

# 5

## From Word Perception to Phonics, and Beyond

*Words may be identified when their individual letters are separately indistinguishable.*

— Frank Smith

### THE EYES AND THE BRAIN

When children have difficulty reading, it is common practice to have their eyes checked. This is wise, because various kinds of eye malfunction can indeed make reading more difficult. In most cases, appropriately prescribed glasses compensate for problems with the eyes themselves. However, there are few children whose reading problems can be attributed solely to physical problems with the eyes.<sup>1</sup> This is because visual perception is only partly a function of the eyes. Perhaps your experience traveling on superhighways illustrates this point. Have you ever “seen” the words on a road sign, yet passed the sign before you were able to determine what the words were? Perhaps you were a little slow in looking at the sign, or perhaps you are nearsighted and were a little slow in picking up the visual image. Nevertheless, the crucial problem was not in your eyes, but in your brain: the brain simply did not have enough time to process the visual image before it disappeared from sight.

The preceding illustration suggests that visual perception is not merely a function of the eyes, but a function of the brain. In this text we are concerned with one particular kind of visual perception, the perception of words. We will be concerned with *both* aspects of word perception: with ocular and sensory processing, and with the actual identification of words.<sup>2</sup> However, such division is merely a convenient fiction. Visual perception is an *active* process, and what the eye processes is in large part determined by what the brain directs it to look for, as well as the knowledge that the brain brings to the visual task. We use our prior knowledge and experience to guide even the most elementary aspects of visual processing.

### OCULAR AND SENSORY PROCESSING

It was implied above that the eye registers a visual image. Strictly speaking, however, this statement is not accurate. As the psycholinguist Frank Smith explains, “What goes into

the open eyes is a diffuse and continual bombardment of electromagnetic radiation, minute waves of light energy that vary only in frequency, amplitude, and spatial and temporal patterning. The rays of light that impinge on the eye do not in themselves carry the color and form and texture and movement that we see." Rather, these are constructions of the brain (F. Smith, 1988, p. 68). So too in reading: the eye receives waves of light energy that are transmitted to the brain as a series of neural impulses. Initially, the written symbols may be perceived as sets of bars, slits, edges, curves, angles, and breaks (Gough, 1972, p. 332; see also F. Smith, 1979, chaps. 8 and 9). The brain may then construct the words of the text from these bars, curves, angles, or whatever.

How, then, do the eyes (the ocular part of the system) pick up these waves of light energy that are transformed into words? In 1879, the Frenchman Émile Javal discovered that the eyes move along a line of print with a series of jerky movements he called *saccades*, meaning 'jerks.' It is difficult if not impossible to become aware of one's own saccades, for the eyes *seem* to move along a line of print with a smooth, continuous motion. Nevertheless, they do not: they move in a sequence of tiny leaps or jerks.

There is no useful vision during the eye movements themselves, as you can demonstrate by looking into a mirror with your head held still and moving your eyes from left to right between two imaginary points. As you will discover, you cannot see your eyes in motion. Neither can you read with your eyes in motion (I. H. Anderson & Dearborn, 1952, p. 101).

The saccades, or eye movements, take up only a small fraction of total reading time—about 10 percent of the time in rapid reading and about 5 percent of the time in slow reading (I. H. Anderson & Dearborn, 1952, p. 107). The rest of the time is taken up by *eye fixations*, or pauses. It is during these fixations that the eye receives the stimuli that are transformed into visual images in the brain.

Various aspects of visual processing have been studied in the laboratory, usually with the help of a *tachistoscope*. In simple terms, a tachistoscope is a device for presenting visual information for very short periods of time—as little as ten milliseconds (ten thousandths of a second, or one hundredth of a second). With the use of the tachistoscope, it has been found that successive letters or words can be perceived from a visual presentation as short as one-tenth of a second (see Huey, 1968, p. 65). Further, it has been found that as many as four or five words can be perceived in a single fixation (see F. Smith, 1971, p. 92). Such statistics represent the *maximal efficiency* of the ocular and sensory systems.

Usually, however, reading proceeds much more slowly. The average adult reader makes about four eye fixations per second and identifies about one word per fixation. This gives an average adult reading speed of 240 words per minute (see Carroll, 1970, p. 292; I. H. Anderson & Dearborn, 1952, p. 177; Dechant, 1970, p. 16). Many readers have a slightly higher rate, up to about 300 words per minute. This means either that they average slightly more than four fixations per second, or that they average slightly more than one word per fixation, or both.

These various measurements indicate that there is a considerable discrepancy between what the ocular and the sensory systems are capable of doing, and what they typically do in reading. The crucial differences are summarized in Figure 5.1. As this

*Maximal Ocular and Sensory Efficiency*

An eye fixation of 1/10 second is enough for identifying a letter or word.

We can identify four or five words in a normal eye fixation of about 1/4 second.

We can visually process about 960 to 1200 words per minute.

*Typical Ocular and Sensory Functioning in Reading*

Eye fixations are normally about 1/4 second long.

Readers typically process about one word in a normal eye fixation of about 1/4 second.

Most of us read at an average rate of about 240 to 300 words per minute.

FIGURE 5.1 *Ocular and sensory processing*

figure indicates, most people's ocular and sensory systems do not operate at maximal efficiency in normal reading. The eyes can handle about 960 to 1,200 words per minute, yet most of us read at an average speed of about 240 to 300 words per minute. Apparently most of us read at this slower rate because that is a comfortable speed for comprehending.

Of course, readers need to learn to vary their reading rate according to the material and their purpose for reading. To some extent we all do this, yet many of us could benefit from instruction and practice. We need to learn, for example, that it's okay to read a novel rapidly and without necessarily trying to remember all the details: there is no need to read a novel at a rate of only 240 to 300 words per minute unless we really want to, to savor the imagery and perhaps the language itself. We also need to learn to skim informational material, selecting only those parts of the text that are relevant to the particular purpose at hand. In general, this is the purpose of speed reading courses.

While recognizing the widespread need for these kinds of strategies, we should be wary of the simplistic notion that to improve reading, all we have to do is improve reading rate. If a person reads much slower than the average, he or she may be having difficulty constructing meaning from the text. The slow reading speed may be more a *symptom* of reading difficulty than a cause. In such cases, it may not help much to get readers to identify words faster; indeed, this may not even be possible.

What would help is learning to bring meaning to a text and having the background knowledge to do so. With greater understanding, readers will be able to identify words faster and usually more accurately, and that in turn will enhance their construction of meaning from a text.

There are various kinds of meaning we bring to a reading event. We bring not only prior knowledge of people, places, things, events, ideas, and feelings, but also prior knowledge about letters and sounds and the patterns and interconnections among them. Proficient readers seem automatically to draw upon the most salient and useful visual cues. We shall first consider which parts of words seem most useful in cueing word recognition, and then consider some of the research on how words are perceived.

could  
 short  
 about  
 voice  
 trust  
 surf  
 drunk  
 lost  
 which  
 stand

FIGURE 5.2 Mutilated words

## PARTS OF WORDS AT WORK

Various kinds of laboratory experiments make it abundantly clear that we do not need all the visual information normally available to us in order to identify familiar words. For example, you can probably read all or most of the words in Figure 5.2 fairly easily, though some are significantly mutilated by the omission of visual information. Furthermore, you may find that you have read each word more or less as a whole, without consciously identifying all the letters.<sup>3</sup>

The following three activities are designed to help you determine which parts of words are especially useful and which are less useful in cueing the recognition of words. These informal “experiments” are highly unscientific. There has been no strict control over vocabulary or sentence length and structure, and, most important, the words are presented in context rather than in isolation. But these experiments are more fun and easier to carry out than more scientific kinds of experiments on isolated words, and in most cases the conclusions are likely to be the same.<sup>4</sup>

### Activity 1

You can use a stop watch, or a watch or clock with a second hand, to time yourself or someone else reading the following two sets of sentences, which constitute the beginning of a little story:

#### Vowels absent

-nc- -p-n - t-m- th-r- w-s - h-nds-m- y--ng w-lf  
 n-m-d L-b-. L-b- l-v-d w-th h-s m-th-r -nd f-th-r  
 -t th- -dg- -f - d--p, d-rk w--ds. -v-r- d-- L-b-  
 w-nt t- h-nt -t th- n-rth -dg- -f th- w--ds, n--r  
 th- l-ttl- v-ll-g- -f C-l- -s.

**Consonants absent**

-o-e-i-e- a- - -o-o -ou-- -i- - -a- a -i-e-e- o--  
 -a- -e- o- -i- -i-e, -o--i- - i- --e -ie- -s -ea- --e  
 -oo- - o- -i- -i- - -e- -ie- i- --e --i- -e-. A- o--e-  
 -i-e-, -o-o -i- -- -e -u- -y e-ou-- -o -i- - a --u-- ,  
 -ui-y --i- - -a- -a- -i-o-eye- i- - -a-e- -- a- - --aye-  
 -oo -a- --o- -o-e.

After this experiment, it should be obvious that consonants are more important than vowels in cueing word recognition. This can be explained, at least in part, by two simple facts. First, there are considerably more consonants than vowels in English, and hence the consonants are more distinctive, more able to narrow down the number of possible alternatives that any given word could be. Second, consonants occur more frequently than vowels; that is, in most cases there are more consonants per word. Given these factors, it is hardly surprising to find that consonants are more useful in cueing word recognition. Indeed, written Arabic omits the vowels altogether, except in beginners' books (Gibson & Levin, 1975, p. 524).

**Activity 2**

This activity is related to the first. Again, time yourself or someone else reading the following two sets of sentences, a continuation of the story:

**Bottoms absent**

One day as Lobo was skirting the edge of the forest he came upon a little girl in a red hood. Her cheeks were so rosy and her arms so pudgy that Lobo knew she would be delicious. "Oh," she replied, "I'm taking this basket of goodies to my grandmother on the other side of the woods. Grandma isn't feeling very well."

**Tops absent**

Lobo thought for a moment. He could hardly wait to devour this scrumptious child, but then again he was hungry enough to eat the grandmother, too. "Which house does your grandmother live in?" asked the wolf. "In the house by the three big oak trees," said Red Riding Hood (not that is what she was called). "She lives there all by herself."

Which paragraph took longer to read? Which part seems to be more important in cueing word recognition: the tops of words, or the bottoms? Most people conclude that the tops are more important, and this is indeed what research suggests. If you have not already figured out why, then look at the following list of the letters in our alphabet. How many ascend above the top line? How many descend below the bottom line?

abcdefghijklmnopqrstuvwxyz

As you can readily see, about twice as many letters ascend above the top line, making them visually more prominent. Note, too, that more than half of the consonants either ascend above the top line or descend below the bottom line, while none of the vowels

do either (with the exception of y, which is only sometimes a vowel). Hence, consonants are not only more numerous and more frequently occurring than vowels, but many are also more prominent visually.

### Activity 3

Again, time yourself or someone else reading the following passages, in order to determine the relative importance of the beginnings, middles, and ends of words:

#### Middles absent

"W-at a mar--ous oppo--nity!" th--ht L-bo. He  
t-ld t-e c--ld to s-op a-d p-ck fl--rs f-r h-r  
gran--ther on t-e w-y th--gh t-e w--ds, t-en  
t-ok o-f on a s--rt c-t t-at o-ly t-e wo--es  
k-ow a--ut. S-on he ar--ed at t-e grand--her's  
co--ge. "I-'s me, Gr--ma," L-bo s-id in a t-ny  
v--ce, as he kn--ed on t-e d-or. He pu--ed  
t-e d--r o-en a-d w-nt in.

#### Ends absent

Lob- wen- strai--- to th- grandmoth--' be- an-  
gobb--- he- up. He donn-- he- ca- an- gow-  
an- clim--- int- be-, feel--- non- to- wel- hims---.  
By th- tim- Litt-- Re- Ridi-- Hoo- ha- arri---,  
howe---, he ha- overc--- hi- atta-- of indigest---  
and wa- rea-- fo- dess---. He answe--- Red'- kno--  
in an ol-, crack-- voi--: "Com- in, dea-. Jus-  
com- on in."

#### Beginnings absent

-obo -as so ---enous -hat he --dn't -ait -or  
--ttle -ed --ding -ood to -sk -er "--ndma"  
-ow -he -as or -o -ing -er -he --sket of  
---dies. He --rew -ack -he --vers, --mped -ut of  
-ed, -nd -an -ver to -he --ild. -he --eamed  
-nd -an, -ut it -as -oo -ate. -obo ---bled -er  
up. ---erwards he -at by -he ---eside --king  
--ndma's -ipe, ---aming of --icy --ttle --rls.

Once again, which set of sentences took longest to read? Which took the shortest? From this experiment, you have probably concluded that the beginnings of words are more important in word identification than the middles or the ends. This is also what the research suggests. Various kinds of research also clearly indicate that the ends are more important than the middles. (If your results suggested otherwise, it was probably due to the flaws in the design of this particular experiment.)

Again, we may ask why these results occur. First, it seems that the beginnings and ends of words are important just because they are visually prominent, being either preceded or followed by white space. Second, the beginnings of words are particularly important because we read the words of a text more or less from left to right. In addition, the beginnings of words are less predictable than the ends, and therefore more necessary. The ends are more predictable than the beginnings because they often consist of grammatical endings, many of which are predictable from context. Thus, endings are less important cues to word recognition than beginnings, because endings are more predictable. On the other hand, endings are more important than middles, partly because they often do carry grammatical information. (For a discussion of many of the experiments that give rise to such observations, see I. H. Anderson & Dearborn, 1952, chap. 5.)

Children pay increasing attention to the beginnings and ends of words as they become more proficient at reading. In one study, for example, the spaces between words were filled in with a symbol created by superimposing an x on a c (see *see x Spot x run*). Groups of children in the first and second grade read such a "filled" version of a story, as well as an "unfilled," or normal, version of a story. The filled version took significantly longer to read, but the difference was most noticeable for the better readers. The less proficient, slower readers were affected relatively little by the filled-in text (Hochberg, 1970, pp. 87-88). Since the poorer and slower readers were not much affected by the lack of spaces between words, it seems that these readers had not yet learned to pay particular attention to the beginnings and ends of words (see R. G. Brown, 1970, pp. 169-170). And this, in fact, might be one reason why these children *were* the less proficient readers.

### Parts of Words in Review

Clearly, we can recognize familiar words from only part of the visual information available to us. Which parts of words are particularly important in cueing word recognition? We have found that:

1. Consonants are more important than vowels.
2. Beginnings of words are more important than middles and ends, and ends are more important than middles.
3. Some people may be relatively nonproficient readers at least in part because they have not learned to attend particularly to the parts of words that provide the most useful information.

### HOW WE PERCEIVE WORDS

As the foregoing discussion suggests, the brain does not just passively interpret the data relayed through the eyes. In fact, the brain is in large measure independent of the eye. In normal vision, the picture that the eye registers is upside down, but the brain rights it. And as Frank Smith observes,

In a number of perceptual experiments, many men and animals have been fitted with special spectacles which completely distort the information received

by the eye, switching top to bottom, or left to right, or distorting form or color. But within a very short while the brain “adapts” and the perceived world reverts to its normal appearance. No further distortion is perceived until the trick spectacles are removed, whereupon the “normal” pattern of stimulation produces a topsy-turvy percept which persists until the brain readapts. (F. Smith, 1971, p. 89; for more details, see Kohler, 1962).

The brain performs equally marvelous feats in normal reading.

We have seen that some visual cues are more important than others in cueing word recognition—namely, consonants and the beginnings of words (which are often consonantal). But are these the cues *actually* used the most in perceiving words? The answer seems to be yes and no.

Before further investigating how consonants and vowels contribute to word perception, let’s deal with the widespread assumption that words are processed in serial fashion, letter by letter, from left to right.

### Activity 1

First, try the following exercise on formulating phonics rules. In each of the words below, one letter is printed in boldface type. Determine how each boldface letter should be pronounced, and what part of the word signals the pronunciation of the boldface letter. In other words, try to formulate a rule for producing the correct pronunciation of the boldface letters. You will need at least one rule for each of the three sets.

#### Set A

hat	hate
hatter	hater
pet	Pete
petted	Peter
bit	bite
bitter	biting
mop	mope
mopping	moping
cut	cute
cutter	cuter

#### Set B

wrap	war
wren	wet
wring	win
wrong	won

## Set C

car	cent
care	cereal
coat	cite
cough	city
cube	cyclone
cut	cyst

For the first column of words in Set A, you may have formulated a rule something like this: a vowel is short when it is followed by just a single consonant, or when it is followed by a double consonant plus an ending of some sort. For the second column of words in Set A, you may have formulated a rule something like the following: a vowel is long when it is followed by a silent *e*, or when it is followed by a single consonant plus an ending of some sort. Complicated, yes? The words in Set B should have been easier to deal with. You may have formulated a rather simple rule such as this: when a word begins with a *w* followed by an *r*, the *w* is not pronounced; otherwise, it is pronounced as a /w/. For the words in Set C, you might have formulated a rule something like this: when *c* is followed by *a*, *o*, or *u*, it is pronounced /k/; when *c* is followed by *e*, *i*, or *y*, it is pronounced /s/.

Doubtless these are not the only rules possible, nor are they necessarily the best rules. But note that in each case *the pronunciation of the boldface letter is determined not by what precedes, but by what follows*. We could not possibly pronounce the listed words correctly if we processed and pronounced them merely letter by letter, from left to right. Furthermore, most of these words are not exotic words that we encounter only once or twice in a lifetime; most are relatively common words that we encounter fairly often. As Venezky put it in *The Structure of English Orthography*, "A person who attempts to scan left to right, letter by letter, pronouncing as he goes, could not correctly read most English words" (1970b, p. 129).

## Activity 2

Activity 1 leaves open the possibility that we might process each letter separately, even if not left to right. To test this possibility, try replicating the following experiment, from Edmund Huey's *The Psychology and Pedagogy of Reading* (1968, p. 100). For this experiment, you will need either a stopwatch or a watch or clock with a second hand. Figure 5.3 contains a column of letters, a column of four-letter words, and a column of eight-letter words. Time yourself or someone else reading the column of letters as rapidly as possible, either simply identifying each letter mentally or pronouncing it aloud. Repeat the same procedure for the column of four-letter words and the column of eight-letter words.

Even though you may have stumbled over some unfamiliar words, you probably found that it did not take nearly four times as long to read the column of four-letter words as it took to read the column of single letters; nor, surely, did it take eight times as long to read the column of eight-letter words. Huey's four experimental subjects read

y	pool	analysis
w	rugs	habitual
u	mark	occupied
s	send	inherent
q	list	probable
o	more	summoned
m	pick	devotion
k	stab	remarked
i	neck	overcome
g	your	resolute
e	dice	elements
c	font	conclude
a	earl	numbered
z	whit	struggle
x	ants	division
v	role	research
t	sink	original
r	rust	involved
p	ware	obstacle
n	fuss	relative
l	tick	physical
j	rasp	pastness
h	mold	lacteals
f	hive	sameness
d	four	distract

FIGURE 5.3 Huey's list of letters and words

the columns aloud, averaging 15.7 seconds for the isolated letters, 17.3 seconds for the four-letter words, and 19.6 seconds for the eight-letter words (Huey, 1968, p. 101). When I first tried the experiment, I read the columns silently. It took me 7 seconds for the single letters, 7 seconds for the four-letter words, and almost 8 seconds for the eight-letter words.

Clearly, fluent readers do not process words letter by letter. Just as we do not comprehend sentences merely by combining the meanings of individual words, so we do not perceive words merely by combining the perceptions of individual letters.

Given the examples in the preceding discussion, it should not be surprising that words can be identified under conditions that make it impossible to identify individual letters. As long ago as the turn of the century, Erdmann and Dodge determined: (1) that words can be recognized when lying too far from the eyes' fixation point to permit recognition of individual letters; (2) that words can be recognized when they are constructed of letters so small that the letters cannot be singly identified; and (3) that words can be recognized from distances at which the letters, exposed singly, cannot be recognized (see Huey, 1968, pp. 73-74). It has also been found that words can be identified under lighting

conditions that do not permit the identification of single letters. In one experiment, even first graders could identify familiar three-letter words at lower light intensities than they needed for identifying single letters (see F. Smith, 1971, p. 141).

To get an idea of what these experiments are like, suppose that two letters are flashed upon a screen in front of you and that you are told these letters form an English word. Suppose too that you cannot identify either of the letters with certainty, but you can see enough features to determine that the first letter must be *a* or *e*, and the second letter must be *f* or *t*. Since this limits the possible combinations to *af*, *at*, *ef*, and *et*, you can readily identify the word as *at*. Because only one of the possible combinations forms a word in standard written English, you can identify the word without being able to identify either letter by itself (see F. Smith, 1979, p. 125).

A similar thing happens when you play the travel game of locating first one letter of the alphabet and then the next on road signs as you travel down the highway. If you have ever played this game with a young child just learning to read, you may have realized that your tremendous advantage is the fact that you identify the *words* first, and then recognize the letter you are looking for. The child who knows letters of the alphabet but few words must, of course, look for the individual letters. Your ability to recognize whole words aids your perception of individual letters.

In a similar vein, some rather startling experiments indicate that a person can get some sense of a word's meaning without consciously being able to identify it. McKean (1985) mentions, for example, the work of Anthony Marcel at Cambridge, England. Using a tachistoscope to flash words on a screen for an extremely brief period of time, Marcel noted that his volunteer readers were able to get some sense of the meaning of the word, even though they hadn't seen the word long enough to identify it. For example, if the word on the screen was "queen," people would guess it as "king," or if the target word was "yellow" they would guess it as "blue." Odd as it sounds, the people in the experiment retained a subconscious impression of a word's meaning—not only without knowing its identity, but even when the visual exposure was so brief that they weren't sure they had seen any word at all. Recent studies of brain-damaged individuals confirm that a person can recognize some key features of a word's meaning while being totally unable to recall other key features that they "know" (Bishop, 1993).

At this point, we can see in more detail what it means to say that we bring meaning to the written page in order to get meaning from it. We bring not only our knowledge of the world and our intuitive knowledge of grammar, but even an internalized knowledge of letter and sound patterns. Consider, for a moment, the following list of words. Which ones look like English words? Which ones do not?

glung	rpet	cratn	drepm
tsont	dremp	terp	stont
pret	lgung	crant	tepr

Without ever having been told, we know what is possible in English, and what is not. For example, we know that *glung* and *dremp* are possible, while *lgung* and *drepm* are not (see Gibson, Shurcliff, & Yonas, 1970, p. 59; Gibson, 1972, p. 13). Just as we do not consciously

think of how sentences are structured as we speak, so we do not consciously think of how words are structured as we listen or read. Nevertheless, even before learning to read, we have acquired an internalized knowledge of sound patterns, and we quickly begin to acquire a similar internalized knowledge of letter patterns. Thus, our internalized knowledge of letter patterns enables us to identify words from only a fraction of the visual information available. \*

We use a minimal amount of visual information and a maximal amount of nonvisual information. The brain does not passively interpret data gathered by the eyes. On the contrary, the brain tells the eyes what data to gather, which parts of words to attend to. As stated earlier, visual perception is in fact more a function of the brain than of the eye.

An anecdote may help to solidify this point. Bateman reports the following (1974, p. 662):

At a meeting several years ago, an ophthalmologist presented a paper on the eye and reading. After the introduction he came to the podium and stood silently for a moment. Slowly and deliberately he delivered his paper—"Ladies and gentlemen, there are no important relationships between the eye and reading. Thank you." And he returned to his seat.

An exaggeration, certainly, but one containing much truth.

### Syllables: A Perceptually Salient Unit

In reading the eight-letter words from Huey's lists, perhaps you had some sense of dealing with the words in syllables. And in fact, some of the research on word perception suggests that this is how proficient readers accomplish the visual part of word processing: by drawing upon part of the visual information within chunks of letters that more or less correspond to syllables (Mewhort & Campbell, 1981, cited in Adams, 1990a). Perhaps this relationship between the visual and spoken chunks we call syllables partially accounts for the fact that proficient readers typically "hear" what they read in their mind's ear (Perfetti, Bell, & Delaney, 1988; Tanenhaus, Flanigan, & Seidenberg, 1980), even though—as we saw in Chapter 4—mentally hearing or actually saying a word does not occur before the understanding of its meaning (Spoehr, 1981).

Research demonstrates that it is much easier for young children to identify spoken syllables than to abstract either words or sounds (phonemes) from the stream of speech (see Adams, 1990a, pp. 296–300). This is not surprising, for a syllable is the smallest unit that can be spoken in isolation. When we say the names of letters, we necessarily say them as syllables. For example, we cannot pronounce letters like *b* without adding a vowel sound to them ("buh").

A syllable may be said to consist of two major parts, the onset and the rime. The rime consists of a vowel, which is the obligatory part of a syllable, plus any consonants that might follow it. Thus, the following words consist of one syllable, and that syllable has just the rime: *a, I, am, and, earn, up.* Many syllables, of course, have an onset as well. The onset consists of any consonants that precede the vowel: *ma, pi, Sam, hand, learn,*

and cup. While all syllables must have a vowel, or rime, they do not necessarily have to have any preceding or following consonants.

Does that mean that the vowels are the most important parts of words, after all? No, not for most words. From one perspective, vowels are the least useful parts of written words, because they carry much less visual information. Adams (1990a) cites an interesting study in which Miller and Friedman (1957) found that when all the vowels were removed from printed texts, adults could reconstruct the texts almost perfectly:

This dmnstrts tht txt s still mr r lss lgble  
whn th vwls hv bn rmvd.

On the other hand, when a similar proportion of randomly selected letters had been removed, readers reconstructed the text with only 20 percent accuracy (that was the median, not the mean):

Tis dosts that ex bome elatey ilgi when a pabl  
ropoon f rndoml lec etters a ben eov.<sup>5</sup>

The random omission of letters may be more confusing than the systematic omission of certain kinds of letters. However, we have already seen for ourselves the difficulty of reconstructing text with all the consonants systematically omitted.

On the one hand, then, the vowels are visually not very distinctive or prominent, and therefore the *specific* visual information they carry is not very helpful in identifying words. They become even less necessary when prior knowledge and context can be used along with consonants, as in normal reading. And yet, vowels seem to attract consonants to them (particularly the preceding consonants), and thus they help us group letters into visual patterns that correspond roughly to syllables. The vowel letters seem to pull consonants to them to create visually salient patterns that we can readily recognize. Perhaps, as Marilyn Adams suggests, the most useful function of vowels is simply to *be there* (Adams, 1990a, pp. 118-121, 219).

A quick caveat is in order, though. It surely is not important that we chunk words into syllables as defined by the dictionary or by linguists; the important thing is to cluster letters into visually identifiable chunks, whatever those may be. Thus, it's not really important whether we see *medical* as *mē-di-cal* or *med-i-cal*, *elephant* as *el-e-phant* or *ele-phant*, *crumple* as *crum-ple* or *crump-le*. The point is that the chunks are ones we recognize at a glance.

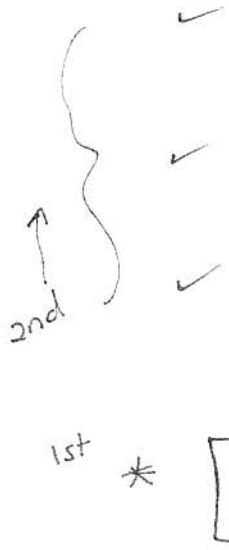
As to *how* we chunk letters into syllables and other recognizable patterns, the following informal experiment should shed some light upon that topic.

### Activity 3

Read the following paragraph aloud, as smoothly as possible:

Corandic is an emurient grof with many fribs; it granks from corite, an olg which cargs like lange. Corite grinkles several other tarances, which garkers excarp by glarcking the corite and starping it in tranker-clarped storbs. The tarances starp





4. Identification of letters, groups of letters like onsets and rimes and syllables, and whole words occurs more or less simultaneously. That is, the perception of words—even words out of context—is simultaneously a bottom-up and a top-down process, from smaller units to larger but also from larger units to smaller.
5. Thus, proficient readers typically “see” the individual letters in a word (Rayner & Pollatsek, 1989), even though they don’t need *or use* all the letters or all the visual information to identify them. The brain constructs the letters from the bars, slits, lines, curves, and such perceived by the eye.
6. We decode unfamiliar words by analogy with familiar words and word parts, particularly syllables and small meaningful units.

Notice that for the purposes of this discussion, we are considering the perception of words in isolation, or as if they occurred in isolation. We have already seen in Chapter 4 what was further demonstrated by some of our activities here: that proficient readers automatically draw upon prior knowledge and context as they read, making word perception even more of a top-down process—potentially, at least—and further reducing the need for visual information during normal reading.

We shall see in the concluding section of this chapter that the notion of word perception as partly a top-down process is not universally accepted, though it is strongly supported by decades of miscue research.

## ENGLISH AS AN ALPHABETIC SYSTEM

English is fundamentally an alphabetic system. That is, it uses visual characters—those of the Roman alphabet—to more or less represent sounds and sound patterns. Having said this, however, it is also critical to point out that English is not strictly a phonetic system. That is, the orthographic system (spelling system) was also designed, or has developed, so as to reflect meaning *rather than* sound, in many instances.

### Homophones

One obvious example is the existence of homophones: words that sound alike but are spelled differently to reflect their difference in meaning. Examples include those from our spelling test, at the end of Chapter 4:

sun, son  
 brake, break  
 rowed, rode, road  
 mete, meat, meet  
 no, know  
 new, knew  
 knight, night  
 wrap, rap  
 wring, ring  
 write, right, rite

The homophones with at least one less common member often cause children difficulties that we adults may find amusing. For example, one of my students told in her journal how disappointed her three-year-old nephew was when he found that the mousse she was going to put in her hair was a foam rather than a large, antlered animal! The often humorous misunderstandings caused by homophones are captured in the Amelia Bedelia books by Petty Parish; there are several books in the series. More to my liking are books by Fred Gwynne: *The Sixteen Hand Horse* (1987), *A Chocolate Moose for Dinner* (1988a), *The King Who Rained* (1988b), and *Little Pigeon Toad* (1990).

In writing, the ambiguity of many homophones disappears. We spell the words differently, signaling the difference in meaning, rather than the sameness of sound.

✓ Gwynne books

### Inflectional Endings

As literate adults, we are usually so aware of representing regular noun plural and verb third-person singular endings as *-s* or *-es* and regular past-tense endings as *-ed* that we don't even recognize the differences in sound among words. But if we spelled by sound rather than by meaning, we would use *-z* or *-ez* for some plural nouns and third-person singular verbs, and *-t* for some past tenses:

bowz (whether it's /bowz/, a noun, or /bawz/, a verb)  
 throwz  
 toez  
 hugz (noun or verb)  
 dreamz  
 wishez  
 ditchez  
  
 laught  
 misst  
 kickt  
 jumpt  
 watcht

What determines these endings is the nature of the last sound in the base noun or verb: if that sound is voiceless, a voiceless sound is added; but if that sound is voiced, a voiced sound is added. The spelling reflects the meaning, not the sound.

### Cognates

If we think about the uninflected form of a word as "basic," then we can reasonably describe some words as "changing" sounds when they add certain derivational endings indicating the word's part of speech. Notice, for example, the following changes:

medicine      medic; medical      The /s/ of *medicine* changes to the /k/ of *medic(al)*, and the second vowel changes.

music	musician	The /k/ of <i>music</i> contributes to /sh/ in <i>musician</i> , but remains /k/ in <i>musical</i> .
logic	logician	The same change occurs, and the first vowel sound changes as the accent on syllables changes, but <i>logical</i> retains the sounds of <i>logic</i> .
site	situate; situation	The /t/ of <i>site</i> contributes to /ch/ in <i>situate</i> , and the second /t/ of <i>situate</i> contributes to /sh/ in <i>situation</i> ; also, the vowel of <i>site</i> changes.
bomb	bombard	The silent /b/ of <i>bomb</i> is pronounced in <i>bombard</i> (and <i>bombardment</i> , <i>bombardier</i> ).
resign	resignation	Both the vowels of <i>resign</i> change as the accent on the syllables changes, and the silent <i>g</i> in <i>resign</i> is pronounced /g/ in <i>resignation</i> .

For each example, you can probably think of others that show the same or a similar pattern. Most of the examples reflect a pattern that is the norm for English: that is, the pronunciation of vowels changes as the accenting of syllables changes (and as even the syllable divisions sometimes change). Vowels in unaccented syllables are typically pronounced as a schwa: a nondescript, unaccented “uh” sound (or a sound close to it).

Notice, however, that in each case there is good reason for the spelling to remain the same: it indicates the relatedness in *meaning* between words that have the same root. We spell the overlapping parts of the words the same, despite the differences in sound.

## Dialects

Various words and word patterns are pronounced differently in differing parts of the country (Shuy, 1967). For example:

- Words ending in *-og* (e.g., *frog*, *fog*, *dog*, *hog*, *log*, *bog*, *cog*, *smog*, *clog*, *tog*) are not pronounced the same everywhere. In some English dialects, the vowels are all the same; in others, there are at least two differing sets.
- *Merry*, *marry*, and *Mary* may all be pronounced the same in some dialects; others may make two or even three distinctions.
- *Far*, *father* and *awe* may have the same “a” sound in some dialects, but not in others.
- *Pin* and *pen* are different in most dialect areas, but not all.
- *Wash* and *Washington* take an added /r/ for many South Midlanders, who say the words as “warsh” and “Warshington”; Bostonians, on the other hand, may add an /r/ to words like *idea* (“the idear is”) and *Cuba* (“Cubar is”); while in some areas of the South and the Northeast, speakers typically omit *r* after a vowel and before a consonant, as in “cahd” for *card*, “bahn” for *barn* (this pattern occurs also in Black English Vernacular).

As the proportion of these examples would suggest, most of the regional differences occur in vowels and vowel patterns—a potentially serious problem for children in classrooms that use phonics programs, since about two-thirds of the lessons often focus on

vowel patterns. Even a simple little exercise on “short a” can be enough to bring forth these difficulties.

For the moment, however, the major point, again, is that our orthographic system holds the spellings constant, despite the regional differences in pronunciation. And we have not even considered ethnic differences, the differences in the speech of those who are learning English as a second language, or differences among English-speaking countries or within a country like Great Britain, which has a much greater variety of distinctively different dialects. In other words, spelling reflects constancy in meaning, even though the sounds may differ and change over time.

In short, various kinds of evidence demonstrate that while English is an alphabetic system, with letters more or less representing sounds, “more or less” is indeed the key. Spelling often reflects meaning rather than sound, and to do so, spelling often remains constant even though pronunciation differs or changes.

## PHONICS AND PHONICS RULES

Most people think of phonics in connection with the *teaching* of letter/sound correspondences, relationships, and patterns. I use the term mostly this way too, but sometimes refer to functional “phonics knowledge” or “phonics know-how” as something acquired by the reader, irrespective of whether or how it has been taught. Such phonics knowledge may well be unconscious rather than conscious. Indeed, it is such unconscious phonics knowledge that proficient readers use in processing letter patterns into their corresponding sound patterns.

The earlier discussions of parts of words at work and of word perception should certainly convince us that letter/sound knowledge is important in reading. Indeed, who would ever have thought otherwise? What is not so obvious, however, is how teachers can best help students develop a functional awareness of letter/sound relations and patterns.

Clearly, these patterns are not simple. If our language were strictly phonetic as well as alphabetic, each distinctive sound would be represented by one consistent symbol, and vice versa: only one symbol would represent one distinctive sound. For English, however, we have already seen that this principle breaks down in many—perhaps most—of our words, as spelling reflects meaning even when pronunciation differs or changes. Furthermore, the principle does not hold even at the subword level. Take, for instance, the following exceptions to the one-to-one principle:

- There are several consonant digraphs, wherein two letters represent a single sound: *ch, sh, th* (which has two different sounds), *wh, gh, ph, ck, ng*
- There are some consonants that have have different pronunciations, depending upon what vowel follows:

*c* is pronounced /k/ before *a, o, u*, but /s/ before *e, i, y*

*g* is usually pronounced /g/ before *a, o, u*, but “j” before *e, i, y* (some notable exceptions are *get, give, girl*)

\* rhymes

not true consonant digraphs

- There are some consonants that combine with vowels to produce different consonant sounds. For example:

*t* joins with the *i* to become “sh” in *-tion* (*action, motion, nation, etc.*)

*c* joins with the following *i* to become part of “sh” in *-cial* (*crucial, special, etc.*),  
*-cian* (*musician, physician, etc.*), and *-cious* (*atrocious, conscious, etc.*)

*s* joins with the following *i* to become “zh” in *-sion* (*confusion, fusion, etc.*)

And so forth.

This list comes nowhere close to illustrating all the possible pronunciations of the consonants—and the possibilities are far more numerous for vowels.

In short, the conditions governing spelling/sound correspondences are often far more complex than is generally recognized (Venezky, 1967, 1970a, 1970b). Merely to represent the spelling/sound mappings of a good majority (80 to 90 percent) of English words—that is, ignoring true exceptions—it has generally been found that hundreds of correspondences are involved (Hanna et al., 1966, as cited in Adams, 1990a, p. 242). Nor is this complexity confined to words that are used primarily by adults rather than children. In one of the more extensive studies, Berdiansky and her associates tried to establish a set of rules to account for the spelling/sound correspondences in over six thousand one-syllable and two-syllable words among those in the comprehension vocabularies of six- to nine-year-olds. The researchers discovered that their 6,092 words involved 211 separate spelling/sound correspondences—that is, 211 correspondences between a letter and a sound, or between two letters functioning together (like *qu* or the digraphs above) and a sound. Of these 211 correspondences, 166 occurred in at least ten words out of the set of 6,092 different words, while 45 of the correspondences occurred in fewer than ten words (Berdiansky, Cronnell, & Koehler, 1969, p. 11); see F. Smith, 1979, pp. 139–140).

Research such as this should certainly convince us of the ridiculousness of Rudolph Flesch’s simple prescription: “Reading means getting meaning from certain combinations of letters. Teach the child what each letter stands for and he can read” (Flesch, 1955, p. 10). In fact, as my colleague Bonnie Regelman has pointed out to me, Johnny could not even read the print on the cover of Flesch’s *Why Johnny Can’t Read* (1955) by using phonics rules alone! Nor could Johnny read the vast majority of the 150 most common words in schoolbook English (Adams, 1990a, p. 273).

Furthermore, sound-to-spelling patterns are not consistent or predictable with much precision, either. For example, applying the rules of Berdiansky and her associates in reverse, Cronnell found that that they generated correct sound-to-spelling translations for fewer than half the words in his corpus (Cronnell, 1970, as cited in Adams, 1990). Furthermore, using the 300 rules developed by Hanna and her colleagues (Hanna et al., 1966), fewer than 50 percent of the 17,000 words in their corpus would be spelled correctly. Yet, as Adams notes, “in a spelling bee between fourth graders and a computer that had been programmed with these rules, the fourth graders handily won out” (Simon & Simon, 1973, cited in Desberg, Elliott, & Marsh, 1980; Adams, 1990a, p. 390). So much for the oft-asserted opinion that we should teach phonics so that children will learn to spell correctly.

One might still ask, however, whether we aren't exaggerating the problem with phonics rules: rules that describe spelling-to-sound relationships. Aren't these simple and consistent enough to be taught to children? To answer that question, take a look at Figure 5.4, which reviews the actual usefulness of forty-five generalizations about phonics, as examined by Clymer (1963). A glance at the reliability of these rules suggests that relatively few would be worth teaching, even if teaching rules were a good idea. But is it?

Most children cannot remember abstract phonics terms and rules, yet they can apply such rules unconsciously in their reading. Tovey demonstrated this in a study of children from grades 2 to 6, with five children from each grade. Though their teachers indicated that the children had learned terms like *consonant*, *consonant blend*, *consonant digraph*, *vowel*, *long vowel*, *short vowel*, *vowel digraph*, and *diphthong*, the children's responses suggested otherwise. The only term acceptably defined by over half of the children was *silent letter*. More than half of the terms were acceptably defined by only 20 percent or fewer children. Interestingly, Tovey notes that second graders produced only two acceptable responses to questions about terms, and that sixth graders seemed relatively less able to deal with phonics terms than children in grades 3 through 5—probably, I would assume, because upper elementary students do not typically receive phonics instruction. However, all the children did much better on a phonics test that required them to pronounce nonsense words and to deal with the kinds of elements listed above (plus others) in reading actual text. On this test, all the scores were 55 percent or above, with the percentage rising steadily from 55 percent at grade 2 to 79 percent at grade 6 (fourth graders broke the gradually rising pattern temporarily with 83 percent). The children were able to make use of phonics knowledge that they were not conscious of, that they could not verbalize. Tovey concludes: "Instruction which requires children to deal constantly with the abstract or technical language related to phonics does not warrant the time and effort often expended. This time might better be spent reading" (Tovey, 1980, p. 437).

Certainly there is a correlation between rapid decoding and comprehension, especially in timed tests (see, for example, Perfetti & Hogaboam, 1975; Stanovich, 1980, 1991; and Allen, 1985). However, it does not necessarily follow that children must be taught phonics rules in order to decode rapidly. Since children can *apply* phonics rules even though they cannot define the terms or verbalize the rules, much of the current phonics instruction surely goes beyond what is needed, as pointed out even by phonics advocates. (See, for example, the discussion of phonics in *Becoming a Nation of Readers* [Anderson, Hiebert, Scott, & Wilkinson, 1985, p. 38], and my fuller discussion of this report's treatment of phonics in Chapter 7.)

Even Marilyn Adams, who advocates teaching phonics relationships systematically, generally seems to agree that teaching rules is no substitute for experience with words that exemplify the patterns. She sees some value in teaching rules, but summarizes thus: "For neither the expert nor the novice can rote knowledge of an abstract rule, in and of itself, make any difference" (1990a, p. 271).

Here is a further point to consider. Activity 1, at the end of Chapter 1, presented four sketches of children in first-grade classrooms (D. R. King & Watson, 1983, p. 70): one child being taught by what is probably a combined phonics/linguistics approach,

Handwritten notes:  
Handwritten notes:  
Tests Blank  
Use  
Tovey

\*

Generalizations	Number of Words Conforming	Number of Exceptions	Percent Utility
1. When there are two vowels side by side, the long sound of the first one is heard and the second is usually silent.	309 (bead)†	377 (chief)†	45
2. When a vowel is in the middle of a one-syllable word, the vowel is short.	408	249	62
middle letter	191 (dress)	84 (scold)	69
one of the middle two letters in a word of four letters	191 (rest)	135 (told)	59
one vowel <i>within</i> a word of more than four letters	26 (splash)	30 (fight)	46
3. If the only vowel letter is at the end of a word, the letter usually stands for a long sound.	23 (he)	8 (to)	74
4. When there are two vowels, one of which is final <i>e</i> , the first vowel is long and the <i>e</i> is silent.	180 (bone)	108 (done)	63
* 5. The <i>r</i> gives the preceding vowel a sound that is neither long nor short.	484 (horn)	134 (wire)	78
6. The first vowel is usually long and the second silent in the diagraphs <i>ai</i> , <i>ea</i> , <i>oa</i> , and <i>ui</i> .	179	92	66
<i>ai</i>	43 (nail)	24 (said)	64
<i>ea</i>	101 (bead)	51 (head)	66
<i>oa</i>	34 (boat)	1 (cupboard)	97
<i>ui</i>	1 (suit)	16 (build)	6

\*Generalizations marked with an asterisk were found "useful" according to the criteria.

†Words in parentheses are examples—either of words that conform or of exceptions, depending on the column.

SOURCE: Clymer, T. "The Utility of Phonic Generalizations in the Primary Grades." *The Reading Teacher* 16 (January 1963): 252-58.

FIGURE 5.4 The utility of forty-five phonics generalizations

Generalizations	Number of Words Conforming	Number of Exceptions	Percent Utility
7. In the phonogram <i>ie</i> , the <i>i</i> is silent and the <i>e</i> has a long sound.	8 (field)	39 (friend)	17
* 8. Words having double <i>e</i> usually have the long <i>e</i> sound.	85 (seem)	2 (been)	98
9. When words end with silent <i>e</i> , the preceding <i>a</i> or <i>i</i> is long.	164 (cake)	108 (have)	60
*10. In <i>ay</i> the <i>y</i> is silent and gives <i>a</i> its long sound.	36 (play)	10 (always)	78
11. When the letter <i>i</i> is followed by the letters <i>gh</i> , the <i>i</i> usually stands for its long sound and the <i>gh</i> is silent.	22 (high)	9 (neighbor)	71
12. When <i>a</i> follows <i>w</i> in a word, it usually has the sound <i>a</i> as in <i>was</i> .	15 (watch)	32 (swam)	32
13. When <i>e</i> is followed by <i>w</i> , the vowel sound is the same as represented by <i>oo</i> .	9 (blew)	17 (sew)	35
14. The two letters <i>ow</i> make the long <i>o</i> sound.	50 (own)	35 (down)	59
15. <i>W</i> is sometimes a vowel and follows the vowel digraph rule.	50 (crow)	75 (threw)	40
*16. When <i>y</i> is the final letter in a word, it usually has a vowel sound.	169 (dry)	32 (tray)	84
17. When <i>y</i> is used as a vowel in words, it sometimes has the sound of long <i>i</i> .	29 (fly)	170 (funny)	15
18. The letter <i>a</i> has the same sound ( <i>ô</i> ) when followed by <i>l</i> , <i>w</i> , and <i>u</i> .	61 (all)	65 (canal)	48

19. When <i>a</i> is followed by <i>r</i> and final <i>e</i> , we expect to hear the sound heard in <i>care</i> .	9 (dare)	1 (are)	90
*20. When <i>c</i> and <i>h</i> are next to each other, they make only one sound.	103 (peach)	0	100
*21. <i>Ch</i> is usually pronounced as it is in <i>kitchen</i> , <i>catch</i> , and <i>chair</i> , not like <i>sh</i> .	99 (catch)	5 (machine)	95
*22. When <i>c</i> is followed by <i>e</i> or <i>i</i> , the sound of <i>s</i> is likely to be heard.	66 (cent)	3 (ocean)	96
*23. When the letter <i>c</i> is followed by <i>o</i> or <i>a</i> , the sound of <i>k</i> is likely to be heard.	143 (camp)	0	100
24. The letter <i>g</i> often has a sound similar to that of <i>j</i> in <i>jump</i> when it precedes the letter <i>i</i> or <i>e</i> .	49 (engine)	28 (give)	64
*25. When <i>ght</i> is seen in a word, <i>gh</i> is silent.	30 (fight)	0	100
26. When a word begins <i>kn</i> , the <i>k</i> is silent.	10 (knife)	0	100
27. When a word begins with <i>wr</i> , the <i>w</i> is silent.	8 (write)	0	100
*28. When two of the same consonants are side by side, only one is heard.	334 (carry)	3 (suggest)	99
*29. When a word ends in <i>ck</i> , it has the same last sound as in <i>look</i> .	46 (brick)	0	100
*30. In most two-syllable words, the first syllable is accented.	828 (famous)	143 (polite)	85
*31. If <i>a</i> , <i>in</i> , <i>re</i> , <i>ex</i> , <i>de</i> , or <i>be</i> is the first syllable in a word, it is usually unaccented.	86 (belong)	13 (insect)	87
*32. In most two-syllable words that end in a consonant followed by <i>y</i> , the first syllable is accented and the last is unaccented.	101 (baby)	4 (supply)	96

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FIGURE 5.4 Continued

33. One vowel letter in an accented syllable has its short sound.	547 (city)	356 (lady)	61
34. When <i>y</i> or <i>ey</i> is seen in the last syllable that is not accented, the long sound of <i>e</i> is heard.	0	157 (baby)	0
35. When <i>ture</i> is the final syllable in a word, it is unaccented.	4 (picture)	0	100
36. When <i>tion</i> is the final syllable in a word, it is unaccented.	5 (station)	0	100
37. In many two- and three-syllable words, the final <i>e</i> lengthens the vowel in the last syllable.	52 (invite)	62 (gasoline)	46
38. If the first vowel sound in a word is followed by two consonants, the first syllable usually ends with the first of the two consonants.	404 (bullet)	159 (singer)	72
39. If the first vowel sound in a word is followed by a single consonant, that consonant usually begins the second syllable.	190 (over)	237 (oven)	44
*40. If the last syllable of a word ends in <i>le</i> , the consonant preceding the <i>le</i> usually begins the last syllable.	62 (tumble)	2 (buckle)	97
*41. When the first vowel element in a word is followed by <i>th</i> , <i>ch</i> , or <i>sh</i> , these symbols are not broken when the word is divided into syllables and may go with either the first or second syllables.	30 (dishes)	0	100
42. In a word of more than one syllable, the letter <i>v</i> usually goes with the preceding vowel to form a syllable.	53 (cover)	29 (clover)	73

Generalizations	Number of Words Conforming	Number of Exceptions	Percent Utility
43. When a word has only one vowel letter, the vowel sound is likely to be short.	433 (hid)	322 (kind)	57
*44. When there is one <i>e</i> in a word that ends in a consonant, the <i>e</i> usually has a short sound.	85 (leg)	27 (blew)	76
*45. When the last syllable is the sound <i>r</i> , it is unaccented.	188 (butter)	9 (appear)	95

FIGURE 5.4 Continued

one being taught by a sight word approach, one being taught through the Initial Teaching Alphabet (see activity 3 in the section "For Further Reflection and Exploration" at the end of this chapter), and one being taught by a language experience/whole language approach. Are all of these children going to become readers, King and Watson ask? Their answer: it is quite likely. But they suggest that some children may learn to read in spite of the instructional program rather than because of it. (And, of course, some children are receiving more impetus to enjoy reading and to become lifelong readers.)

If children are taught by a phonics method and they in fact learn to read, it seems logical to assume that they learned to read because of the phonics instruction. But this is not necessarily so. The fact that the rooster crows and the sun then comes up does not mean that the rooster's crowing causes the sun to rise, even though primitive societies and young children in our own society have assumed that the former causes the latter. The fact that parents buy their son or daughter a computer does not necessarily mean that the student will get better grades because of the computer, though a computer ad might have us believe otherwise. And the fact that children who have been exposed to a phonics approach learn to read does not necessarily mean that they learned to read *because of* that approach, though people unaware of the nature of the reading process and what is involved in learning to read are often inclined to make that assumption.

In determining how children best learn to read, Marie Carbo points out that "what works is not always phonics, and, in fact, for young children, what works *best* in reading may seldom be intensive phonic instruction" (Carbo, 1987b). Carbo has concluded that a small percentage of children really *need* phonics instruction—but not phonics *rules*—in order to become good readers. However, most children fall into other categories:

“those who are capable of learning phonics, but who *do not* need it to become good readers, and children who are *unable* to master phonics” (Carbo, 1987c).

One reason that most children are able—perhaps *best* able—to learn to read without intensive phonics instruction is (as we have seen in Chapters 2 and 4) that learning to read involves much more than learning to sound out words. It involves learning to bring one’s own schemas to the act of transacting with the text, and it involves learning to use and coordinate all three language cue systems: syntactic, semantic, and grapho/phonemic. If children try to read by merely sounding out words, merely using grapho/phonemic cues, they may never learn to read effectively. Even word identification itself, a seemingly low-level skill, will suffer. Other excellent discussions of the role of phonics and the teaching of phonics can be found in F. Smith (1979), and in Sebasta’s article “Why Rudolph Can’t Read” (1981), a spoof of Rudolph Flesch’s *Why Johnny Can’t Read* (1955).

How is it, then, that children can learn to read with, or perhaps in spite of, an approach that focuses mainly on the grapho/phonemic cues? Because children have a natural, innate tendency to create meaning by transacting with their environment. Because they are often surrounded by meaningful print in their daily lives. Because many of them naturally transfer to the reading of print the strategies they have learned to use in making sense of spoken language. And because they have a tremendous capacity for forming their own hypotheses about how language works, a capacity clearly exemplified in the infant and preschool years as they learn to speak more and more like adults. On the other hand, children who have not had extensive preschool experiences with books may find learning to read particularly difficult with intensive and extensive focus on phonics; they may not so readily draw upon these other experiences and resources as children who already know the purpose of books and the joys of reading or being read to. (These points will be explored further in Chapter 7.)

Good points

## DEVELOPING PHONICS KNOWLEDGE

Clearly, there are many reasons for *not* teaching phonics relationships intensively and systematically, much less for teaching actual phonics rules. Among these reasons are the following, some of which summarize previous points and some of which look ahead to subsequent chapters, especially Chapter 7:

1. *It’s not necessary.* Just as they learn the patterns of oral language, so most children will unconsciously learn common phonics patterns, given ample opportunity to read environmental print and predictable and enjoyable materials, and ample opportunity to write with invented (constructive) spelling. (See Chapter 7.)
2. Not all visual information is equally important. For example, vowels contribute relatively little to the specific identification of words, particularly when the words occur in a meaningful context. Vowels help mainly by being there. ✓
3. There are too many rules and patterns, especially for vowels—and there are too many exceptions to the rules. Even if a given rule applies to a word, it’s not always possible to know which rule applies, or even whether a rule applies, unless you already know the word.

phonics

4. Proficient readers don't process words letter by letter: they process words in clusters of letters that typically correspond, at least roughly, to syllables and/or onsets and rimes. Fortunately, the pronunciation of vowels is relatively stable within common rime patterns (patterns like *-and*, *-ate*, *-ent*, *-el* and *-le*, *-er* and *-re*, *-ion*, *-ung*). In other words, pronouncing syllables and/or onsets and rimes may be far easier than trying to sound out an unfamiliar word letter by letter (Adams, 1990a, pp. 308-328; she cites, in particular, Treiman, 1985, 1986, 1988; Treiman & Chafetz, 1987; and Treiman & Baron, 1981).
- ✓ 5. Proficient readers use prior knowledge and context *along with* visual cues and their knowledge of letter/sound relations, in order to get words and construct meaning. This reduces the amount of strictly visual processing that is necessary. See Chapter 4.
6. Too much emphasis on phonics encourages children to use "sound it out" as their first and possibly only independent strategy for getting words and meaning. (Applebee, Langer, & Mullis, 1988b).
- ✓ 7. Overemphasizing word identification may encourage readers to focus too much on getting words and too little on constructing meaning. (See Chapters 1, 4, and 6, especially).
8. Many emergent readers are not good at learning analytically, abstractly, or auditorily. For them, the study of phonics is difficult, if not impossible. This conclusion is derived partly from Piagetian studies of child development (e.g., Wadsworth, 1989), but also from research into learning styles and reading styles (Carbo, especially the 1987 references).
9. Thus, teaching and testing numerous phonics patterns or rules may result in many children's quickly being labeled as reading failures or slow readers. For many children, it is far harder to "do phonics" than to learn to read (e.g., Carbo, 1987b—and a great deal of anecdotal observation over the years).
10. Children who learn to read relatively naturally—in the home, or in whole language classrooms—typically do so without the systematic teaching of phonics. Furthermore, a whole generation of readers in the 1940s and 1950s learned to read with phonics being taught only in the context of meaningful reading, and incidentally rather than formally. (This does not mean that everyone learned to read, but then neither does everyone heavily dosed with phonics. See, for instance, Boder, 1973; K. S. Goodman, 1973; C. Chomsky, 1976; Meek, 1983; Doake, 1985; and Carbo, 1987b. Coming from different perspectives, all of these researchers similarly note that less effective and/or "dyslexic" readers have typically received *more* phonics instruction than the average reader.)
- ✓ 11. Research in whole language classrooms suggests that less formal and less systematic ways of helping children develop *functional* phonics knowledge work better than direct, systematic teaching of phonics. (See Chapter 7.)
12. Time spent on intensive and systematic phonics may be better spent in developing and experiencing other aspects of literacy, with phonics taught primarily as the need and opportunity arise during authentic reading and writing. (See Chapters 3 and 7.)

13. Children who have had less extensive experiences with literacy and books prior to school may be especially disadvantaged by programs that teach phonics intensively and systematically. (Again, see Chapter 7.) Other excellent resources dealing with phonics include Kenneth Goodman's *Phonics Phacts* (1993) and Sandra Wilde's forthcoming book on phonics.

Figure 5.5 summarizes these various kinds of research leading to the conclusion that it is best *not* to teach phonics systematically and intensively, much less extensively, but rather to use other means to help children grasp the alphabetic principle that letters relate to sounds, and to internalize the letter/sound knowledge they need for reading and writing.

The fact that children develop phonics knowledge with less than complete and systematic teaching should hardly be a surprise, since they learned the sound patterns, word patterns, and major grammatical patterns of their language before entering school, and without direct teaching. (See Chapter 3.) The next section will focus on how children develop phonics knowledge. This will be followed by a summary from the point of view of what the teacher might do to facilitate such learning. Finally, the chapter concludes with what is in effect a summary of concepts from all the earlier chapters, but especially Chapters 2, 4, and 5 on the reading process: a section titled "Toward a More Complete Model of the Reading Process."

### How Children Develop Phonics Knowledge

While children may develop phonics knowledge through the following means in their homes, the purpose of this section is to emphasize ways that children develop phonics knowledge in supportive classrooms. The following are only some of the ways, many of which will or can occur within the context of a shared reading experience (see Chapter 3). In fact, I will illustrate many of these possibilities by reference to what a group of first graders experienced over several days, as their teacher Tracy Cobb and I worked with them. This set of activities illustrates a "core literature" approach (Chapter 9) that does not reflect where I am in my thinking and practice today. However, some of our activities nicely illustrate how children can be guided in developing phonics knowledge throughout the activities that may be associated with a shared reading experience. The examples are partially out of the order in which they occurred, to illustrate the principles in what seems a logical order.

In supportive classrooms, children develop phonics knowledge through such means as these:

1. *By having familiar and favorite stories read to them again and again, during a shared reading experience wherein they can see the text and thus begin to make connections between spoken and written words and between letters and sounds.* In the shared reading experience, teachers facilitate this learning by running their hand or some kind of pointer under the text, word by word. For example, Tracy read the folktale *Stone Soup* to the children, using the simple Ann McGovern version (1968) because of its repetitive and cumulative refrains. Beforehand, I had written on posterboard the repetitive refrain: ✓

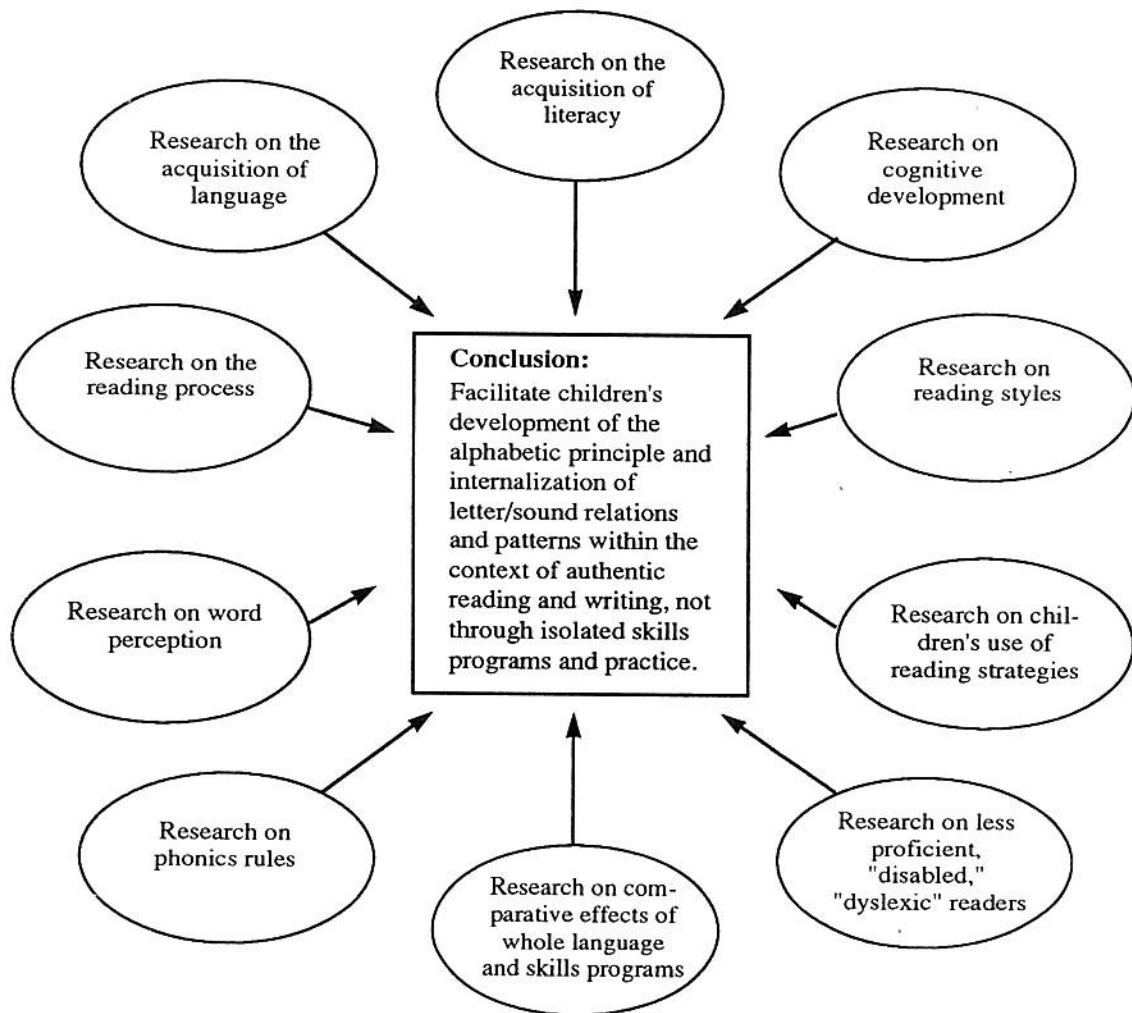


FIGURE 5.5 Kinds of research relevant to the learning and teaching of phonics

"Soup from a stone,"  
said the little old lady.  
"Fancy that."  
The pot bubbled and bubbled.

On a second reading, we took advantage of there being two teachers: while Tracy read, I pointed to the words in the refrain and we encouraged the children to "read" along with us. I had also prepared strips of paper for constructing the cumulative refrain as

each new ingredient was added to the pot. The children helped me add the strips of paper to the posterboard, and we read the cumulative refrain in like manner, adding to it each time.

2. *By rereading favorite stories, songs, and poems, independently or with a peer.* Such rereadings help solidify the children's growing understanding of print. The rereading is facilitated if children have individual copies of the texts, and if they can listen to a tape recording of the text as they read. It's especially helpful if the tape recording is appropriately paced (Carbo, 1989).

We made stone soup with the children, first using paper vegetables and then, on a later day, making real soup (yes, with a real stone). The children generated a language experience chart and I typed their text on the computer, making small booklets in which each child's line was printed at the bottom of the page, leaving most of the page for the child to illustrate. The children thoroughly enjoyed drawing the pictures and reading and rereading their very own books. Figure 5.6 shows one of the pages from the book that the children illustrated for me (each child illustrated his or her own page).

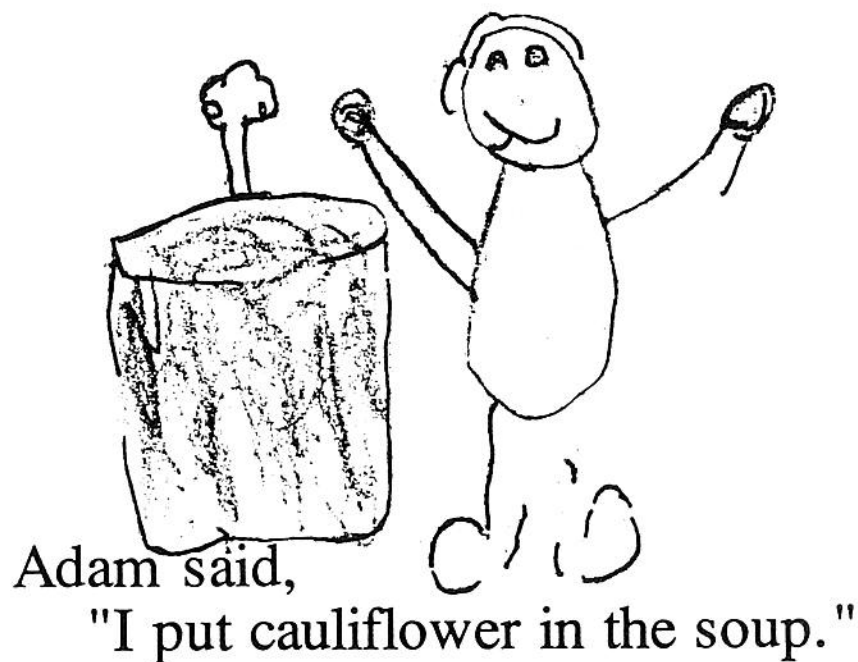


FIGURE 5.6 Page from children's book on making stone soup

3. *By observing and participating as the teacher demonstrates letter/sound relationships while writing.* For example, the teacher may compose something of his or her own while the children watch; the teacher may write a language experience chart or story while the children dictate sentences individually; or the teacher may write and rewrite what the children compose collectively. In any case, the teacher may select certain letter/sound correspondences to call to children's attention.

In the language experience chart we generated after making stone soup, I called particular attention to the initial consonants at the beginning of children's names—that is, to the correspondence between the sound and the letter. Serendipitously, we had another chance to comment on the nature of print when the children noticed that I had written small *a* in two different ways: a typewriter *a*, and a cursive *a*. This gave us an opportunity to think and talk about the fact that letters can be written in more than one way and still mean the same. In retrospect, I realize that I might have invited children to tell other things they noticed about the print, too.

4. *By writing independently, constructing their own spellings as best they are able.* Of course schoolchildren should be writing in whatever way they can, whether it be scribble writing, random letters and symbols, or letters that at least begin to be decipherable as words. But when they can use letters to represent sounds, they begin to promote their own phonics development through writing. In fact, Harste has noted that the knowledge of letter/sound correspondences exhibited in writing soon exceeds the knowledge that is called for by the phonics worksheets that, often, the children cannot do (Harste, 1985, p. 8:27). This is supported by a research study in which Clarke investigated the effects of promoting traditional (i.e., "correct") versus invented spelling among first graders. The inventive spellers scored better on almost all of the standardized tests of reading and spelling (Clarke, 1988). And, of course, the children could write more, and with far more sophisticated words, than they could if correct spelling were emphasized every time they put pencil to paper.

We had intended to have children write recipes for stone soup independently, but Tracy thought that we had extended the sequence of activities long enough without this. To my regret, then, all we had them write independently was the names of vegetables they wanted to put in the soup. The children's spellings were sophisticated enough that you can surely tell what vegetables are represented: *Bocele, Brocele, Bracle; Karrts, cairt; peesss; tumatu; collr; unyn; and machroms.* (See Weaver, 1990a, Chapter 7 for a fuller discussion.)

✓ 5. *By considering how grapho/phonemic cues can be used along with prior knowledge and context, to predict what might make sense before looking at the entire word or the following context.* Much of this can be done casually and spontaneously, as teachers and children discuss books. Teachers can demonstrate how they use prior knowledge, context, and initial consonants to predict a word. They can invite children to do the same with appropriate words in the shared reading. And they can discuss this strategy when children have problems with specific words, if the strategy seems likely to be productive.

In the context of our *Stone Soup* experiences, the day after we had developed the language experience chart I covered with Post-Its all but the initial consonants of two key words:

I put c \_\_\_\_\_ in the soup.

Let's put b \_\_\_\_\_ in the soup.

We then brainstormed for the names of vegetables that could go in each of the slots. Afterwards, of course, we looked carefully at each of the printed words, to decide which of our alternatives the word actually was.

6. *By discussing the use of grapho/phonemic cues in the context of meaningful reading.* ✓  
One way to give children such opportunities is to choose literature in which words alliterate (begin the same) and/or rhyme (end with the same rime pattern). In fact, such emphasis on onsets and rimes is precisely what Marilyn Adams recommends (Adams, 1990a, pp. 318–328), as well as what many teachers have found effective, drawing upon literature rather than phonics programs. Children also enjoy and learn from literature with onomatopoeic words (words that sound like what they mean, such as *buzz* or *crunch*). Often children themselves will call attention to such patterns if they are asked, “What do you notice about this poem?” or “What do you notice about the sounds in this poem?” Of course, attention can be focused on letters, too. See Figure 5.7 for some literature with interesting sound elements.

In retrospect, I notice that the refrain of *Stone Soup* has several words starting with *b*: *butter*, *barley*, *bit* (of pepper), and *beef bones*. The children and I might have attended to these. And we might have attended to the three *s* words: *stone*, *soup*, and *salt*. If the children enjoyed thinking of other words that begin with these letters and sounds, we might even have begun a chart to which the children could keep adding words as they thought of them, using their own constructive spellings. They could later graph the number of words starting with these and other initial letters and blends they first charted. In fact, Whitin, Mills, and O’Keefe (1990) demonstrate that this is an excellent way for young children to learn math concepts in the context of developing literacy.

7. *By making charts of words exhibiting letter/sound patterns of particular interest to them.* ✓  
After two or more charts have been compiled, children could make related graphs comparing appropriate data, as explained in item 6 above.

8. *By experimenting with print and solidifying their understanding of letter/sound patterns in a variety of self-chosen ways.* For example, some children enjoy sorting word cards into related sets: words that start the same, words that end the same, words that sound like what they mean, or whatever. It seems appropriate to encourage such activities if children are genuinely interested in them, and as long as the activities do not take much time away from actual reading and writing.

**Alphabet books**

- Anno, Mitsumasa. (1975). *Anno's alphabet: An adventure in imagination*. New York: Harper.
- Base, Graeme. (1986). *Animalia*. New York: Harry N. Abrams.
- Boynton, Sandra. (1987). *A is for angry: An animal and adjective alphabet*. 2nd ed. New York: Workman Publishing.
- Lear, Edward. (1986). *Edward Lear's ABC: Alphabet rhymes for children*. Illus. Carol Pike. Topsfield, MA: Salem House.
- Lobel, Arnold. (1981). *On Market Street*. Illus. Anita Lobel. New York: Mulberry Books (William Morrow).
- Van Allsburg, Chris. (1987). *The Z Was zapped. A play in twenty-six acts*. Boston: Houghton Mifflin.

**Poetry and prose emphasizing sound elements**

- Aardema, Verna. (1981). *Bringing the rain to Kapiti plain*. Illus. Beatriz Vidal. New York: Dial.
- Bennett, Jill. (Ed.) (1987). *Noisy poems*. Illus. Nick Sharrat. New York: Oxford University Press.
- Brown, Marc. (1985). *Hand rhymes*. New York: Puffin.
- Cameron, Polly. (1961). "I can't" said the ant. New York: Scholastic.
- Ciardi, John. (1989). *The hopeful trout and other limericks*. Illus. Susan Meddaugh. Boston: Houghton Mifflin.
- Dunrea, Oliver. (1989). *Deep down underground*. New York: Macmillan. [cumulative tale]
- Lee, Dennis. (1983). *Jelly belly: Original nursery rhymes*. Illus. Juan Wijngaard. New York: Bedrick/Blackie.
- McMillan, Bruce. (1990). *One sun: A book of terse verse*. New York: Holiday House.
- Milne, A. A. (1924). *When we were very young*. New York: E. P. Dutton.
- Nicoll, Helen. (Ed.). (1983). *Poems for 7-year-olds and under*. New York: Puffin.
- Obligado, Lilian. (1983). *Faint frogs feeling feverish, and other terrifically tantalizing tongue twisters*. New York: Puffin.
- Parry, Caroline. (Ed.). (1991). *Zoomerang a boomerang: Poems to make your belly laugh*. Illus. Michael Martchenko. New York: Puffin.
- Prelutsky, Jack. (1986). *Ride a purple pelican*. Illus. Garth Williams. New York: Greenwillow.
- Prelutsky, Jack. (Ed.). (1983). *The Random House book of poetry for children*. Illus. Arnold Lobel. New York: Random House.
- Seuss, Dr. [Theodore Seuss Geisel]. *Green Eggs and Ham*. New York: Random House.
- Silverstein, Shel. (1974). *Where the sidewalk ends*. New York: Harper.

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FIGURE 5.7 Literature with interesting sound elements

9. *By developing their own strategies for learning letter/sound patterns.* The story of Jevon in *Jevon Doesn't Sit at the Back Anymore* (White, 1990) beautifully illustrates how children may develop their own strategies that teachers are not always aware of. During Jevon's second year in her kindergarten, White noticed that Jevon was learning letter/sound correspondences by observing the spellings of his classmates' names. She writes:

While books and most other print were still obviously a hurdle for Jevon, he read his classmates' names in a multitude of places each day. He could independently read and deliver the canteen orders; he could use the alphabetical list I'd posted on chart paper to predict when he or any of his classmates would be the leader again; he read the name of the leader on the News Chart each day. When it was his turn to be leader and fill in the chart, he would rally his friends to help him; when one of his friends was leader, he was there ready to offer his help in return. He found his name and all of his classmates' names on the message board and the sign-up sheets. Reading the selections his friends had made for art, writing or math gave him information he sometimes wanted to consider before making a choice himself.

Long before Jevon connected sounds and symbols in inventive spelling, names made their way into his written communication. (White, 1990, pp. 18-19)

Such a description suggests that Jevon was one of the many children who cannot readily learn letter/sound correspondences. However, he did eventually develop such knowledge, by attending first to what was meaningful to him: the names of his friends and classmates.

Obviously, it is important for teachers to notice children's own developing strategies and to support them.

10. *By receiving additional help as needed, either from peers in a collaborative setting, from older children, from the teacher, from a Reading Recovery or resource room teacher, or from whoever might help.* However, it is important not to assume that children need help with phonics just because they cannot do phonics activities on worksheets.

Consider the case of Jan, a fourth grader who was a good student and who considered herself a good reader, as did her teacher and her parents (Watson and Crowley, 1988). Given a worksheet on the three main sounds of *ea*, Jan completed less than half of the 72 items, and missed nearly half of the 31 items she attempted. Frustrated by this failure, Jan cried herself to sleep that night.

Equally frustrated and concerned, her parents consulted a reading teacher, who prepared for Jan a passage containing several words exemplifying four *ea* sounds. (Watson and Crowley called this a "determining lesson" because it was designed to help the teacher determine whether or not Jan had particular problems with *ea* words within connected text.) Here is the passage, with the *ea* italicized in those words. Also, Jan's miscues are marked:

① When hunting *season* comes Uncle Bill is almost as *eager*

to head for the woods as Babe and Bingo are. Babe and Bingo

are beautiful *beagles*, but Uncle Bill calls them *eager beavers* when it comes to *pheasant* hunting.

When Uncle Bill <sup>②</sup> <sup>③</sup> re- <sup>③</sup> <sup>p</sup> releases those dogs from their steady <sup>④</sup> <sup>e</sup> break- <sup>④</sup> <sup>e</sup> break- leash, you should see them streak across the meadow at break- neck speed. They can really work up a sweat!

Aunt Joan dreads hunting *season*. Babe and Bingo's <sup>⑤</sup> <sup>deafening</sup> <sup>deaf</sup> <sup>⑥</sup> <sup>a</sup> <sup>⑦</sup> steady stream of barking is deafening and gives her headaches. She can't <sup>⑧</sup> <sup>e</sup> b- bear to think of one feather on a bird being harmed.

Uncle Bill gives the *pheasants* to a neighbor. Babe and Bingo howl.

In context, Jan was able to read three of the words, or variants thereof, that she had not been able to get in isolation: *sweat*, *pheasants*, and *steadier*. In context, she had trouble with few of the *ea* words.

This should serve as a reminder that the ability to read independently does *not* require the ability to “do phonics” in isolation. Nor is work on phonics in isolation likely to be the best way to promote independent and proficient reading.

Figure 5.8 lists valuable references for understanding how children develop phonics knowledge, and how teachers facilitate this learning.

### How Teachers Facilitate Development of Phonics Knowledge

Teachers who understand that we do not teach rules and patterns of language to children as they are acquiring spoken language should find it easy to understand that, likewise, we do not need to teach children rules and patterns of written language for children to learn them. The same holds true for the relationships between the written and the spoken language: the grapho/phonemic relationships and patterns. In other words, we do not need to teach phonics systematically and intensively. This is borne out by a growing body of comparative research (see Chapter 7).

- Freppon, P. A., & Dahl, K. L. (1991). Learning about phonics in a whole language classroom. *Language Arts*, 68, 190-197. ✓
- Mills, H., O'Keefe, T., & Stephens, D. (1992). *Looking closely: Exploring the role of phonics in one whole language classroom*. Urbana, IL: National Council of Teachers of English.
- Powell, D., & Hornsby, D. (1993). *Learning phonics and spelling in a whole language classroom*. New York: Scholastic. ✓
- Weaver, C. (1990). *Understanding whole language: From principles to practice*. Portsmouth, NH: Heinemann. See Chapter 7, "Developing phonics knowledge in whole language classrooms." ✓

In addition, a packet of informational material on topics relating to literacy education, including several sheets on phonics and/in whole language, can be obtained for \$4 (U.S.) from the Center for Establishing Dialogue (CED), 325 E. Southern Avenue, Tempe, AZ 85282; (602) 929-0929. These sheets can be photocopied for distribution to teachers, parents, administrators, and school board members.

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*FIGURE 5.8* References on developing phonics knowledge (Note: Research on the development of phonics knowledge is discussed in Chapter 7. This bibliography focuses mainly on how teachers help children develop phonics knowledge in whole language classrooms, with examples from children.)

On the other hand, a certain amount of classroom attention to letter/sound correspondences and patterns will surely help children in learning what they need to know about the orthographic (spelling) system and in developing a working knowledge of phonics—that is, in developing the phonics knowledge they need to read effectively and independently. Furthermore, a relatively small proportion of children may actually find it easiest to develop a functional command of grapho/phonemic relations through some explicit attention to phonics—though even for them, phonics rules do not seem particularly helpful (Carbo, 1983, 1987b; Carbo, Dunn, & Dunn, 1986). Thus, without teaching phonics systematically or intensively, the teacher may nevertheless do several things to help children internalize the letter/sound knowledge they need to process words easily and automatically, and to use grapho/phonemic cues *along with* prior knowledge and context.

Here, then, are some of the ways that teachers can foster acquisition of the alphabetic principle and automaticity in using grapho/phonemic knowledge. These are the flip side of the aforementioned ways children may develop phonics knowledge in supportive classrooms. Teachers can help:

1. By rereading favorite stories, songs, poems, and other materials during a shared reading experience and moving their hand or a pointer under the words, to give children the opportunity to notice not only correspondences between spoken and written words but also correspondences between sounds and letters. ✓

- ✓ 2. *By providing individual copies of materials read during a shared reading experience, so that children can reread the materials independently.* Taping these texts for the children to listen to as they read will further enhance the benefits of rereading. Carbo (1978) suggests too the value of taping the readings at an appropriate pace, and provides suggestions for doing so in *How to Record Books for Maximum Reading Gains* (Carbo, 1989).
- ✓ 3. *By discussing selectively chosen letter/sound correspondences and patterns while composing as the children watch, or while doing guided writing with the children.*
4. *By encouraging children to write using constructive (invented) spelling, and by helping them make letter/sound connections until they can produce early phonemic spellings independently.*
- ✓ 5. *By demonstrating how to use prior knowledge and context along with initial consonants to predict what a word will be, before confirming or correcting by looking at the entire word and using following context.* Having demonstrated this, the teacher continues to encourage the use of this strategy within the context of shared reading experiences—and in group literature discussions and conferences with individual children, as needed.
- ✓ 6. *By choosing for shared reading experiences some enjoyable literature that includes interesting sound elements, particularly alliteration, rhyme, and onomatopoeia.* And of course by engaging children in discussion of such elements during the shared reading experience.
- ✓ 7. *By helping children develop charts of interesting sound elements, beginning with those they have encountered and discussed in the context of shared reading experiences, the children's names, or patterns drawn from any other sources meaningful to the children.*
8. *By accepting children's suggestions for other meaningful activities with words and word parts, and being receptive to a limited number of other good ideas they might think of or encounter,* including games derived from children's interests and experiences (Mills, O'Keefe, & Stephens, 1992). I emphasize "a limited number" because this aspect of teacher support could easily get out of hand, reflecting the discredited notion that phonics must be taught explicitly and extensively.
9. *By observing children's own developing strategies for making sense of print, and supporting the children in their endeavors and their strategies.*
10. *By providing additional materials and help for individual children, as appropriate.* For instance, children who seem readily to grasp the concept of letter/sound relationships might especially benefit from Dr. Seuss books that reinforce letter/sound relationships (of course other children can enjoy and benefit from such books too). Other children will surely benefit from attention to letter/sound relationships in a tutorial setting, with such assistance offered within the context of authentic reading and writing. This may include attention to basic letter/sound correspondences, and some attention to dividing words roughly into syllables and reading them by analogy (e.g., Gaskins, Gaskins, & Gaskins, 1991)—but I question the need for such *extensive* direct instruction. (See also the discussion of retrospective miscue analysis in Chapter 6, as well as strategies for working with special needs students in Chapter 12. For some first graders, the Reading Recovery program originally developed by Marie Clay may be a feasible and appropriate option; again, see Chapter 12.)

In whole language classrooms, such support for the development of phonics knowledge reflects characteristic whole language principles, most notably the conviction that learners are capable of constructing phonics knowledge for themselves, given appropriate input and support.

### TOWARD A MORE COMPLETE MODEL OF THE READING PROCESS

In Chapter 2, we developed a simple socio-psycholinguistic model of the reading process, emphasizing the fact that reading proceeds at least as much from whole to part as from part to whole. In Chapter 4 we deepened our insights by considering research that sheds light on the reading process through consideration of readers' miscues (e.g., K. S. Goodman, 1973; K. S. Goodman & Y. M. Goodman, n. d.). Taken together, such research demonstrates, among other things, that:

1. The meanings of individual words contribute to the meaning of the evolving whole, yet the evolving whole also determines the appropriate meanings of individual words.
2. Context reduces the amount of visual information that readers need in order to identify words and their constituent letters. That is, in proficient reading, even visual processing is facilitated by automatic use of context and prior knowledge.
3. Proficient readers ("good" readers, or what some researchers call "skilled" readers) automatically use prior knowledge and context to construct meaning as they read, as well as to reduce their reliance on visual information.
4. Proficient readers usually go directly from print to meaning. Only occasionally do they recode written words into spoken words in order to get meaning.
5. Some less proficient readers may succeed rather well at constructing meaning, even though they identify considerably fewer than all the words. Their focus on meaning minimizes the effects of their problems with specific words.
6. Some less proficient readers may not succeed very well at constructing meaning from texts, even though—or *because*—they try hard to identify all the words. Their focus on identifying words diverts them from the goal of constructing meaning.
7. Still other less proficient readers may not be very effective (much less efficient) at constructing meaning *or* at getting the words, even though—or *because*—they try hard to sound out words they don't immediately recognize. They make inadequate use of other reading strategies and language cues, such as prior knowledge and context.
8. Some less proficient readers may not succeed very well at getting the words of a text, even though—or *because*—they try to identify words on sight. They make inadequate use of other reading strategies and language cues, such as context and letter/sound patterns.

Some researchers have concentrated on what they perceive as a problem of inadequate letter/sound knowledge for recognizing words (e.g., Perfetti, 1985), while others have concentrated on what they perceive as a problem of inadequate use of prior knowledge

and context to construct meaning (K. S. Goodman, 1973; and many of the references in K. S. Goodman & Y. M. Goodman, n. d.). Obviously, the problems are interrelated. However, a major theme of this book is that it is critical to emphasize the construction of meaning first and foremost—not only because the attempt to construct meaning facilitates word identification, but, much more crucially, because constructing meaning is the primary goal of reading. Therefore, attention to word parts and word processing should occur within the context of authentic reading and writing experiences.

However, a more complete model of the reading process than that in Chapter 2 should also take into account relevant research on the perception and processing of words, combining this with the research on reading as a sustained and natural process of constructing meaning. Some key conclusions from research on word perception and word processing are the following:

- ✓ 1. Good readers do not need context in order to recognize a majority of the words they encounter in text. They automatically recognize many words on sight (Stanovich, 1991).
- ✓ 2. However, longer and less familiar words are not recognized as wholes but rather as related clusters of letters—especially syllables and/or onsets and rimes (Mewhort & Campbell, 1981; Treiman & Chafetz, 1987).
- ✓ 3. Syllabic units are not recognized prior to letters, nor letters prior to syllables, but both more or less simultaneously.
4. What triggers such recognition is bars, slits, lines, curves, and so forth; visual information is processed selectively, with consonants contributing much more useful information than vowels.
5. Nevertheless, readers typically “see” the individual letters in a word—at least skilled readers do. Using prior knowledge of letters and letter patterns, the brain constructs a complete visual image from the partial data supplied by the eye.
6. Skilled readers typically recode printed words into sound; they “hear” the words in their mental ear.

Much of this research is summarized in detail by Adams (1990a) and succinctly by Stanovich (1991). Stanovich in particular discusses various models of word perception that became popular through the decade of the 1980s, culminating in complex models like the connectionist or distributed network model of Seidenberg and McClelland (1989). Typically, these models have been based upon the assumption that reading is a hierarchical process, with word identification preceding the process of constructing meaning. The later connectionist models involve greater overlap and simultaneity, while still tending to assume that prior knowledge and context play no role, or very little, in the automatic word identification of proficient readers. This assumption has led to research that seems to confirm it (see Stanovich, 1991, for a summary). On the other hand, there seems to be ample evidence from other experimental studies as well as miscue research that proficient readers do use prior knowledge and context to construct meaning and also to reduce their reliance on visual information in identifying words.

Without discussing in more depth the research on orthographic and phonological processing (Adams and Stanovich have done that), I would like to suggest a model that I think more adequately reflects experimental research on isolated word perception and

naturalistic research on the reading of connected and coherent texts. Among other things, this model must reconcile the seeming contradictions between some of the conclusions from miscue research and word perception research, as indicated above. The model must somehow capture such observations as these:

1. Proficient readers automatically "see" the individual letters in most content words and many function words, *even though* their equally automatic use of context makes this unnecessary for identifying most words (McConkie & Zola, 1981; Rayner & Pollatsek, 1989).
2. Proficient readers automatically make use of contextual constraints as they read, *even though* their equally automatic processing of letter sequences and words makes the use of context unnecessary in identifying familiar words.
3. Proficient readers identify most of the words in a text, *even though* their primary goal is to construct meaning rather than to identify words.
4. Proficient readers pay most attention to constructing meaning from a text, *even though* they do identify most of the words in the process.
5. Proficient readers automatically "hear" the words of the text (Paterson & Coltheart, 1987; Banks, Oka, & Shugarman, 1981), *even though* translating written words into spoken words is rarely necessary for getting meaning, and in fact slows down their reading significantly (Tanenhaus, Flanigan, & Seidenberg, 1980).
6. In short, proficient readers make simultaneous and redundant use of all the information available to them, *even though* this is not necessary unless problems arise. This information includes orthographic (spelling), phonological (sound), and grapho/phonemic information (knowledge of letter/sound relations and patterns), as well syntactic, semantic, and schematic information (including pragmatic, or practical information, such as information about the demands of the reading situation). Simultaneous use of these linguistic and cognitive resources facilitates effective and efficient reading.

Furthermore, each kind of processing facilitates the others. The use of schemas and context to predict upcoming text facilitates the processing of letters, letter/sound knowledge, and sounds. The recognition of words facilitates the development of schemas and the further use of both schemas and context in identifying subsequent words. The processing of letters triggers not only phonological and grapho/phonemic knowledge but the use of context and schemas to grasp the meaning of words. And so forth. In other words, the processing systems each work in concert with and support of one another. This becomes most obvious, perhaps, when the orthographic processor does not lead to immediate word recognition. Then, if a word is in the person's listening vocabulary, the reader can get the word by processing the word grapho/phonemically, all the while automatically using context, schemas, and relevant knowledge of word meanings to process the word.

The redundancy within this processing system as well as within texts can help us understand how less proficient readers may construct meaning without necessarily identifying most of the words, and without being equally effective in using all kinds of language cues and strategies. Less proficient does not necessarily mean ineffective.