing system are regular and predictable, with one sound represented by one symbol or letter. Once we learn the sound that goes with a letter, we can read the words by using that code.

English, in contrast, is a "deep" (or "opaque") alphabetic orthography. Its spelling system represents morphemes (meaningful parts) as well as speech sounds. The term we use to describe how English is spelled by both speech sounds (phonemes) and meaningful units (morphemes) is **morphophonemic**. Consider these examples:

wanted, hummed, pitched

rite, ritual

compress, compression

anxious, anxiety

native, national, nativity

We tend to spell the meaningful parts of words (morphemes) the same way, regardless of their pronunciation. If English were a totally transparent orthography, **-ed** would be spelled the way it sounds. Instead, it has three pronunciations—/t/, /d/, and /əd/—that are all spelled the same way. The word **compression** uses stable spellings of the prefix *com-* and the root *press*, even though the prefix is unaccented, the vowel is indistinct (schwa), and the final **ss** in *press* sounds like /sh/. The spellings of **compress** and **compression** look the same and help us see these words as sharing meaningful parts.

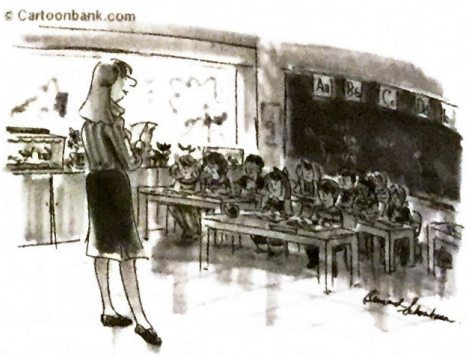
Look at the other examples that are provided above. We spell these words by sound *and* by meaning. George Bernard Shaw once led a campaign to change English spelling to a more phonetic (or transparent) system, but his efforts failed because much would be lost if English spellings were changed. For example, it would become difficult to read English writings from centuries past if the spelling patterns were radically altered. In addition, stable spelling of meaningful word parts allows us to read and get to the meaning of words more quickly, which is the overall goal of reading. Nevertheless, it is impossible to read an alphabetic writing system unless one can mentally link the alphabetic symbols with the single speech sounds or phonemes that they represent. All alphabets require the reader to be aware of *speech sounds (phonemes)*.

Some teachers of Spanish believe that Spanish uses a syllabic writing system. In Spanish, spoken syllables often end with long vowel sounds, whereas in English, at least half of the syllables have short vowels and end in one or more consonants. Syllables in Spanish are often consonant-vowel sequences, such as **mi**, **me**, **ma**, **mo**, and **mu**, and are relatively easy to learn. In addition, many Spanish words are cognates that are built around the same Latin and Greek prefixes, suffixes, or roots that English words also employ. The common language ancestors of Spanish and English enable English speakers to readily recognize the meanings of Spanish words such as *problema*, *diagrama*, *universidad*, *aniversario*, *laborioso*, *abundante*, *técnico*, *turista*, *argumento*, *atención*, and *romántico*. Spanish writing is somewhat more transparent or decodable, with regard to its phonics system, than English. Even so, Spanish writing is not a syllabic system. Although syllable patterns are often taught, Spanish uses an alphabetic orthography that represents the sound or phonemic level of spoken language, and Spanish readers must also be aware of the individual speech sounds that letters represent.

The Cherokee language, on the other hand, is a true syllabary, with one symbol representing one whole syllable. Modern Japanese includes sound-based representations, both syllabic and alphabetic, added to Chinese characters, or radicals; it is a true amalgam of sound-based and meaning-based writing systems.

Advantages of an Alphabetic System

Why was the alphabet such a wonderful invention? Because any word could be read or written, using a small set of symbols. Armed with knowledge of the code, the learner could read without memorizing hundreds of unique signs or symbols. A limited number of symbols could be combined infinitely to represent an entire language. Language could be written down and read by anyone who could match the symbols to the sounds they represented.



"Now you're probably all asking yourselves, 'Why must I learn to read and write?'"

In spite of its utility, alphabetic writing eluded human invention until about 5,000 years ago and was not a common form of written communication until 3,000 years ago. The Phoenician alphabet, clearly established and used in the Middle East by 1100 B.C., was adapted by the Greeks and Romans; however, alphabetic writing was by no means universal until a few hundred years ago. Why? Because the existence of the phoneme—that which a letter represents—is not a self-evident, natural, or consciously accessible understanding for humans. People are "wired" instead to process speech for the meanings it conveys. Our brains are not adapted to read, but they are adapted to support learning to speak. The invention of the alphabet represented an astonishing achievement of metalinguistic awareness—that is, the ability to think about and reflect on the structure of language itself. Had insight into the building blocks of language been easily achieved, then alphabets would have been invented much more readily and used more widely.

Of all the alphabetic languages in the world, the writing system of English is comparatively difficult. Languages such as Spanish, Italian, Serbo-Croatian, and Finnish are more phonetic and more easily decoded than English. Those languages are closer to having one letter for each sound. "Congratulazioni per l'acuisto della stampante" can be read with relatively little difficulty if the vowel sounds are known to the reader, even if that person does not know the meanings of Italian words.

English sound-symbol correspondences are regular enough that we can read nonsense words as well as real words if we know alphabetic or phoneme-grapheme correspondences. Lewis Carroll's poem *Jabberwocky* in *Through The Looking Glass and What Alice Found There* (Carroll, 1993) can be read by anyone who knows the phonic code, even though it has little (or no?) meaning:

'Twas brillig, and the slithy toves
Did gyre and gimble in the wabe;
All mimsy were the borogoves,
And the mome raths outgrabe.

Do you remember how you learned to read? *Exercise 2.2* will briefly put you in the shoes of a novice reader.

Cut out these sight word cards so that you can manipulate them, or make your own by copying the words onto sticky notes. You will use these words in *Exercise 2.2*.

ðə	wʌz	ænd
ə	aj	tu
ju	ʌv	

Exercise 2.2 Simulation of Learning to Read

- After completing this exercise, be prepared to share your reflections.
- Follow your instructor, who will be using the script in *Appendix A*, as you are guided through these activities:
  a. **Phoneme awareness**: Imitate the correct production of each phoneme. Describe how each one is articulated.
  b. **Phoneme-grapheme association**: Match phonemes with symbols. Match symbols with phonemes.
  c. **Blend** sounds into words.
  d. **Memorize** some of these sight words so that sentence reading is possible.
  e. **Read** words, phrases, and sentences.
  f. **Spell** words with letter tiles.
  g. **Write** symbols for sounds that are dictated.
  h. **Practice**. Make a word chain. Build fluency in word recognition.
  i. **Read** a story with sounds and words that have been taught.

1. Select or make the following letter tiles:

f	k	n	ŋ	θ	š	I

2. Select or make word cards for the following irregular sight words:

ænd	ə	ðə	wʌz

3. Review the sounds /f/, /k/, /n/, and symbols *f, k, n.*

4. Learn these four new sounds—/ŋ/, /θ/, /š/, /I/—and their symbols. Practice listening for the sounds, pointing to the symbols, and saying the sounds for the symbols.

5. Blend these sounds into words:

In	θIn	θIŋ	fIš
fIn	šIn	θIk	
kIn	kIŋ	kIk	

(continued)

Exercise 2.2 (continued)

6. Read these words with consonant blends:

kIŋk Iŋk fIŋk θIŋk

7. Read these irregular whole sight words:

ænd ə ðə wʌz

8. Read these phrases and sentences:

θIk ænd θIn

wʌz ə fIŋk

θIŋk In Iŋk

kIk ðə šIn

kIŋk ðə θIŋ

fIšIŋ wʌz ə kIk.

ðə kIŋ wʌz fIšIŋ.

ðə kIŋ wʌz θIn.

ðə fIš fIn wʌz θIn.

wʌz ðə θIŋ ə fIš?

9. Spell with letter tiles. Write the words you spell on these lines:

θIK ððIK θIŋ IðIŋK

~~ððIK~~ θIK θIaK

~~ðð~~

10. Write the dictated words, phrases, and sentences.

θInK

θ ðð KIng waZ ~~θIK~~

waZ

Exercise 2.2 (continued)

11. Learn these additional sounds and symbols:

w	t	ċ

12. Listen. Write the symbol:

_____

_____

13. Read these regular words:

ċn	ċf	tċŋ	tċk
θċt	tċt	fċt	kċt
θċŋ	kċŋ	kċf	wċnt
wIš	wIŋ	wIn	wIθ
wIkIŋ		wċkIŋ	

14. Learn these additional irregular whole words:

aj	tu	ju

15. Read these phrases and sentences:

a. θIŋk, tċk, ænd wċk

b. wċnt ænd wIš

c. θIŋk ðə θċt

d. tċkIŋ ċn ænd ċf

e. ðə kIŋ kċt ə kċf.

f. kIŋ kċn fċt ċf ðə θIŋ.

g. aj wċnt tu fIš wIθ ju.

h. ju wċkt θIŋkIŋ θċts ċn ænd ċf.

(continued)

Chapter 3 What the Brain Does When It Reads

Learner Objectives for Chapter 3

- Survey the skills that support proficient reading.
- Understand what eye movement studies reveal about reading.
- Identify and describe the role of four major brain-processing systems in recognizing printed words.
- Contrast the Four-Part Processing model with a cueing systems model.

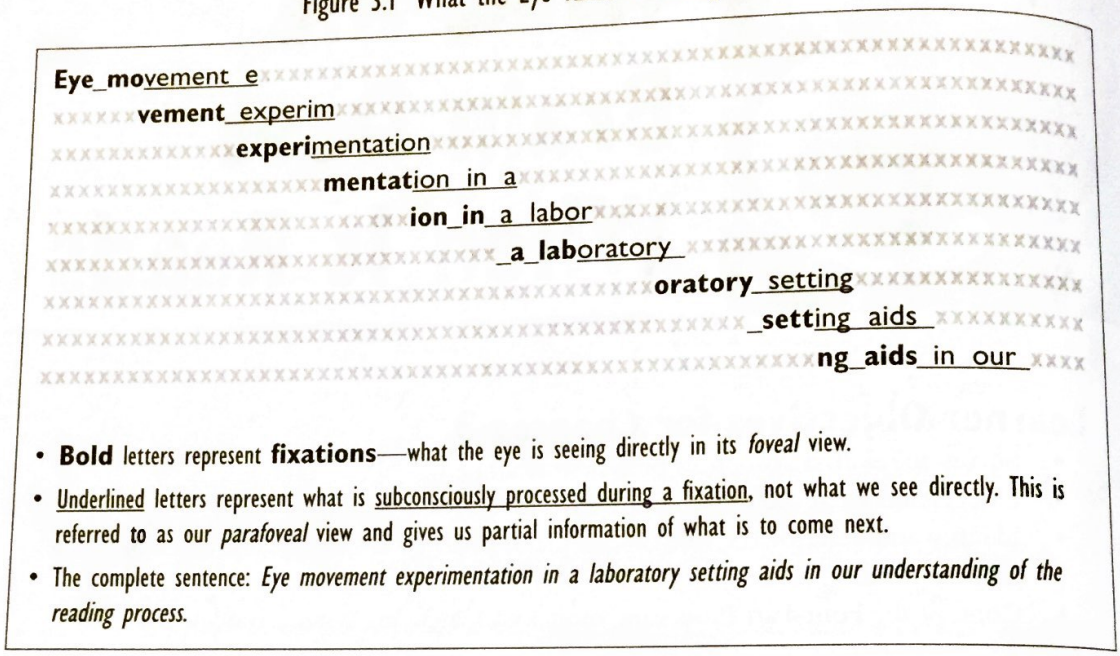
Warm-Up: Watch Eye Movements

- Working with a partner, take turns watching each other's eyes during oral reading of a paragraph or two of this book.

Eye Movements and Reading

You have just watched the eyes of a person scanning text at a normal rate. The eye seems to be ahead of the voice when we read aloud—and indeed, it is. The precision eye-movement research of scientists such as Rayner and Pollatsek (1989) at the Massachusetts Institute of Technology showed in many experiments over 20 years that the reading eye fixates on most content words (especially nouns and verbs) in a rapid series of stops and jumps called *fixations* and *saccades*. When fixated, the eye rests for about .25 seconds (250 milliseconds) on a content word and takes in a span of about seven to nine letters to the right of the fixation and three to four letters to the left before it jumps over to the next fixation point. More letters are processed to the right of the fixation if the eye is scanning from left to right. The opposite would be true for reading a language that is scanned from right to left, such as Hebrew or Arabic.

Figure 3.1 What the Eye Takes in During Fixations



Although we may not be aware of it, we do not skip over words, read print selectively, or recognize words by sampling a few letters of the print, as whole language theorists proposed in the 1970s. Reading is accomplished with letter-by-letter processing of the word (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001, 2002). Fluent readers *do* perceive each and every letter of print. Thus, we can distinguish **casual** from **causal**, **grill** from **girl**, and **primeval** from **prime evil**. Better readers process the internal details of printed words and match them to the individual speech sounds that make up the spoken word. Even when "chunks" are recognized, they can be analyzed into their individual phoneme-grapheme correspondences on demand.

Some children do have inherent vision problems, but they are independent of the types of problems that can be causes of reading difficulty. Visual acuity problems, such as near-sightedness, certainly should be identified and treated with corrective lenses, but language-based reading problems will not be cured with vision therapies. For example, there is no evidence that colored lenses or overlays relieve language-based reading problems or that eye-movement therapy is effective as a substitute for reading instruction. Faulty eye movements or visual fatigue most often are symptoms, not causes, of reading difficulty.

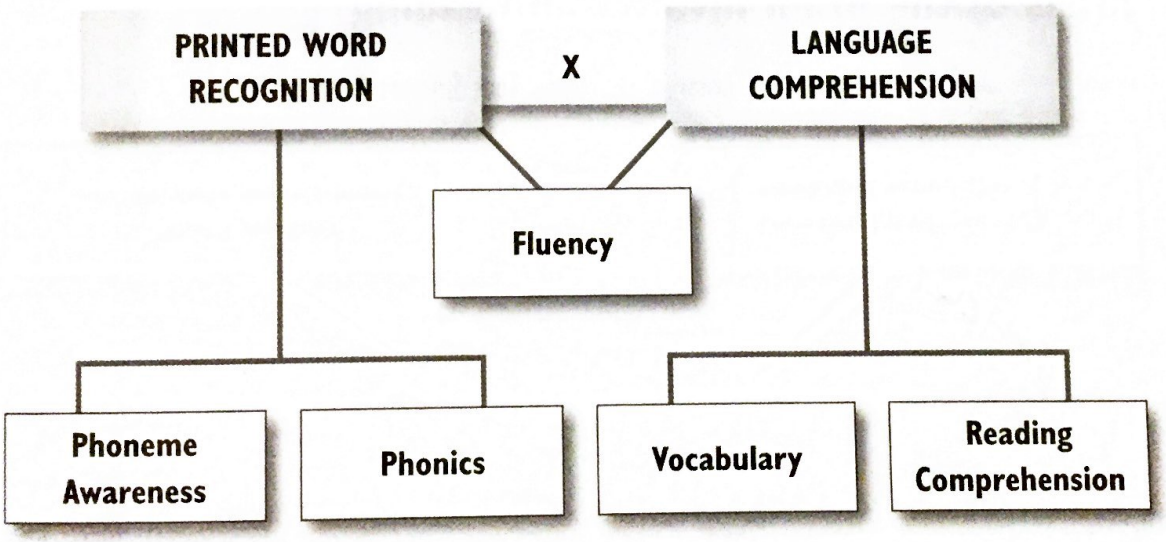
Eye movement studies have shown that mature, proficient readers do not skip words, use context to process words, or bypass phonics in establishing word recognition. Reading requires letter-wise processing of print and the ability to match symbols with the speech sounds they represent.

Proficient Reading Depends on Many Skills

The mechanics of fluent, accurate reading are quite remarkable. A proficient reader appears to scan the print effortlessly, extracting meaning and sifting through it, making connections between new ideas in the text and existing knowledge, and interpreting according to his or her purposes. The proficient reader figures out new words and names very quickly and with minimal effort, consciously sounding out new words if necessary. New words are decoded with minimal effort because the sounds, syllables, and meaningful parts of words are recognized automatically. If the good reader happens to misread a word or phrase or does not comprehend a word or phrase, he or she quickly adapts by rereading to make sense of the information and clarify what was unclear. As she reads along, the reader forms a mental model, or schema, for the meanings just extracted, linking new information to background knowledge. That schema, or mental construction, has a logical framework into which she files the information to remember. Reading is a complex mental activity!

The attainment of reading skill has fascinated psychologists and invited more study than any other aspect of human cognition because of its social importance and its complexity. The study of proficient reading and reading problems earned more funding increases from Congress in the 1990s than any other public health issue studied by the National Institute of Child Health and Human Development (Lyon & Chhabra, 2004). As a consequence of programmatic research efforts over many years, scientific consensus on some important issues in reading development and reading instruction has been reached (McCardle & Chhabra, 2004; Rayner et al., 2001).

Figure 3.2 Two Domains and Five Essential Components of Reading



One important result of research is the finding that fluent reading for comprehension depends on the ability to recognize and attach meaning to individual words. Reading is the product of two major sets of subskills: *printed word recognition* and *language comprehension*. Printed words cannot be interpreted unless they are accurately pronounced or named (e.g., **abroad** is not **aboard**; **scarred** is not **scared**; **etymology** is not **entomology**). Pronouncing or

decoding a word requires knowledge of the sounds in words (*phoneme awareness*) and the alphabetic system by which we represent those sounds (*phonics*). The meanings of those sounds must be recognized at the word level (*vocabulary*) and at the level of connected language (*text comprehension*).

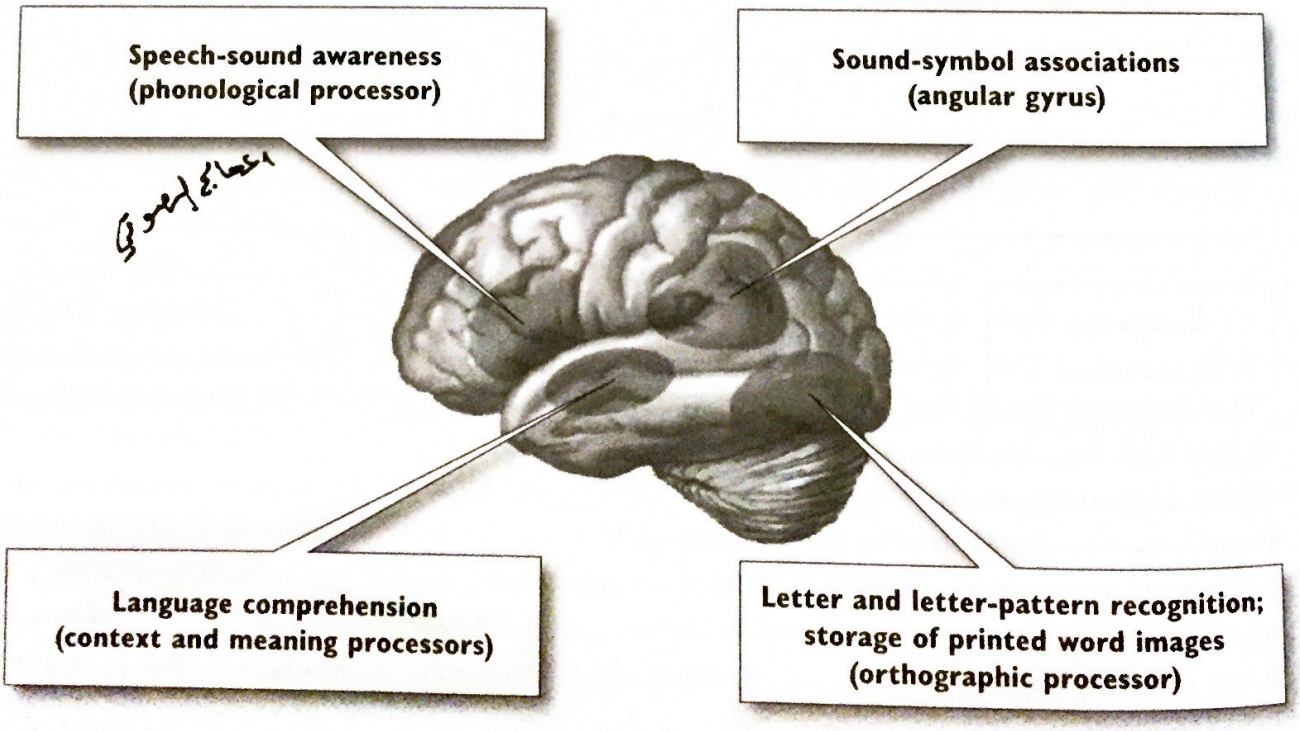
A *fluent* reader carries out the process of word-naming with deceptive ease. A fluent reader recognizes or names words so rapidly and effortlessly that he or she is not aware of those mental processes. Automatic word recognition frees up cognitive resources (i.e., attention, self-monitoring, working memory) that can then be applied to comprehension. A short list of some major subskills of reading, then, is as follows:

- Phoneme awareness
- Use of phonics to decode words accurately
- Automatic recognition of words previously deciphered
- Knowledge of what most words mean
- Understanding sentences and language of books
- Constructing meaning (connecting ideas in the text and with each other and with prior knowledge)
- Monitoring comprehension and rereading or rethinking if miscomprehension occurs.

Four Processing Systems That Support Word Recognition

Areas of the Brain Involved in Reading

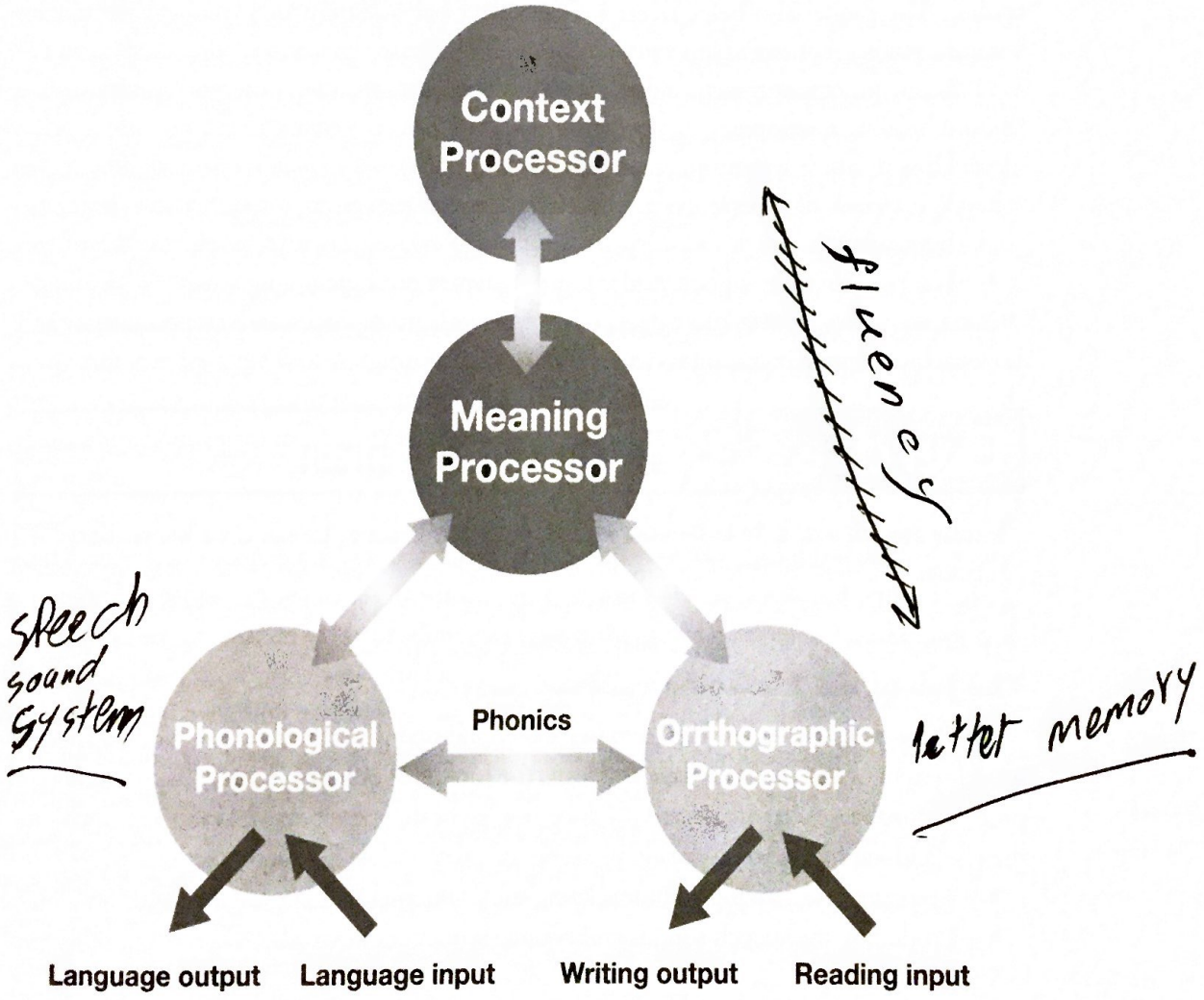
Figure 3.3 Areas of the Brain That Support Reading



In order for reading to occur, several major regions of the left half of the brain must perform specific jobs in concert with the others. In most people, language functions are subsumed by the left cerebral hemisphere, and the processing of written language depends on networks that are located primarily in the language centers. The networks that are highlighted in *Figure 3.3* include the **phonological processor** (in the back part of the *frontal lobe* of the brain); the **orthographic processor** (in the *lower back [occipital]* part of the brain); and the middle area (*temporal-parietal-occipital junction*, or **angular gyrus**), where these two processing systems communicate to support word recognition. In addition, pathways link the back and middle areas to the *temporal* areas, where **word meanings** and **connected language** are processed. Notice that the orthographic processor is on the side of the brain that serves language (left side) and that it is wired into the language centers. Learning to recognize words depends heavily on accurate matching of written symbols with sounds and the connection of those sound patterns with meaning.

Jobs of the Four Processing Systems

Figure 3.4 The Four-Part Processing Model for Word Recognition



The schematic representation of the four brain-processing systems involved in word recognition (*Figure 3.4*) is based on cognitive psychological experimentation. It was originally proposed by Seidenberg and McClelland (1989) as a summation and synthesis of many experiments on the nature of skilled and unskilled reading. This model was developed before functional brain studies showed where and when these mental activities take place during reading (Berninger & Richards, 2002; Eden & Moats, 2002; Shaywitz, 2003). The model is discussed at length in Adams' (1990) landmark book, *Beginning to Read: Thinking and Learning About Print*, and two recent summary articles in *Psychological Science in the Public Interest* and *Scientific American* (Rayner, et al., 2001, 2002). The schematic representation of the systems simplifies the nature of skilled reading because several subcomponents within each processing system have also been identified (Vellutino et al., 2007).

The four-part processor concept, although a simplification, is useful because it suggests: (a) the various ways in which reading problems might develop; and (b) why reading instruction should target several kinds of skills. The model reminds us that *instruction should aim to educate all of the processing systems and enable them to work together.* It shows why recognition and fast processing of sounds, letter patterns, and morphemes—as well as word meanings, language comprehension, and background knowledge—are all important components of skilled reading. The model also helps researchers decide what questions or hypotheses to test in scientific studies. For example:

- Is one processing system more important to educate than the others at a given stage of reading development?
- How do these systems interact?
- What kinds of experiences are necessary for each processing system to learn its job in the reading brain?
- Is it possible to be a good reader if one system is not functioning well?

Next, we will explore in more detail what each of the four processors is responsible for and how each one contributes to proficient reading and writing.

Exercise 3.1 Acting Out the Brain

- *Follow your instructor as he or she walks you through the next section on the jobs of the four processing systems.*

The Job of the Phonological Processor

This processing system enables us to perceive, remember, interpret, and produce the speech-sound system of our own language and learn the sounds of other languages. The phonological processor enables us to imitate and produce *prosody*, or the stress patterns, in speech, including the rise and fall of the voice during phrasing. It is responsible for such functions as:

- Mentally categorizing and identifying the phonemes in a language system;
- Producing the speech sounds and syllable sequences in words;

- Comparing and distinguishing words that sound similar (e.g., **reintegrate** vs. **reiterate**);
- Remembering and repeating the words in a phrase or the sounds in a word;
- Retrieving specific words from the mental dictionary (lexicon) and pronouncing them;
- Holding the sounds of a word in memory so that a word can be written down; and
- Taking apart the sounds in a word so that they can be matched with alphabetic symbols.

The phonological processor has many jobs, all of them related to the perception, memory, and production of speech. *Phoneme awareness* is one job of the phonological processor. Children who have trouble with phonological processing show a variety of symptoms, such as difficulty remembering sounds for letters or blending them together, difficulty recognizing the subtle differences between similar words, and trouble spelling all the speech sounds in a word.

LETRS Module 2 is all about this processing system. The phonological processor is so important that it needs its own module!

The Job of the Orthographic Processor

The orthographic processing system receives visual input from printed words. It perceives and recognizes letters, punctuation marks, spaces, and the letter patterns in words. The orthographic processor enables us to copy lines of print, recognize words as whole units, or remember letter sequences for spelling. When we look at print, its features are filtered, identified, and matched to images of letters or letter sequences already in our orthographic memory. If the letters or letter sequences are familiar, we associate them with sounds and meanings.

Most people have no trouble interpreting widely varying print forms, including individual handwriting styles, type fonts, or uppercase and lowercase letters. The size, style, and case of print are not major factors in word recognition once a reader knows letters and letter-sound relationships. Letters are recognized by their distinguishing features, including curves, straight lines and angles.

The orthographic processing system stores information about print that is necessary for word recognition and spelling. The speed with which letters are recognized and recalled is very important for proficient reading. Obviously, print images must be associated with meaning for reading comprehension to occur. Children with orthographic processing weaknesses will have trouble forming "sight word" habits, will be poor spellers, and will often read slowly because they are sounding everything out long after they should be doing that.

LETRS Module 3 is all about the organization of English orthography (the information that the orthographic processor must learn), and Module 7 is devoted to the teaching of phonics. Additionally, Module 10 addresses the advanced skills of phonics and word study necessary for reading and spelling multisyllabic words in our language.

The Job of the Meaning Processor

According to the four-part processing model, recognizing words as meaningful entities requires communication among the phonological processor, orthographic processor, and meaning processor. The meaning processor is also called the *semantic processor* because it interprets the meanings of words in and out of context. If we associate speech sounds with print symbols but do not access the meaning processor, we may read a foreign language (or our own!) without knowing what it means, read nonsense words, or read a new name by sounding it out but with no possibility of comprehension. The meaning processor stores the inventory of known words, organizes the mental dictionary or lexicon, and constructs the meanings of any new words that are named during reading. The context of the passage supports the construction of those meanings.

A word filed in your mental dictionary is a linguistic entity with many facets. When words are known in depth, their sounds, spellings, meaningful parts, typical uses, alternative meanings, and customary uses are known. The meaning processor is structured according to a number of semantic organization features such as synonym relationships, roots and other morphemes, spelling patterns, common meaning associations, and connotations. It expands and reorganizes itself as new vocabulary is learned.

In the lexicon, or mental dictionary, words are "filed" in meaning networks. Words are typically learned in relation to one another, not in isolation. We learn words best if we can connect them to something we already know. We learn words more readily if they are connected to images of their sounds and their spellings, as well as the contexts in which they are usually used. Children with weak vocabularies, limited knowledge of English, and/or weaknesses in verbal reasoning ability may have trouble reading. In these cases, children's decoding skills may or may not be better than their skills in meaning-making.

LETRS Module 4 is devoted to an exploration of word meanings and how to teach them.

The Job of the Context Processor

Refer back to page 33 and notice where the context processor is positioned in *Figure 3.4*. Its primary job is to interact with and provide support for the meaning processor. The term "context" refers to the sentence and sentence sequence in which a word is embedded, and the concepts or events that are being discussed or reported in the text. Context provides the referent for a word's meaning. Many same-sounding words have multiple meanings, but only one is correct when used within a specific sentence. For example, the spelling of a word such as **passed** or **past** is determined by its meaning in the context of a sentence:

- The quarterback **passed** the ball to the receiver for the touchdown.
- Champions of the **past** were guests at the start of the game.

Context may help us find or figure out a word's intended meaning if we do not already know the word. Context also enriches our knowledge of how each word is typically used in our language system. Context will resolve ambiguities associated with multiple meanings of many words. Context may also help us catch decoding errors and cause us to reread for

clarification. Well-developed background knowledge and verbal abilities as well as adequate reading fluency enable readers to use context productively.

A major point about the function of context in word recognition is that it plays only a limited role in facilitating word-naming itself. Word recognition and pronunciation are primarily the job of the phonological and orthographic processors. Students cannot comprehend text if they cannot read it accurately and fluently!

Module 6 of LETRS covers the topic of comprehension for young students; LETRS Module 11 addresses research and instructional practices best used for grades 4 and beyond.

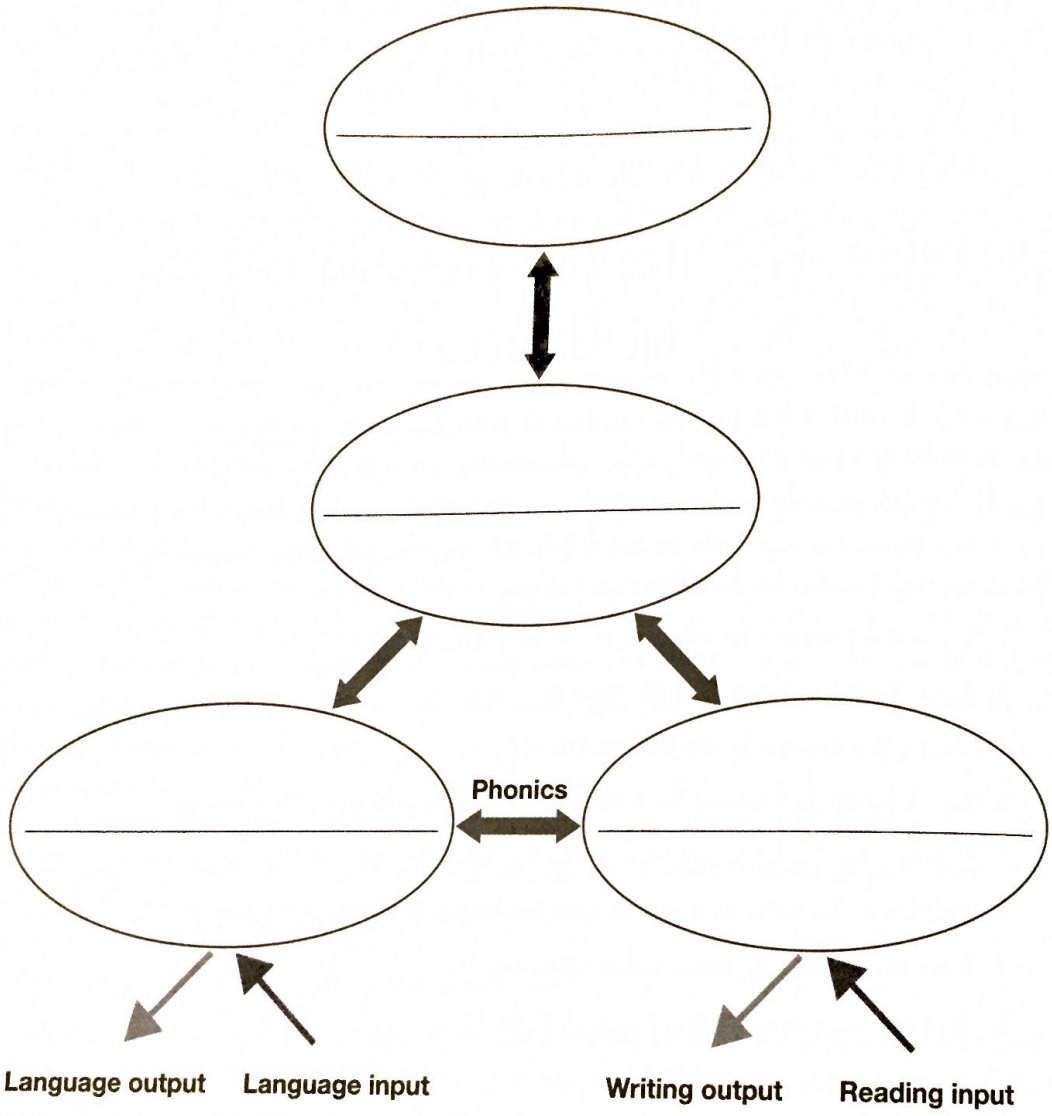
Exercise 3.2 The Four Processors at Work in the Classroom

- Walk through this exercise with your instructor. First, fill in the correct labels for the processors in the diagram on the next page: *phonological*, *orthographic*, *meaning*, and *context*.
- After labeling each processing system in the diagram, match each numbered task below to the processor(s) that is most obviously activated while the task is performed. Place the task number alongside the processor(s). Your presenter will do the first one with you.

1. Decode and pronounce the unfamiliar printed word **chimera**.
2. Repeat the *spoken* phrase "Riki-tiki tembo no serembo."
3. Orally give a synonym for the word **anthology**.
4. Read a passage to determine which meaning of the word **affirmative** is intended.
5. Determine whether the spoken words **does** and **rose** end with the same speech sound.
6. Underline all the words on a page in which the letter **c** is followed by **e**, **i**, or **y**.
7. Write this sentence: *My mental lexicon craves enrichment.*
8. Read and comprehend the next paragraph of this book.

(continued)

Exercise 3.2 (continued)



Exercise 3.2 (Alternative) Processing Systems and Classroom Instruction

- *On a blank piece of paper, write out an activity you typically do with your class as you teach reading.*
- *Crumple the paper and throw your "snowball" into the center of the room. Your presenter will let you know what to do next.*
- *Are all processing systems addressed? Is one aspect of reading given more emphasis than another?*

Moving Beyond Cueing Systems

In the early 1980s, an alternative conception about the nature of reading was promoted in the non-scientific literature on reading instruction, although the origin of this model is unclear (Adams, 1998). Known as the "Three Cueing Systems" model, it proposed that word recognition depended on three systems of linguistic cues that reside in a text. The model proposed that these three systems are used during reading as needed to decode words: (1) a *graphophonic* (visual) system; (2) a *semantic* (meaning) system; and (3) a *syntactic* system that provides linguistic context to process words in sentences. The cueing systems model was embedded in the miscue analysis procedure in "running records" or oral reading assessments and also was used as a rationale for whole-language approaches to reading instruction.

The Seidenberg and McClelland (1989) Four-Part Processing model departs from the Three Cueing Systems model in several critical ways. In the Four-Part Processing model, which converges with modern brain science, the phonological processor is separate and distinct from the orthographic processor. Each is only indirectly influenced by or driven by context. To educate the phonological processor and the orthographic processor, we teach children about speech sounds and print patterns, and then teach them how the two are linked. Accurately read words are then associated with meaning and placed in context.

In the Three Cueing Systems model, the phonological and orthographic processing systems are unified and characterized as "visual" instead of linguistic. The role of phonological processing in word recognition is minimized and obscured because it does not exist in the diagram. Teachers are not helped to understand or teach phonology directly, and teachers are encouraged to use meaning and context *as a replacement for* systematic instruction in the alphabetic code.

The Three Cueing Systems model overemphasizes the usefulness of context and meaning in word recognition. It encourages teachers to say to students who are stuck on a word, "What would make sense here?" before they expect the student to decode the word or blend the sounds together. It encourages teachers to believe that phonics strategies are a last resort and that systematic phonics instruction is unnecessary because children can rely on meaning to figure out words. The cueing model fosters dependence on pictures, prereading rehearsal, and context for identifying words. Unfortunately, these are the strategies that poor readers rely on when they are having difficulty deciphering the alphabetic code.

The Four-Part Processing model explains why a systematic, organized approach to teaching sounds and spellings is necessary and productive for many children. Until decoding skills are known, the most productive prompt to a student who is stumbling on a word is, "Look carefully at all the letters. Sound it out. Does that make sense?" Guessing at words on the basis of context, even with reference to an initial consonant sound, is not a good habit to encourage when children are first learning to read. Later reading fluency

Teaching Tips

What to say when a student stumbles on a word:

- "Look carefully at all letters."
- "Sound it out."
- "Does that word make sense?"

Avoid asking "What word makes sense here?" as your initial cue!

depends on early mastery of associations between letters, letter patterns, and speech sounds. Moreover, context use is an accurate way to identify unknown words only about one out of four to one out of ten times!

Take 2 Review

- Complete this two-column organizer.
- In the first column are restatements of main ideas. Work with the group or your partner to complete the second column. List a few details that elaborate the main ideas or that state the relevance of those ideas for your school or classroom.

Knowledge/Main Ideas	Application/Details
1. Good readers process *all* the letters in printed words; they read words completely and accurately.	
2. Four processing systems must work together to support printed word recognition.	

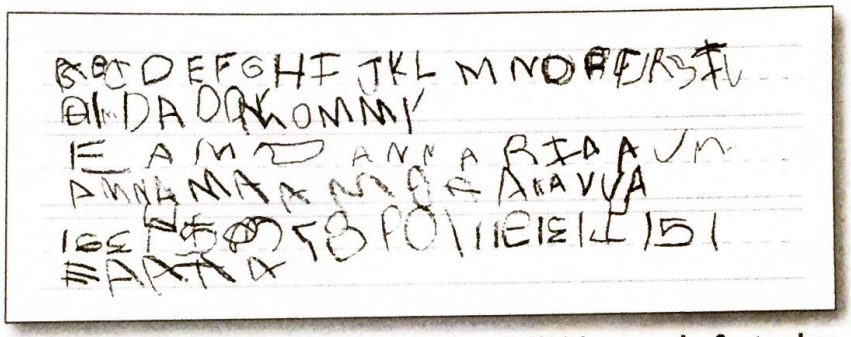
Chapter 4 How Children Learn to Read and Spell

Learner Objectives for Chapter 4

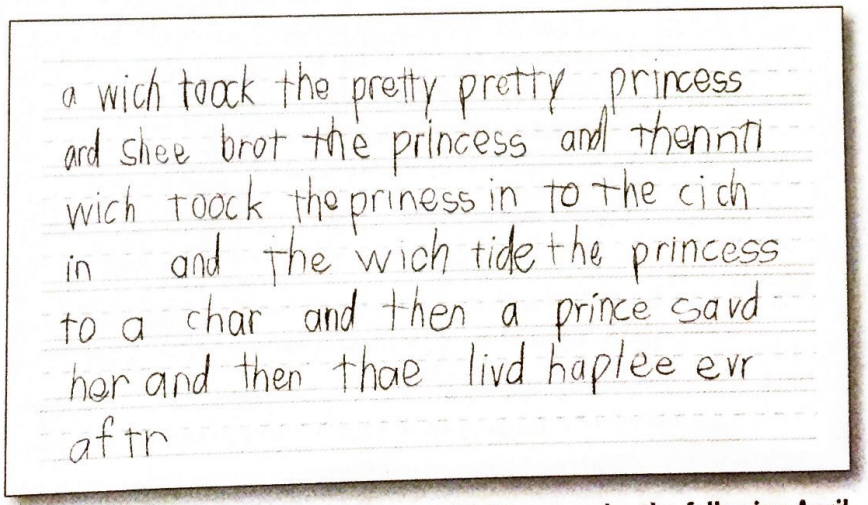
- Describe how decoding and comprehension contribute to reading skill over time.
- Become familiar with the conceptions of reading development by Scarborough (2001), Chall (1996), and Ehri and Snowling (2004).
- Examine children's writing, spelling, and reading, and describe the phases of development for each skill.

Warm-Up: Look Closely at Spelling

- Here are two writing samples[2] from the same kindergarten student; the first sample was obtained in September, and the second sample was obtained in April of the following year.
- What has happened? What can the student do after eight months of excellent instruction that he could not do at the beginning of kindergarten?



Student C: Writing sample, September



Student C: Writing sample, the following April

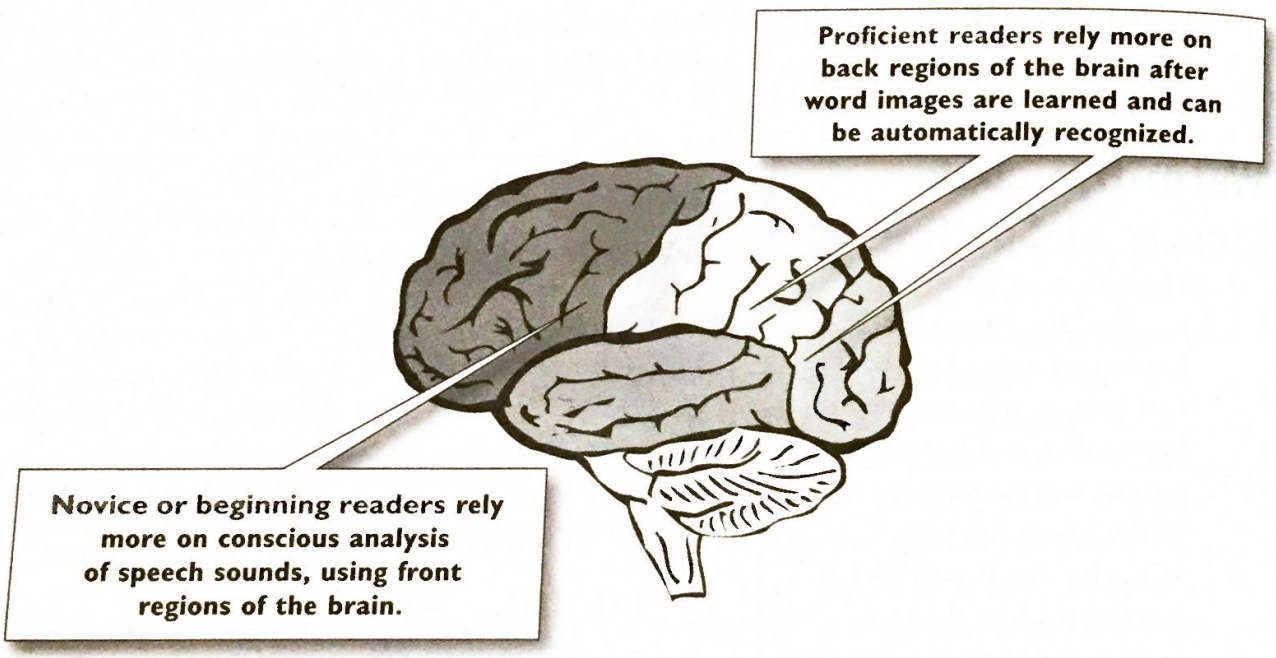
[2] Kindergarten writing samples provided by Pat Tyborowski (Tyborowski & Crosby, 2001).

The Continuum of Reading and Spelling Development

The Developing Reading Brain

Models of proficient reading and an understanding of the many cognitive systems that support it do not tell us how people learn to read. Researchers have, however, investigated how the nature of skilled reading changes over time. At the end point, the proficient reader has learned to recognize words and interpret text rapidly, accurately, and often effortlessly. All processors are functioning and support reading. However, the role that each processor plays in reading development and the functional relationships among the processing systems change as reading skill develops.

Figure 4.1 Reading Levels and Reliance on Different Regions of the Brain



Good readers' brain activation patterns change with experience in reading. When children first learn to read, they are novices who must learn each component skill. During this time (refer to *Figure 4.1*), novice readers show greater activation in frontal and parieto-temporal (front to mid-back, left side) regions than skilled readers do because they must dismantle words for step-by-step, sound-symbol analysis. Novice good readers are aware of the sound-symbol connections in words and can use those to sound out words.

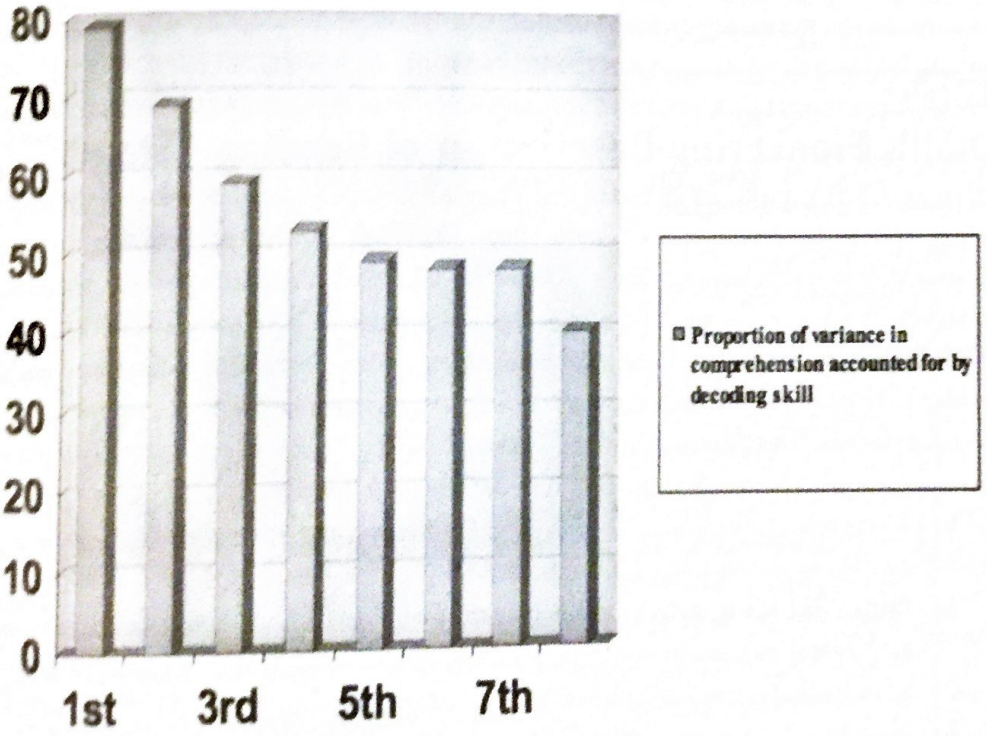
With practice and reading experience, however, good readers' brain patterns change slightly. More experienced good readers become more reliant on the occipito-temporal (farther back, left side) region to recognize words. They are more fluent because word recognition is automatic. At this stage of experienced good reading, readers often think that they are

reading "by sight." While experienced good readers still activate the sounds in words and use phonics to decode words, they are unaware of this happening. Word recognition becomes a subconscious process, freeing up attention so that the reader can focus on the ultimate goal of reading, which is to understand what is being read.

The Connecticut Longitudinal Study

The two major subcomponents of reading—word recognition and text comprehension—change in relationship to each other between grades 1 and 8 (Foorman et al., 1997; Tannenbaum, Torgesen, & Wagner, 2006; Torgesen, 2005). Started in 1983 at the Yale University School of Medicine, the Connecticut Longitudinal Study (Foorman et al., 1997; Shankweiler, et al., 1999; Shaywitz, 2003) randomly selected a sample of 445 kindergarten children in various Connecticut public schools and tracked their progress for more than 20 years. Each child was tested yearly with the Woodcock-Johnson Achievement Test reading subtests (Woodcock & Johnson, 1989), which includes tests of word reading (real and nonsense words) and a test of passage comprehension. *Table 4.1* shows how the relative importance of word reading skill to passage reading comprehension changed over time.

Table 4.1 How the Relationship Between Decoding and Comprehension Changes Over Time
(based on data from the Connecticut Longitudinal Study, Foorman et al., 1997)



The correlations between these two components of reading changed as students learned to read. The correlations reflect the strength of association between decoding and comprehension. Initially, the ability to decode—the ability to read the words accurately—accounted for about 60 percent of passage reading comprehension ability. (The proportion of variance accounted

for in one variable by another variable is obtained by squaring a correlation between the two.) Phonic decoding and fast word recognition were the most important tasks for first-grade students to master if they were going to be able to read a simple text passage and understand it. Passage comprehension at that level depended almost entirely on the ability to read single words accurately.[3]

By fourth grade, about 50 percent of the ability to comprehend passages was accounted for by the ability to read the words and apply phonics in word reading. As students progressed, comprehension of text depended more and more on other skills such as verbal reasoning, background knowledge, and knowledge of academic language. The Connecticut Longitudinal Study did not assess reading fluency. Torgesen (2005), at the Florida Center for Reading Research, has shown that verbal reasoning, topic knowledge, and language ability become even more important than fluency as students progress beyond the fifth grade.

These findings and others (Connor, Morrison, & Underwood, 2007) make it clear that the teaching of reading is not simply an equal "balance" of all subskills at each grade level. Rather, expert teachers know what subskills and processing capabilities to emphasize for which grade levels in order to get to the end goal of reading, which is comprehension. Many instructional approaches acknowledge the importance of all reading subskills, but an equal balance is not necessarily what gets the best results. Rather, the subskills of word recognition (i.e., phonology, letter naming, phonics, and word attack) should receive more emphasis early in reading development rather than later and will be more important for poor readers than good readers as students get older. Vocabulary and comprehension are important targets for reading instruction no matter what the student's age.

Chall's Pioneering Description of Reading "Stages"

Jeanne Chall, a professor of reading at Harvard for many years, developed the first-stage theory of reading development (Chall, 1996). Dr. Chall argued that "reading" was a word with very different meanings for children and adults of different ages and skill levels. In brief, her conceptual outline of reading stages differentiated the characteristics and demands of reading in six major periods of reading development. Her stages described well what children typically had to master as they progressed through a school curriculum. Chall's stage framework is still useful in understanding how the challenges of learning and teaching reading change over time. Her stages were defined as follows:

0 **Prereading**; also called *Prealphabetic*, *Logographic*, and *Preconventional* (typical of preschool through late kindergarten)
1 **Initial Reading** or **Alphabetic Decoding**; also called *Alphabetic Decoding Stage for Learning to Read Words* (typical of late kindergarten through early grade 2)
2 **Confirmation and Fluency** (typical of grades 2 and 3)
3 **Reading to Learn** (typical of grades 4 to 8)
4 **Multiple Points of View** (typical of high school)
5 **Construction and Reconstruction** (typical of college and adulthood)

[3] An analogy to math learning and teaching may be helpful here. To teach division, we first teach underlying skills, including number sense, addition, subtraction, multiplication, and place value. Reading comprehension depends on children recognizing words accurately.

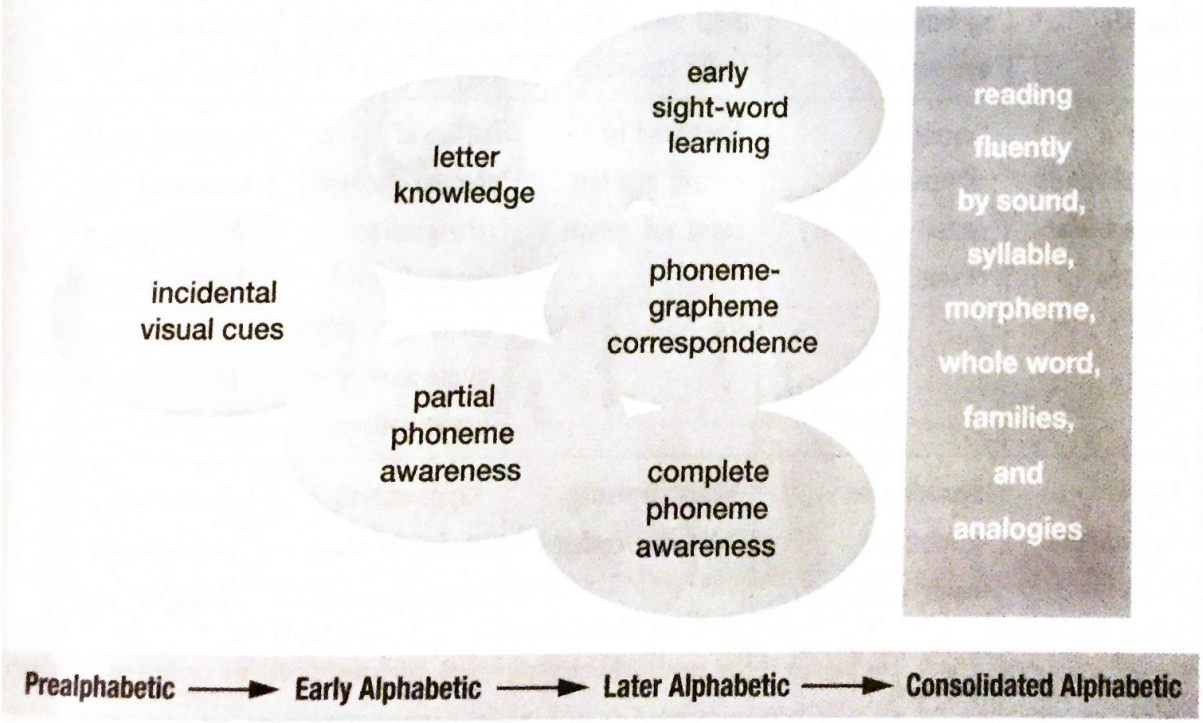
Subsequent reading research has modified Chall's framework, especially in the areas of early word recognition and spelling. Current theories of early word-reading development emphasize the simultaneous and reciprocal growth of skill in all major processing systems (Ehri, 1996; Ehri & Snowling, 2004; Rayner et al., 2001; Stanovich, 2001) and the "amalgamation" of sound, spelling, and meaning in word learning. Phonological processing, orthographic processing, and meaning-making develop on a continuum, in tandem. Fluency is an essential component of skill development at each stage of learning. Verbal comprehension and vocabulary develop from the time children are infants. Exposure to text and reading practice are critical in moving the growth process along.

Ehri's Model of Reading Progression

Ehri's phases of word-reading development (Ehri, 1996; Ehri & Snowling, 2004), summarized in *Figure 4.2*, are widely referenced because their description rests on multiple experiments conducted over many years that have been replicated by other researchers. In Ehri's model, the ability to recognize many words "by sight" during fluent reading rests on the ability to map phonemes to graphemes or to master the alphabetic principle.

At first, children may recognize a few words as wholes by their configuration or the context in which they are found, such as on labels, boxes, or lists. However, progress in reading an alphabetic system occurs only if children learn how letters and sounds are connected. It is impossible for children to memorize more than a few dozen words without insight into the purpose of alphabetic symbols. Alphabetic learning is acquired through progressive differentiation of both the sounds in words and the letter sequences in print. Phoneme awareness is the foundation upon which letter-sound association can be constructed.

Figure 4.2 Ehri's Phases of Word-Reading Development



As students learn phoneme-grapheme mapping, their orthographic processors begin to store memories for recurring letter patterns in the form of "chunks"—syllable spellings, common endings and word parts, and high-frequency words. Accurate and fluent perception of chunks, however, rests on phoneme-grapheme mapping.

Table 4.2 documents the phases of gradual integration of information from the four processing systems that underlie word recognition. To illustrate, children at the beginning decoding stage, who have been exposed often to print in books, often show surprising awareness of the letter sequences and orthographic patterns that characterize English spelling. They may not associate familiar letters and letter sequences with speech sounds, but they know something about the sequences of letters in print just from looking at so many examples (Treiman & Bourassa, 2000). For example, they may know that **-ck** is used at the ends, not at the beginnings, of words; that letters can be doubled at the ends, not at the beginnings, of words; that only certain letters are doubled; and that syllables typically contain a vowel letter. Orthographic knowledge, or knowledge of the spelling system itself, develops when children have internalized an awareness of the sounds in words to which the letters correspond.

Table 4.2 Phases of Reading and Spelling Development
(based on Ehri & Snowling, 2004)

	Prealphabetic phase	Early Alphabetic phase	Later Alphabetic phase	Consolidated Alphabetic phase
How a child reads familiar words	Rote learning of incidental visual features of a word; no letter-sound awareness	Partial use of letter-sound correspondence; initial sound and salient consonants	Pronunciation of whole words on the basis of complete phoneme-grapheme mapping	Reads variously by phonemes, syllabic units, morpheme units, and whole words
How a child reads unfamiliar words	Guessing is constrained by context or memory of text	Constrained by context; gets first sound and guesses	Full use of phoneme-grapheme correspondence; blends all sounds left to right; begins to use analogy to known patterns	Sequential and hierarchical decoding; notices familiar parts first, reads by analogy to similar known words
Other indicators	Dependent on context; few words; errors and confusions; cannot read text	Similar-appearing words are confused	Rapid, unitized reading of whole familiar words is increasing	Remembers multisyllabic words; analogizes easily, associates word structure with meaning

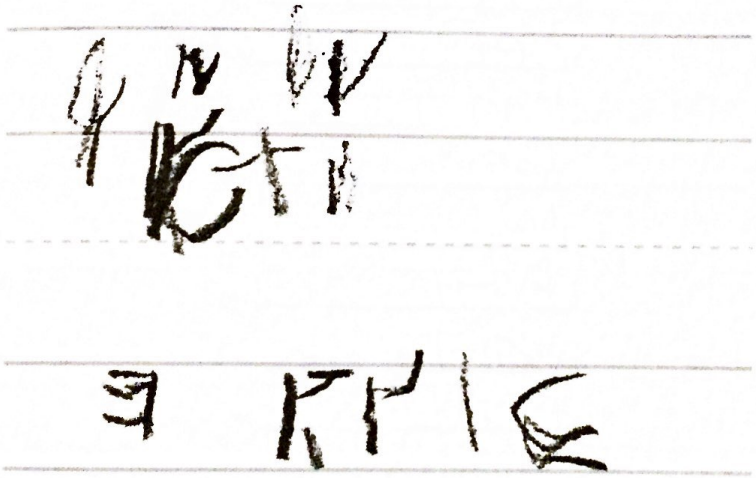
(continued)

	Prealphabetic phase	Early Alphabetic phase	Later Alphabetic phase	Consolidated Alphabetic phase
Spelling	Strings letters together, assigns meaning without representing sounds in words	Represents a few salient sounds, such as beginning and ending consonants; fills in other letters randomly; knows some letter names for sounds	Phonetically accurate; beginning to incorporate conventional letter sequences and patterns; sight-word knowledge is increasing	Word knowledge includes language of origin; morphemes; syntactic role; ending rules; prefix, suffix, and root forms

Case Study Examples of Early Reading and Spelling Development

Prealphabetic Reading and Spelling

Figure 4.3 Prealphabetic Writing



Many children come to kindergarten as prealphabetic readers and spellers, especially children from homes that do not provide them with exposure to books, reading aloud, or early instruction in the alphabet. In contrast, children with rich preschool experiences may move beyond this stage very early, by age 3 or 4. Sometimes this stage is called "logographic"

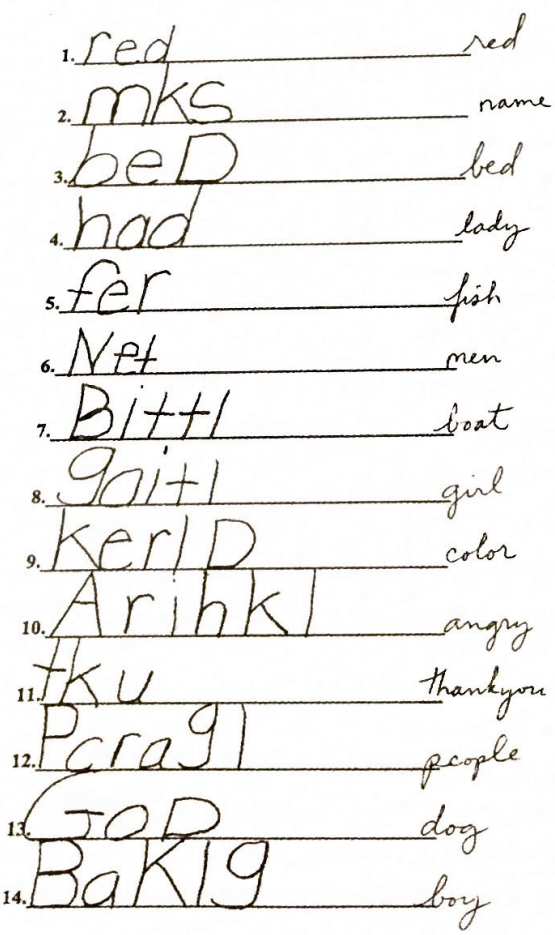
or "incidental visual cue" reading and writing because children memorize words by their appearance.

The kindergartener whose writing is displayed in *Figure 4.3* may not yet understand the alphabetic principle—the concept that letters represent speech sounds. The letters are not fully recognizable and look like marks designed simply to fill up some space on the page. This child may have memorized the letters in his name (e.g., Kyle). On a DIBELS® (Good & Kaminski, 2005) assessment or an early screening test, this child may not know what he is being asked if the teacher poses, "What is the first *sound* in the word **dog**?" The child might answer, "Bow-wow!"

This child may not yet understand that individual speech sounds are the building blocks of spoken words. Nevertheless, he may begin to observe the visual characteristics of print, such as left to right progression, the spacing of words, the alternating patterns of letters, the use of capitals at the beginnings of words, or the fact that certain combinations exist. We do not know how many letter names this child may have learned; he may know some even though he does not understand how the letters represent the sounds. Children at this stage need to learn phoneme awareness and the concept that letters represent sounds.

Early Alphabetic Reading and Spelling

Figure 4.4 Early Alphabetic Writing



On DIBELS (Good & Kaminski, 2005) testing or early screening measures, this child (*Figure 4.4*) is likely to do well at identifying the initial sound in words but may be weak at blending all the sounds in an unknown word. This child will try to read by identifying the first sound and guessing from context. She is just learning how to segment or separate all of the sounds in simple spoken words and may confuse printed words that share letters. For example, the words **house**, **horse**, and **how** begin with the same two letters; unless the child can process *all* of the letters and sounds, she may mistake one word for another.

The early alphabetic-phase learner is ready to learn how each sound is typically spelled and how to blend letter-sound correspondences into simple words. For a few weeks, months, or even longer, a novice alphabetic reader might expend a good deal of attention and mental effort to break words apart, blend the sounds, and approach new words sound-by-sound as symbols are linked. As individual phoneme-grapheme associations are learned and used, they become rapid and automatic, and the new reader "chunks" them into patterns. After sufficient exposure and practice, whole words are recognized as units. This kind of "sight" word recognition, however, depends on the reader being able to rapidly process the internal details of the word, letter by letter and sound by sound, so as to store a complete image of the word in memory.

Exercise 4.1 Sounds in Letter Names

- Write out the sounds in each letter name. (Two are completed as examples for you to follow.)

A	/ā/	J	/j/ /ā/	S	/e//s/
B	/b/e/	K	k/a/	T	/t/e/
C	s/e/	L	/e//l/	U	/y//ū/
D	d/ă/ĕ/	M	/e/m	V	/v/ /ē/
E	ĕ/e/	N	ĕ/e/n/	W	/d/u/b/w/y
F	ĕ/f/	O	/ŏ/	X	ĕ k
G	j/e/	P	/p/ĕ	Y	
H	ă/ch/	Q	k/y/u	Z	
I	ă/t/	R	ar/		

(continued)

Exercise 4.1 (continued)

Children in the early and later alphabetic stages of reading and spelling rely on letter names to derive sounds.

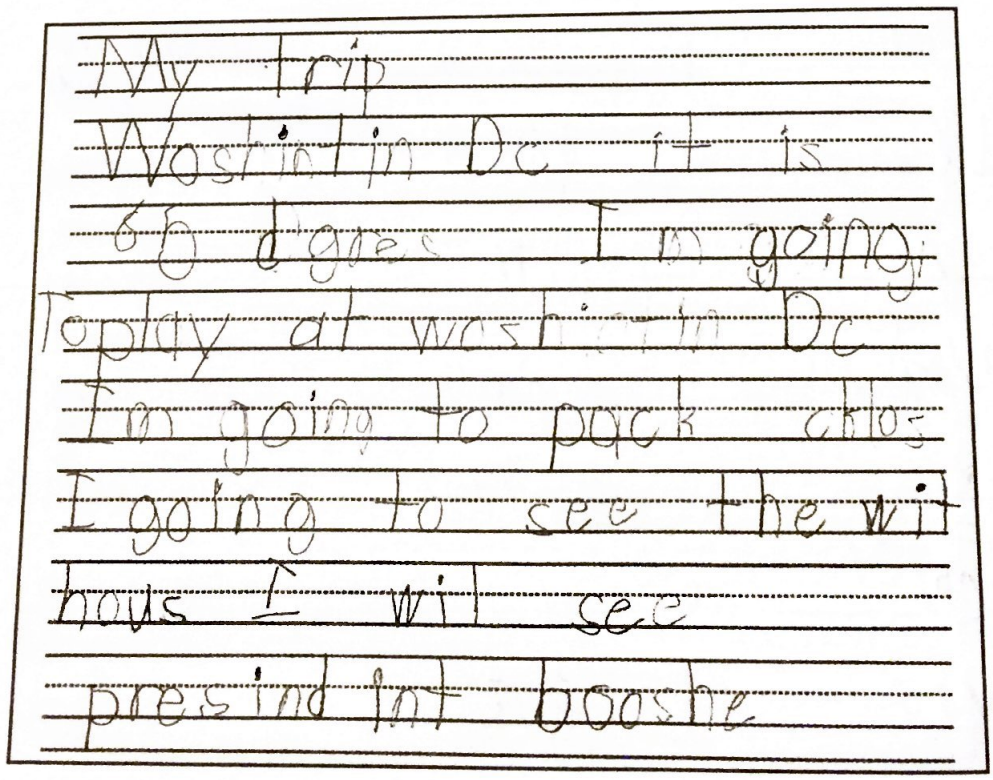
1. Which letter names do *not* have the sounds that the letters represent?

2. Which letter names and sounds are likely to be most easily confused?

3. Can you think of a sound that is *not* in any letter name?

Later Alphabetic Reading and Spelling

Figure 4.5 Later Alphabetic Writing



Children at the later alphabetic stage (*Figure 4.5*) will write fairly complete and reasonable phonetic spellings, showing that they can identify all of the sounds in words and know at least a common way to spell them. They sound out written words from left to right, applying what they have learned about phonics. As a consequence of accurate word identification, they store information about letter sequences in common words and syllable patterns. Thus, a "sight" vocabulary for reading begins to develop.

The instructional or learning goal of this stage is to build fast and accurate word recognition and spelling so that words will not have to be laboriously sounded out. Fluency with the elements will build fluency with sentences and passages. The process of sounding out is a first step that builds the essential foundation for differentiating, remembering, and quickly recognizing words in print. As word recognition is mastered, cognitive "desk space" is freed up for higher-level comprehension.

Consolidated Alphabetic Stage

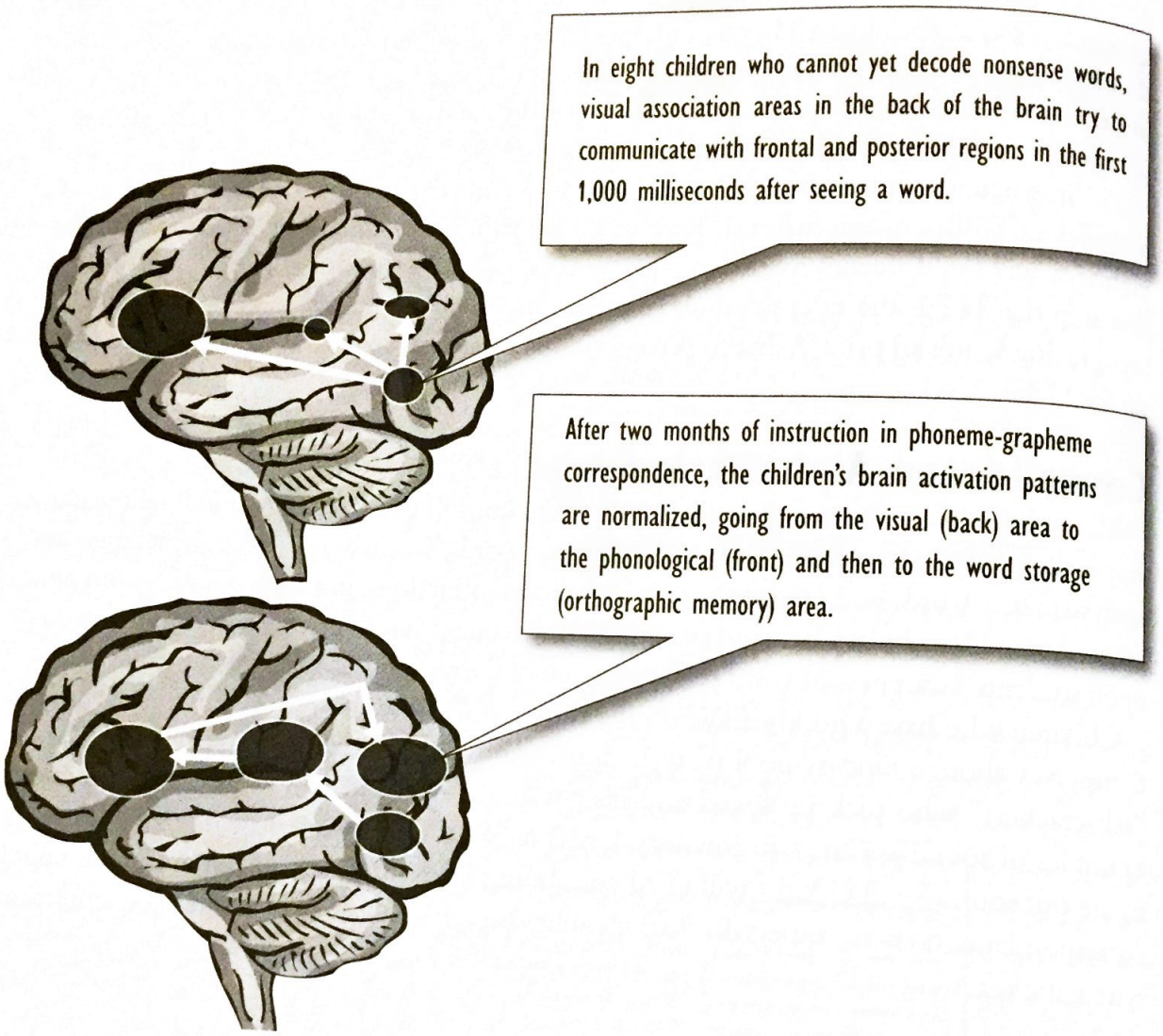
Many children do not complete the transition to consolidated, accurate, and fluent reading and writing until second or third grade. Longer words, words with unusual spellings, and analysis of base words, endings, prefixes, compounds, contractions, and other constructions must be conquered. Vocabulary or word meaning knowledge is both enhanced by and dependent upon students' awareness of word structure, including meaningful parts (morphemes).

Children who have a good handle on the most regular sound-symbol elements may teach themselves about sound-symbol patterns from exposure to many examples. These are the "self-teachers" who pick up speed and insight about words as they store more and more examples of sound-spellings in memory. Children who are less able to compare words and figure out sound-symbol links will need continuing instruction in the entire sound-symbol correspondence system, especially for spelling. Nevertheless, most children benefit from systematic teaching of the code.

Brain Studies of Reading Growth

The brain illustrations in *Figure 4.6* (next page) are based on the results of studies of changes in eight children's brain-activation patterns as they responded to reading instruction (Simos et al., 2002). Before students learned the alphabetic code, they attempted to recognize words by shape or by one or two letters. Consistent with Ehri's (1996) conception of a prealphabetic reading phase, they did not activate their phonological processors while trying to read words. After two months of daily, systematic instruction in how to match symbols and sounds, note that other pathways were established to facilitate complete and accurate use of the alphabetic code, as measured by reading phonically regular nonsense words. New words were processed through these pathways, corresponding to the characteristics of Ehri's (1996) later alphabetic stage of reading.

Figure 4.6 How Activation Patterns in the Brain Change as Reading Is Learned



As decoding pathways were established, novice readers could decode new words accurately. This achievement enabled them to build a store of known words in orthographic memory that were then recognized quickly by sight. There were significant gains in word recognition and decoding in all eight cases in this study, and the resulting progression of brain activity resembled the profile typical of normally progressing young readers.

This experiment also found that a few of the children did not respond well to a few months of instruction and did not normalize the pathways involved in word recognition during the study. Those non-responders probably represent a small group of "treatment resistors," or those who would likely be eligible for special education and sustained, intensive remediation if the pattern continued.

Achieving Passage-Reading Fluency With Comprehension

In second and third grade, with decoding skills learned well enough to support word recognition accuracy and with daily reading practice, children usually consolidate their reading skills and build reading fluency. Their speed typically increases from about 60 words correct per minute (WCPM) at the end of first grade to about 120 WCPM in oral reading by the end of third grade. If this goal is not reached, reading may be too slow and inefficient to support sustained passage-reading comprehension. While many teachers believe that poor comprehension is the primary issue for poor readers, many of those students are still struggling with aspects of decoding accuracy and fluency and do not have the cognitive desk space available to think about their reading. As a result, many poor readers at this level may still need remediation at the decoding and/or fluency levels (Hamilton & Shinn, 2003). Speed and accuracy of oral passage reading in grades 1–3 predicts comprehension of passages on high-stakes examinations such as the Stanford Achievement Test.

Extensive reading in material that can be read with accuracy is the best way for children to develop fluency. Better readers read more and, by reading more, get to be even better readers. If children read too slowly, a number of instructional techniques may help them get up to speed. LETRS Module 5 addresses reading fluency in depth.

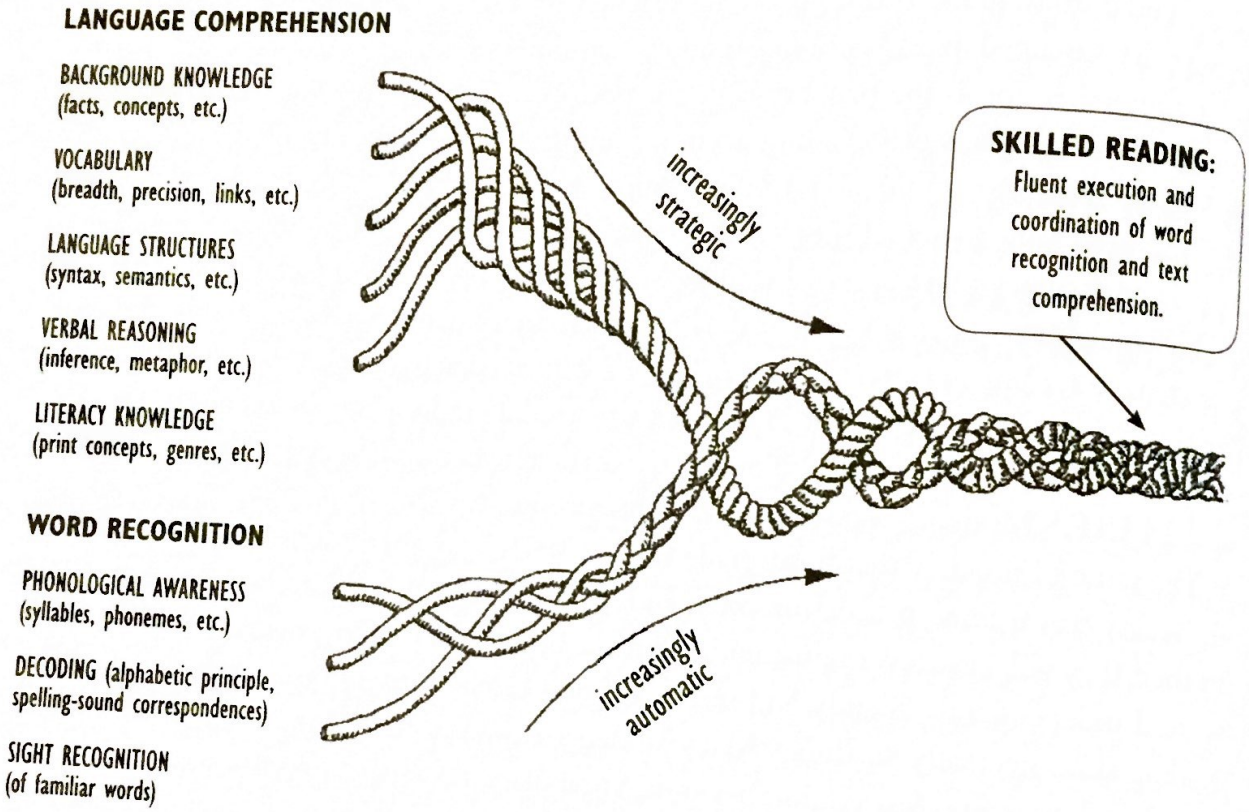
The sense of urgency that third-grade teachers feel about their students' skills stems from the reality that reading instruction often ends by fourth grade, and if students are not skilled by then, they will have few opportunities to make up lost ground. Fourth graders are expected to read independently, silently, and selectively, and teachers assume they have acquired the reading skills necessary to do so. Many students, however, need continuing instruction in decoding longer and less common words, vocabulary, text structure (especially expository text), regulation of reading speed according to the purpose of an assignment, monitoring comprehension, and comprehension skills such as asking the author questions, stating or writing summaries of main ideas, and understanding the organization of a text. LETRS Modules 4, 6, and 11 address the vocabulary and comprehension components of reading.

Scarborough's "Rope" Model of Reading Development

In actuality, skilled reading is attained when many subskills are automatized. Scarborough (2001) represented the achievement of fluency in both decoding and language comprehension with a rope image. Note that there are many more "threads" to add to the "reading rope" when language comprehension must be considered in addition to word recognition.

Figure 4.7 The Many Strands That Are Woven Into Skilled Reading

(Scarborough, 2001, p. 98)



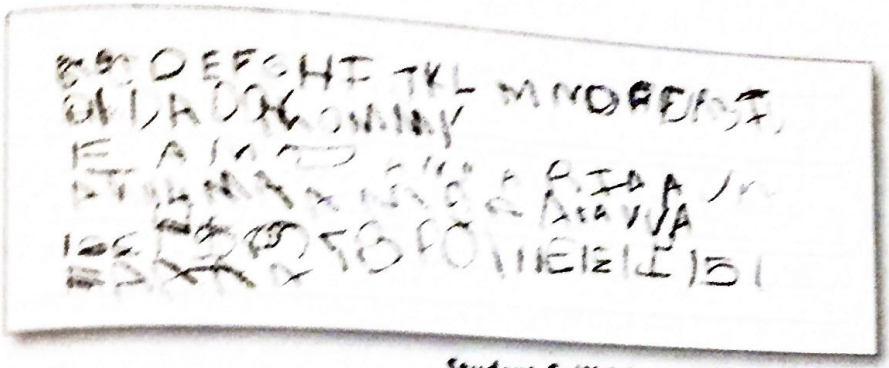
Used with permission of Hollis Scarborough.

Scarborough conceptualizes skilled reading as a combination of strands, or subskills, that interact with one another and that are increasingly amalgamated as reading skill is acquired. *Figure 4.7* shows clearly that fluent reading depends on automatic execution of both word recognition and comprehension subskills.

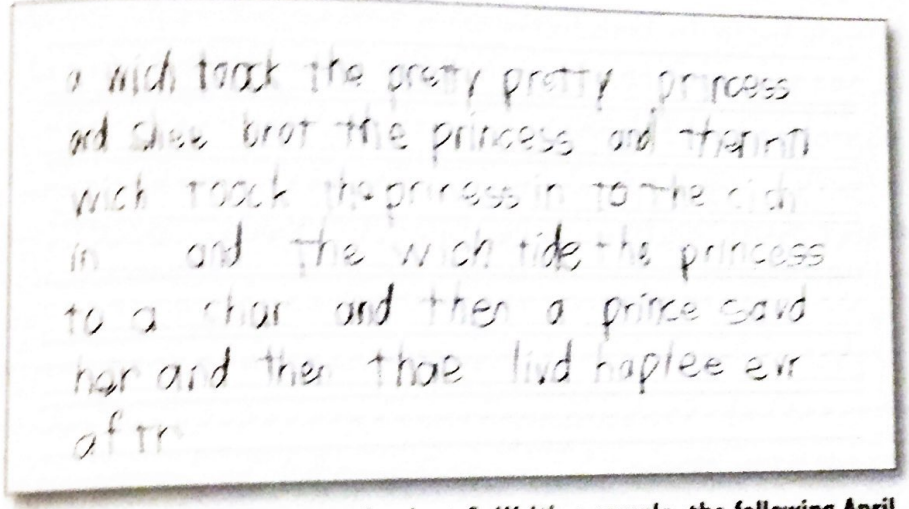
Exercise 4.2

Review Reading and Spelling Development With Writing Samples

- Revisit these writing samples from the Warm-Up activity. What more can you say about them after learning about reading and spelling development?



Student C: Writing sample, September



Student C: Writing sample, the following April

September writing sample:

April writing sample:

Exercise 4.2 (Alternative) For Teachers of Older Students

- Read this composition that was written by a sixth-grade student, and then answer the questions below.

"TITEL WAVE!" But befor she could do eny thing a dig hug hole opend up in the middel of the wave. The two gerles started to run, but the wave was tow fast for them. It suked them in the hole and then they startet floping around, they hit ther hedes on part of the rocy botom. They both got knoked out dead. When they woke up they were in a room whith a deap blue ceiing and the bed they were laing on was made of orol and the blanket was a dark blue tint over them. Gust then they herd the dore creek open. A girl with really long brown hair and a white sooba biving shurt and pants with a "sbc" on the shurt. Walked over to them and said "hellou" my name is Maddie, wats your name." I'm mary and shes ruby mary said. "Well come with me and lets get some food."

1. Find examples of phonetic, sound-by-sound spellings. Which of Ehri's phases best describes this trait?

2. Which processing system—phonological or orthographic—appears to be more underdeveloped in this student? Why do you think so?

3. This student is a dysfluent reader. Why would you expect a sixth-grade student who spells phonetically to be a dysfluent reader? (If the student moved through this stage to the next stage of reading and spelling development, what would he have to learn to do?)

Five Essential Components of Comprehensive Reading Instruction

Where did the five essential components come from?

The federally funded Reading First program (No Child Left Behind Act, 2001) enumerated essential components of reading instruction, based on the Report of the National Reading Panel (NICHD, 2000). Commissioned by Congress, the National Reading Panel report was based on a meta-analysis, or comprehensive review and statistical synthesis, of scientific studies of effective reading instruction. Evidence was strong that the most effective instructional programs taught all of the components thoroughly and skillfully.

Since then, the five essential components of reading have served to organize programs of instruction, assessment programs, and teacher education requirements. These components are now found in all core, comprehensive reading programs by major publishers, and most states who are referring to "scientifically based reading instruction" in their regulations are referring to these components:

- Phonemic awareness and letter knowledge
- Phonics, decoding, spelling and word recognition
- Text reading fluency
- Vocabulary (knowledge of word meanings)
- Comprehension of connected text

Moreover, these additional components are often added to the list of essentials:

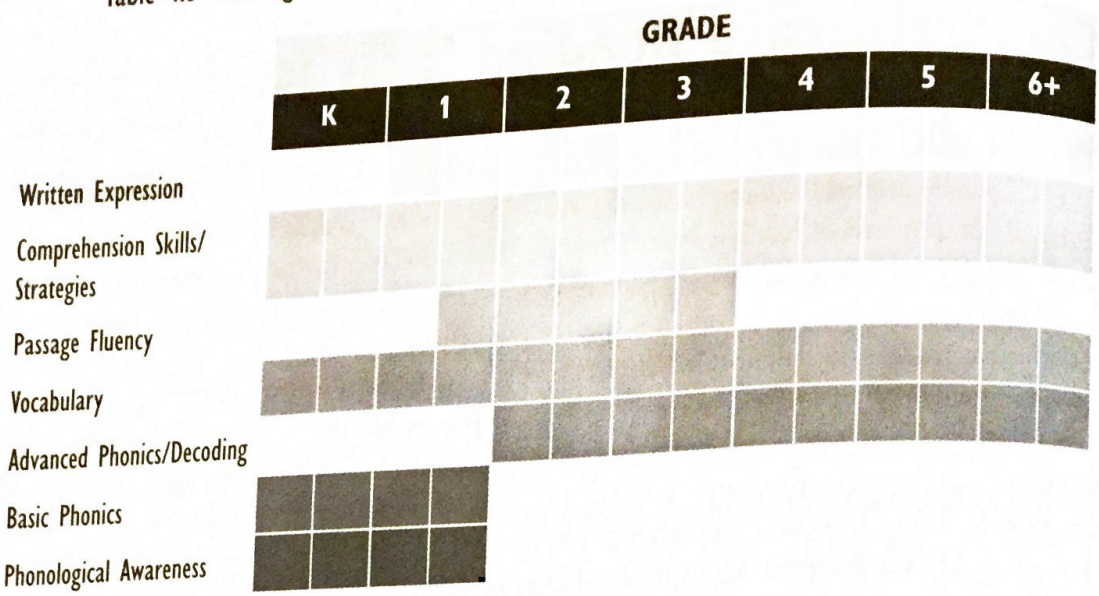
- Written expression
- Oral language (listening and speaking)
- Ongoing assessment

Familiarity with the five essential components and their treatment in core, comprehensive reading programs is imperative for all teachers of reading. Additional exercises are included in *Appendix C* for those who should spend more time learning to identify the components.

What should be emphasized at each stage of reading development?

Although all components of a comprehensive lesson are needed at all levels, different skills and activities will be emphasized at different stages of reading development (see *Table 4.3*, next page). At the prealphabetic stage, alphabet knowledge, phonological awareness, and language development deserve emphasis. In the early alphabetic and later alphabetic stages, phonological awareness and phonics, word recognition, and spelling should receive emphasis with daily practice reading simple, decodable books. Vocabulary and comprehension are taught from the beginning, with an early emphasis on reading aloud until children can read "real" books for themselves. Reading with fluency, expanding vocabulary, and deciphering longer words merit emphasis in second grade. Advanced phonics, including the study of meaningful word parts, should continue throughout elementary school.

Table 4.3 Reading Instruction Components Typically Emphasized at Each Grade Level



As children gain comfort and skill with written language, more instructional time will be devoted to comprehension at the word, sentence, and whole-text levels. Programs should promote wide reading in a variety of texts and thorough discussions of text meanings. Ultimately, the best readers are those who read the most and who learn to question deeply as they read. Written responses to reading promote that kind of deep reflection.

Finally, it is the interactions or interrelationships among the essential components that will receive the most attention in LETRS. Like any well-designed machine, the reading brain works best when the right parts are engaged in the right order and at the right speeds to accomplish specific jobs.

Teaching Tips

- Focus on vocabulary and comprehension throughout all grades, with an increased emphasis in grades 4 and beyond.
- Automatize decoding skills (phonology, letter names, phonics) in early grades.
- Use student data to adjust to their needs!