

TABLE 2-1

Common
sound units
for English
words

Character	Common Spellings	Examples
b	b	back
c or k	c, k	cat, kitten
ch	ch, _tch	chief, catch
d	d	dog
f	f, ph	fit, elephant
g	g	give
h	h	help
j	j, _dge, ge, gi, gy	just, fudge, age, giant, gym
l	l	lion
m	m	milk
n	n, kn	no, know
ng	ng	sing
p	p	pot
r	r, wr	right, write
s	s, c	sent, cent
sh	sh, _t_, _c_	shoe, nation, special
t	t	ten
th	th	thin
th	th	that
v	v	voice
w	w	way
wh	wh_	white
y	y	yes
z	z, _s	zebra, nose
zh	_s_	vision
a	a, a_e, ai_, -ay, ea, -ey	able, cape, train, day, steak, they
e	e, ee, e_e, ea, _y, _i_	equal, feet, eve, each, baby, babies
i	i, i_e, igh, _y, _ie, ai	I, bite, high, sky, pie, aisle
o	o, o_e, oa, _ow, _oe	go, phone, boat, low, toe
u	u, ue, you, u_e, _ew	using, cue, youth, use, few
ā	a, au, ai	hat, aunt, plaid
ah	a, al, o	father, calm, on
aw	a, aw, au, o	tall, law, caught, soft
ē	e, ea	bed, bread
i	i, ui, u, ea, ee, ie	sit, build, busy, dear, deer, pierce
ū	u, o, ou, a, e, o	cup, some, couple, alone, loaded, wagon
oo	oo, u, ew, ue, ou, o	too, rule, new, due, group, do
oi	oo, u	book, full
ow	oi, -oy	oil, toy
ar	ow, ou	owl, ouch
ur	ar	park, car
	ur, ir, er, or, ear	hurt, stir, term, word, earn

Note: This table does not include separate listings for "q" (as in "queen") or for changes in sounds in unaccented syllables. Pronunciation guides vary in listing from 41 to 45 sounds.

What are the sounds in the spoken word, "cat"? What word is made of the spoken sounds, /s/ /k/ /u/ /l/? What is the spoken word "smile" without the /s/ sound? All are examples of tests of phonological awareness (referred to respectively as phoneme segmentation, phoneme blending, and phoneme deletion). Students are classified as phonologically aware if they are able to break a spoken word such as "cat" into its three constituent sounds; to combine the /s/, /k/, /u/, and /l/ sounds to create the spoken word "school"; and to say "mile" when asked to delete the /s/ sound from the spoken word, "smile." An alternative test of phoneme segmentation is to ask students to tap out the number sounds in a spoken word (such as giving three taps for "hat"). Other common tests include phoneme isolation (e.g., "Tell me the first sound in 'paste'"), phoneme identity (e.g., "Tell me the sound that is the same in 'bike,' 'boy,' and 'bell'"), phoneme categorization (e.g., "Tell me which word does not belong: 'bus,' 'bun,' 'rug'"), and phoneme substitution (e.g., "For 'ball' change the /b/ to /k/"). As you can see, all tests of phonological awareness involve spoken words and sounds and never involve printed words or letters.

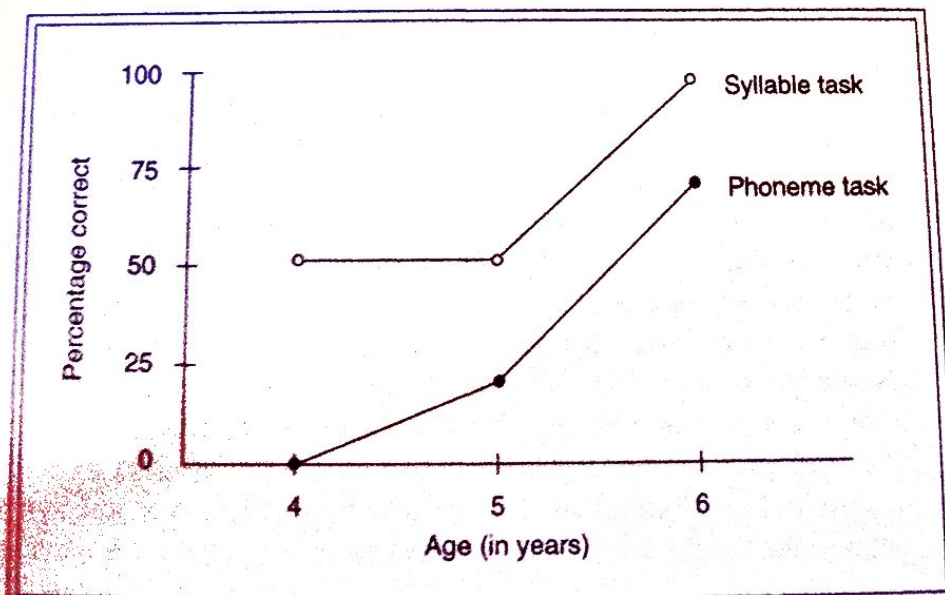
RESEARCH ON PHONOLOGICAL AWARENESS

How does phonological awareness develop? To answer this question, Liberman, Shankweiler, Fischer, and Carter (1974) tested 4-, 5-, and 6-year-olds on their ability to segment words into phonemes and syllables. Figure 2-5 indicates a developmental trend in which almost none of the 4-year-olds recognized phonemes but almost all 6-year-olds did. However, half of the 4- and 5-year-olds and almost all of the 6-year-olds could break words into syllables. These results demonstrate that phonological awareness tends to develop in children in the years leading up to the primary grades.

Similar results were obtained when Juel, Griffin, and Gough (1986) tested the phonological awareness of a group of 80 children at several points across the first and second

FIGURE 2-5

The development of phonological awareness



Adapted from Liberman, Shankweiler, Fischer, and Carter (1974).

TABLE 2-2

A test of
phonological
awareness

Task	Tester Says	Child Says
Segmentation	Say "no." What are the two sounds in "no"?	/n/ /o/
Blending	Say /n/, /i/, /s/. What word is /n/ /i/ /s/?	"nice"
Deletion of first phoneme	Say "top." Now say "top" without the /t/.	"op"
Deletion of last phoneme	Say "same." Now say "same" without the /m/.	"sa" (as in "say")
Substitution of first phoneme	Say "ball." Instead of /b/, begin the new word with /k/.	"call"
Substitution of last phoneme	Say "park." Instead of /k/, end the word with /t/.	"part"

Adapted from Juel, Griffin, and Gough (1986).

grades. Table 2-2 shows some of the items included on the phonological awareness test they used. Children correctly answered 35% of the items in fall of the first grade, 73% in spring of the first grade, 83% in fall of the second grade, and 86% in spring of the second grade. These results are consistent with the idea that phonological awareness increases across the primary school years.

What is the relation between phonological awareness and learning to read? Phonological awareness is a prerequisite for learning to read, so that students who lack skills in phonological awareness are likely to have difficulty in learning to read. This claim, which can be called the *phonological awareness hypothesis*, has been subjected to rigorous testing (Adams, 1990; Ehri, 1991; Rieben & Perfetti, 1991; Wagner & Torgesen, 1987). In particular, let's examine two straightforward predictions of the phonological awareness hypothesis.

First, in comparing groups of good and poor readers, the phonological awareness hypothesis predicts that students who have difficulty in reading tend to have difficulty on tests of phonological awareness. Bradley and Bryant (1978) measured the phonological awareness of younger good readers and older poor readers by asking them to identify which of four words lacked a sound contained in the other words (e.g., answering "rag" for the set "sun, sea, sock, rag," or answering "man" for the set "cot, hut, man, fit") and to produce a word that rhymed with a target word (e.g., saying "fun" for the target word "sun"). As predicted by the phonological awareness hypothesis, in spite of having had more exposure to reading, the older poor readers performed more poorly than the younger good readers on both measures of phonological awareness. Similarly, other researchers also found that children who have difficulty in learning to read in elementary school often lack skill in phonological awareness (Nation & Hulme, 1997; Pennington, Groisser, & Welsh, 1993; Stanovich, 1991). Although these results suggest that lack of

phonological awareness is related to reading difficulties, group comparisons such as these do not allow us to tell whether phonological awareness has a causal relation with reading achievement. For this reason longitudinal studies are useful in determining whether a child's phonological awareness at an early age is related to his or her reading achievement at a later age.

Second, in longitudinal studies the phonological awareness hypothesis predicts that a child's level of phonological awareness at an early age is related to his or her level of reading performance in primary grades. For example, Bradley and Bryant (1985) tested 4- and 5-year-olds on phonological awareness tasks and retested them 3 years later on a standardized test of reading achievement. The correlation was strong ($r = .5$) providing support for the phonological awareness hypothesis.

In a more focused study, Juel et al. (1986) tested students at several points during their first and second grade school years on phonological awareness (as exemplified in Table 2-2) and reading skills (such as pronouncing a printed word and writing a spoken word). Phonological awareness correlated strongly with children's ability to pronounce printed words at the end of the first grade ($r = .8$) and at the end of the second grade ($r = .5$), and phonological awareness correlated strongly with children's ability to write spoken words at the end of the first grade ($r = .8$) and at the end of the second grade ($r = .6$). Even after the effects of intelligence were statistically removed from the analysis, phonological awareness strongly influenced year-end performance on basic reading skills.

In a review of longitudinal studies, Wagner and Torgesen (1987) found 20 instances in which measures of phonological awareness at an early age correlated strongly with later reading achievement, even when the effects of general cognitive ability were taken into account. They concluded that "phonological awareness and reading are related independent of general cognitive ability" (p. 202). Of course, many factors other than phonological awareness may be related to a child's reading level, but this research demonstrates that phonological awareness may be one important contributing factor. Although these results are consistent with the phonological awareness hypothesis, you might ask whether they prove it. These results seem to be consistent with several possible relations between phonological awareness and reading skill: (1) phonological awareness might cause reading skill (i.e., as claimed by the phonological awareness hypothesis); (2) reading skill might cause phonological awareness; and (3) both phonological awareness and reading skill might be caused by a third factor (such as general intelligence). A useful way of distinguishing among these three possibilities is to conduct a training study in which pre-readers who are equated on basic characteristics are taught phonological awareness skills and later tested on their level of reading achievement. This approach is taken in the next section.

IMPLICATIONS FOR INSTRUCTION: PHONOLOGICAL AWARENESS TRAINING

If the phonological awareness hypothesis is correct, then teaching students how to recognize phonemes will improve their ability to learn to read. In addition to providing an important theoretical test of the hypothesis, training studies offer practical implications for early reading instruction. Based on the kinds of results reported in the previous

section, Juel et al. (1986) argue for the practical need to provide instruction in phonological awareness:

These findings suggest the need for oral phonemic awareness training for entering-first grade children with poor phonemic awareness. Without special training, children with poor phonemic awareness appear disadvantaged in learning to read and write. . . . [S]uch children are frequently minority children. It may be that training in oral phonemic awareness should be a routine precursor to reading instruction. (p. 249)

Does phonological awareness training help students learn to read? To answer this question, Bradley and Bryant (1983, 1985, 1991) provided phonological awareness training to 5- and 6-year-olds through 40 ten-minute sessions spread over a 2-year period (phoneme-trained group). The training involved recognizing phonemes in words presented as pictures or as spoken words. For example, in some sessions, the child was shown a picture of a bus and asked to select the picture of a word starting with the same sound in a set of pictures. In other sessions, the child was given a set of pictures and asked to select the one that started with a sound different from the others. In yet other sessions, the child was given a large array of pictures and asked to classify them based on shared sounds while stating which sound each group had in common. In sessions involving spoken words, the child was asked to determine whether two spoken words rhymed, whether two spoken words began with the same sound, which of several spoken words ended in a sound different from the others, and so on. In contrast, a control group received 40 lessons involving the same words, but in which the task was to categorize words based on semantic category (such as grouping pictures of a cat, bat, and rat together because they are all animals). By the end of the training period, the phoneme-trained group scored almost 1 year ahead of the control group on a standardized test of reading performance. Importantly, the advantage of the phoneme-trained students persisted so that 5 years later the phoneme-trained group still scored higher than the control group on reading performance.

In a shorter-term study, some kindergarteners received instruction in phonological awareness during 28 twenty-minute sessions over a 7-week period in the winter (phoneme-trained group), whereas an equivalent group received no intervention beyond regular classroom instruction in reading (control group). For example, phoneme-trained students were taught to repeat a word spoken by the teacher and then to say each phoneme in the word. Other activities were like those used by Bradley and Bryant (1983, 1985) as well as letter-naming tasks.

The left two columns in Table 2-3 show that the training seems to have a strong effect on children's phonological awareness: Although both phoneme-trained and control students scored at the same level on a pretest of phonological awareness, the phoneme-trained group showed a large improvement on a posttest, whereas the control group improved only slightly. More importantly, the right two columns of Table 2-3 show that the training had a positive effect on children's reading skills: On a word-reading posttest administered after the training, phoneme-trained students were able to correctly pronounce printed words containing two or three phonemes much better than the control students. In addition, on a word-spelling posttest, phoneme-trained students performed much better on phonetic spelling of spoken words than did control students. Finally, according to a standardized reading test administered at the end of the school year, 35% of the phoneme-trained group could be classified as readers compared to only 7% of the control group.

What happens when phonological awareness training is implemented for a short time in kindergarten classrooms by classroom teachers? To help answer this question, Fuchs et al.

TABLE

Percent
correct
four test
phoneme
trained
control
students

FIGURE

Training
Control

Training
Control

Training
Control

TABLE 2-3

Percentage correct on four tests for phoneme-trained and control students

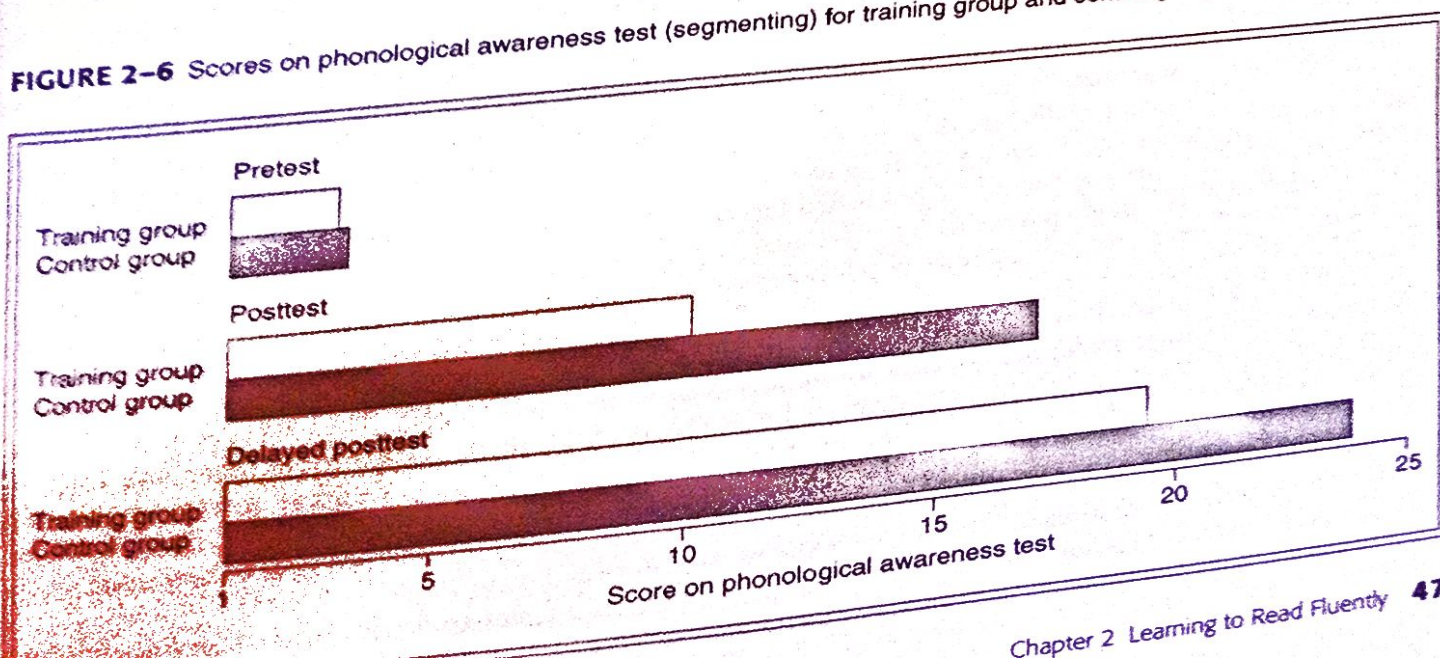
Group	Phonological Awareness		Word Reading	Word Spelling
	Pretest	Posttest	Posttest	Posttest
Phoneme-trained	40%	72%	52%	46%
Control	40%	45%	10%	25%

Adapted from Bradley and Bryant (1983).

(2001) trained teachers in how to carry out 15 whole-class activities aimed at teaching phonological awareness. For example, in *Guess My Word*, the teacher pronounces words in a stretched-out fashion, such as "mmaasskk" and the children have to say the word. In *I'm Thinking Of*, the teacher says an onset rime such as "m—ask" and the children have to say the word. In another activity, the teacher says a word, such as "mask," and asks the children to segment it into its constituent sounds, /m/ /a/ /sk/. Teachers learned the activities by attending a full-day workshop and reading a manual. Teachers fit the activities into their normal language arts program, allocating no more than 45 minutes per week for 20 weeks.

Can less than 15 hours of learning activities have much of an effect on children's reading? To answer this question, let's compare the reading performance of kindergartners who received the phonological awareness training with equivalent students who received the school's regular language arts program. Figure 2-6 shows that the phonological awareness trained group showed considerably more improvement than the control group on a test of phonological awareness (segmenting spoken words into parts). Importantly, the

FIGURE 2-6 Scores on phonological awareness test (segmenting) for training group and control group



effect persisted even a year later. In addition, students who had received phonological awareness training also showed greater improvements in decoding as compared to students who received their regular reading instruction.

These results, like those of other training studies (Cunningham, 1990; Ehri et al., 2001; Ehri & Petersen, 2004; Lundberg, Frost, & Peterson, 1988), provide evidence that explicit instruction in phonological awareness can facilitate early reading skill. Indeed, they offer reason to suspect that the benefits of phonological awareness in young children extend beyond initial learning of basic reading skills. For example, Stanovich (1986) has shown how teachers may be initiating "a causal chain of escalating negative side effects" (p. 364) if they fail to provide phonological awareness instruction to beginning readers with poor phonological skills. The negative effects begin when students with poor phonological skills have more difficulty learning to read words, thus limiting the amount of text they are exposed to, which in turn reduces opportunities to develop automaticity in decoding. Without automated decoding skills, students must pay attention to the process of decoding words rather than to comprehending the meaning of what they are reading. The consequence is a more limited vocabulary and knowledge base compared to those acquired by more skilled readers. Research on phonological training suggests that it may be possible to break this chain before it starts.

Although phonological awareness does not develop naturally in some children, there is encouraging evidence that it can be taught. In reviewing research on phonological training, Spector (1995) concludes that "the research to date provides clear evidence that phonemic awareness training works" (p. 47). Based on this research base, Spector recommends engaging "children in activities that direct their attention to the sounds in words . . . at the preschool level" (p. 41). This advice includes teaching students both to segment (i.e., analyze words into their constituent sounds) and to blend (i.e., to combine sounds into words) in addition to offering instruction in letter-sound relations.

More recently, several reviews of published studies have produced consistent support for phonological awareness training (Blachman, 2000; Bus & van Ijzendoorn, 1999; Ehri et al., 2001; Snow, Burns, and Griffin, 1998). For example, a review of 36 published research studies found that, on average, phonological awareness training had a strong effect on improving phonological awareness and reading skills. Bus and van Ijzendoorn (1999) conclude: "The training studies settle the issue of the causal role of phonological awareness in learning to read: Phonological training reliably enhances phonological and reading skills" (p. 411). In short, "phonological awareness is an important but not a sufficient condition for learning to read" (p. 412).

In a review of 52 published research studies, Ehri et al. (2001) found strong and consistent evidence that 5 to 18 hours of phonological awareness training improved children's performance on tests of phonological awareness and, more importantly, on word reading and on reading comprehension. The researchers concluded that "phonemic awareness instruction is effective . . . in helping children acquire phonemic awareness and in facilitating transfer of phonemic awareness skills to reading" (p. 260). The effects of instruction on learning to read were stronger for at-risk students than for normally progressing students and were stronger when instruction focused on helping students master one or two phonological skills rather than exposing them to multiple skills. Overall, the preponderance of evidence shows that phonological awareness is "a skill essential to becoming a proficient reader" (Blachman, 2000, p. 495).

Goswami and Bryant (1992) provide a useful summary of the instructional implications of phonological awareness research:



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There can be little doubt that phonological awareness plays an important role in reading. The results of a large number of studies amply demonstrate a strong (and consistent) relationship between children's ability to disentangle and to assemble the sounds in words and their progress in learning to read. . . . There is also evidence that successful training in phonological awareness helps children learn to read. . . . [P]honological awareness is a powerful causal determinant of the speed and efficiency of learning to read. . . . However, it is only the first step. (p. 49)

The next step seems to be the development of cognitive processes for decoding words, which is examined in the next section.



Decoding Words

WHAT IS DECODING?

Decoding refers to the process of translating a printed word into a sound. First, please read the following words aloud: *dog, table, jump*. This is an example of decoding regular words, and is sometimes called *word identification skill*. Regular words are commonly used words, i.e., words frequently found in printed material. Second, please read the following words, aloud: *blud, wight, frish*. This is an example of decoding nonwords (or decoding pseudowords), and is sometimes called *word attack skill*. Pseudowords are pronounceable based on phonics rules but are not real words. A highly similar task involves asking students to read words that they have never seen before—i.e., unfamiliar words.

How can we tell if a student is proficient at decoding? The two most common tests of decoding skill are asking students to translate printed regular words into sounds (i.e., word identification skill) and asking students to translate printed pseudowords or printed unfamiliar words into sounds (i.e., word attack skill). We can measure the student's decoding accuracy—by counting the number of times the student makes the correct sound—the student's decoding speed (also called *efficiency*)—by counting the number of correct decoded words per minute. High proficiency is indicated by a high rate of accuracy and speed.

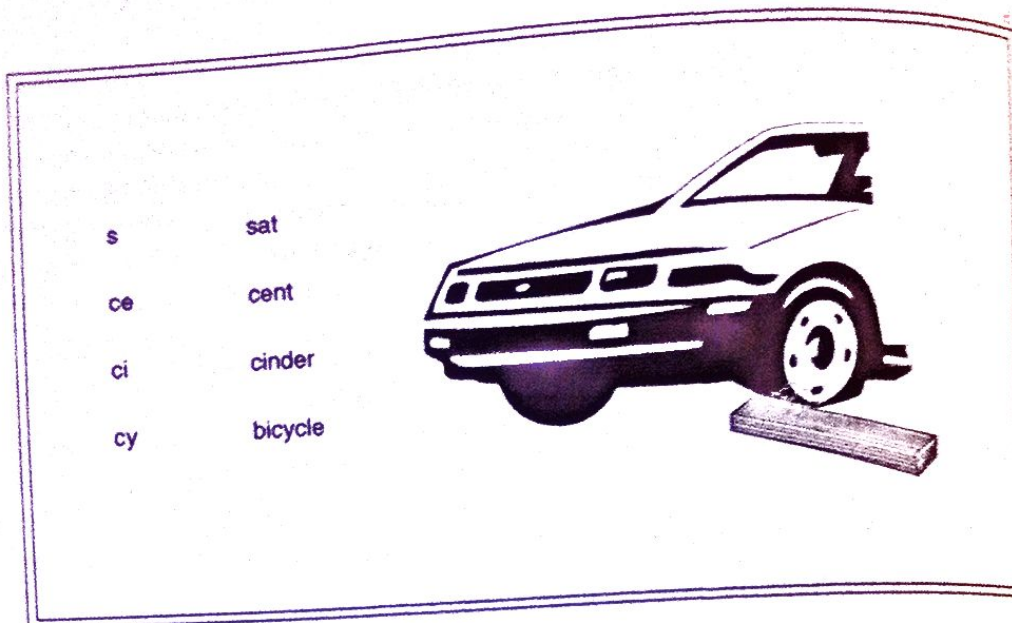
As you can see, decoding is a rather restricted process, for it involves being able to pronounce (or name) printed words rather than being able to explain what they mean. However, fostering skill in decoding is at the center of early reading instruction and represents one of the most important goals of academic instruction in the primary grades. In this section, we explore the long-standing debate over how to teach decoding, some major research findings related to decoding, and instructional research on decoding training.

THE GREAT DEBATE

One of the great debates (Adams, 1990; Chall, 1979, 1983, 2000; Pressley, 1998) in the teaching of reading concerns whether to use a *phonics* or a *whole-word* approach. The phonics (or *code-emphasis*) method involves teaching children to be able to produce sounds for letters or letter groups, and to blend those sounds together to form words. Adams (1990) notes that the central component in phonics instruction is "teaching of correspond-

FIGURE 2-7

Phonics instruction involves associating sounds with letters or letter groups



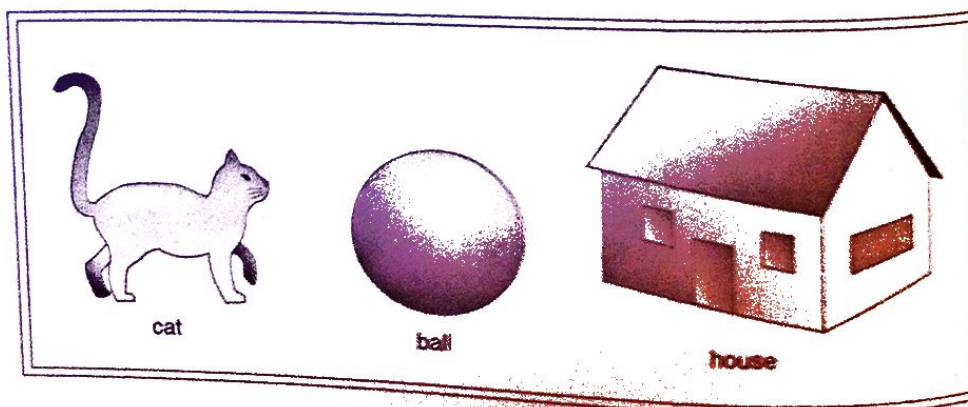
Adapted from Open Court Phonics Kit (2002).

between letters or groups of letters and their pronunciations" (p. 50). For example, Table 2-1 lists 42 basic sounds in spoken English and gives examples of letters that correspond to the sounds. Readers must learn to associate the appropriate sound with the appropriate letter(s). Figure 2-7 shows a picture of a flat tire (making the "sssss" sound) along with letters that can correspond to this sound.

In contrast, the whole-word method involves teaching children to "sight read" words, that is, to be able to pronounce a whole word as a single unit. For example, an early reading program may concentrate on introducing a few hundred words. Figure 2-8 shows some typical first words to be learned by beginning readers. Over time, new words are systematically added to the reader's repertoire. The whole-word approach is generally part of a *meaning-emphasis method*, in which determining the meaning of each word is a major goal. A somewhat related alternative to the phonics approach is the whole-language

FIGURE 2-8

Whole-word instruction involves associating word names with printed words



approach, which emphasizes the development of the child's overall language ability by integrating reading, speaking, listening, and writing, and by using authentic literature rather than drill on phonics subskills (Chall, 2000).

The history of reading research in the United States documents several swings between the phonics and whole-word approach (Adams, 1990; Chall, 2000). In the beginning, during the 1700s, the phonics method was emphasized. The standard textbook was *The New England Primer*, originally published in 1690. First, children learned the alphabet; then, they learned to read two-letter combinations ("ab," "ac," "ad," "al," and so on) and consonant-vowel syllables ("ba," "da," "ca," and so on); next, children were asked to read words containing up to five syllables. Students were drilled on the correct pronunciation for each syllable and the correct spelling of words until they could spell and read short words by sight. Finally, children orally read sentences and stories and afterward answered comprehension questions.

The phonics tradition was heavily used through the early 1800s, when the dominant textbook was *The American Spelling Book*. Published in 1790, this book, like *The New England Primer*, progressed from alphabet to syllables to words. However, whereas *The New England Primer* focused on religious material, *The American Spelling Book* focused on national loyalty and traditions.

During the mid-19th century, there was a swing to the whole-word method. The dominant textbooks were *McGuffey Readers*, which appeared between 1836 and 1844. They systematically introduced a new word by letting the student see the word, hear the word, see a picture or sentence referring to the word, and later spell the word (or break it into sounds). Unlike previous texts, *McGuffey Readers* were a graded series that allowed children to be grouped by age and achievement. By the 1880s emphasis was placed on the reading of fine literature, prompting a return to the phonics method of instruction. The scientific alphabet was introduced in 1902; it consisted of 44 phonemes along with 44 corresponding symbols. Students learned to write sentences phonetically, using these symbols. Other techniques involved teaching students to sound out words before giving any hints with pictures or sentence context.

By the early 1900s scientific research in education was influencing reading instruction. In schools, silent reading rather than oral reading was stressed. For example, as an introductory lesson a teacher might write "Come here" on the blackboard; students would then carry out the commands as written. Emphasis was also placed on getting the meaning out of stories; teachers would question children about their experiences before asking them to read a story. Students learned to recognize whole words before they learned how to break them into parts.

Since the end of World War II, the dominant reading textbooks in American schools have been basal readers. Like *McGuffey Readers*, the modern basal readers are an integrated and graded series of reading books and activities, with each successive book in the series requiring more sophisticated and difficult reading skills. Most basal readers employ aspects of both the whole-word and phonics approach, but according to many critics (Flesch, 1955; Singer, 1981), more attention is given to whole-word methods. For example, Flesch's (1955) famous book *Why Johnny Can't Read and What You Can Do About It* called for a shift back to the phonics method of instruction. Chall (2000) notes that whole-word methods dominated in the early 1900s, reaching their high point in the 1920s; phonics methods made a comeback in the 1960s through the early 1980s; and then the whole-language approach of the late 1980s and 1990s brought back the antiphonics conceptions of the 1920s.