EQUIPPED FOR READING SUCCESS

A Comprehensive, Step-By-Step Program for Developing Phonemic Awareness and Fluent Word Recognition

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CHAPTER 2

UNDERSTANDING PHONOLOGICAL AWARENESS

The findings from countless research studies have been consistent and clear: Students with good phonological awareness are in a great position to become good readers, while students with poor phonological awareness almost always struggle in reading. Poor phonological awareness is the most common cause of poor reading. Reading problems can be *prevented* if all students are trained in letter-sound skills and phonological awareness, starting in kindergarten. You may have heard there is a neurological/genetic basis for reading difficulties. This is accurate. This is apparently because phonological awareness difficulties often have a genetic basis. However, the good news is that despite their neuro-developmental origin, these difficulties are preventable and correctable.

Auditory skills or phonological skills?

Some students with learning difficulties are described as having *auditory* problems. *Auditory* refers to *all* of the sounds we hear, while *phonological* refers only to the sounds of spoken language. Students with learning problems do not typically have auditory problems unrelated to speech sounds. They can understand and produce spoken language because their phonological issues relate to parts of words, not whole words. However, reading is a struggle for them because our alphabet is designed to encode parts of words, and they struggle to connect parts of spoken language to their alphabetic forms. In sum, such individuals have phonological difficulties, not general auditory difficulties.[1]

Phonological Awareness or Phonemic Awareness?

Phonological awareness is an umbrella category. *Phonemic awareness* is a specific skill under that umbrella. Phonological awareness includes all of the following:

- Word Awareness
- Syllable Awareness
- Rhyme awareness
- Alliteration & Initial Sound Awareness
- **Phoneme Awareness**

The difference between the two can be defined as follows:

Phonological awareness: The ability to recognize and manipulate the sound properties of spoken words, such as syllables, initial sounds, rhyming parts, and phonemes.

Phoneme awareness: The ability to recognize and manipulate individual *phonemes* in spoken words.

[1] So, saying these students have "auditory difficulties" is somewhat imprecise.

From this we see that *phonemic* awareness is a specific *type* of phonological awareness. In fact, it is the type of phonological awareness that is necessary for proficiency in reading. The other types of phonological awareness provide the foundation for phonemic awareness. *By themselves, these easier phonological skills do not result in skilled reading*. Many children with reading difficulties lack phonemic awareness, but they can demonstrate the easier phonological awareness skills.

What is a phoneme?

The word *phoneme* comes from the Greek word *phonos*, which means, "sound" or "voice." A phoneme is the smallest unit of sound in *spoken* words. In our alphabet, *written* letters are designed to represent the phonemes used in spoken language. For example, the word *sat* has three phonemes (/s/ /a/ /t/).[2] It also has three letters. Each letter represents one phoneme. However, letters and phonemes are not the same thing. Phonemes are *oral* and letters are *written*. Phonemes are the smallest parts of *oral* words. Letters are the smallest parts of *written* words.

Often, phonemes and letters do not match up. For example, there are four letters in *bake,* but only three phonemes (/b/ /A/[3] /k/). In the printed word *shoe,* there are four letters, but the oral word has only two phonemes (i.e., two sounds). The *sh* represents one sound and the vowels *oe* team up to make one sound. Thus, four letters represent two phonemes. So *bake* and *shoe* do not have a one-to-one match between letters and phonemes. *Teachers and parents must understand the difference between phonemes and letters to successfully train phonemic awareness*. Remember: phonemes are *oral* and letters are *written*.

Many words have the same number of phonemes as letters (e.g., *van, red, Tom, sit, told*, *splash)*. However, in many words there is a different number of letters and phonemes (e.g., *bike, then, boat, tree)*. Try this quiz. How many phonemes are in these words?

time ___ loose ___ new ___ guess ___ best ___ though ___ box ___

How did you do? See the footnote below for the answers.[4] Notice how the words *guess* and *loose* use five letters to represent only three phonemes. Also, *guess* and *yes* share the last two sounds, but represent those sounds with a different number of letters. Two words of interest are are *though* and *box*. The word *though*[5] uses six letters to represent only two phonemes! *Box* has three letters but four sounds/phonemes. This is because the letter *x* is the only letter that has two sounds in it (/k/ /s/; consider that Boston's baseball team is named the Red *So*<u>*x*</u>*,* not Red *Soc*<u>*ks*</u>*,* and <u>*fax*</u> rhymes with *sn*<u>*acks*</u>*)*. These examples illustrate the difference between letters and phonemes. Normally they match up, but in English, they often do not.

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[2]Slash marks on each side of letters mean I am referring to the *sound* represented by that letter, not the letter itself.
[3]A capitalized vowel between slash marks (e.g., /A/) represents the vowel's "long" sound.
[4]*Time* = 3; *loose* = 3; *new* = 2; *guess* = 3; *best* = 4; *though* = 2; *box* = 4.
[5]Keep in mind that the digraphs *sh, th, ch, wh, ph,* and *gh* each represent a single phoneme.

What is the difference between phonics and phonemic awareness?

Often confused, phonics and phonemic are quite different. Phonemic awareness was discovered in the 1950s-1960s in the fields of linguistics and speech pathology. It deals with *spoken* language. By contrast, phonics was developed nearly 200 years ago in the field of education. It deals with *written* language. Below is a description that helps distinguish the two:

- PHONICS has to do with the *printed* language. It deals with the letters and the various sounds represented by those letters. It is a strategy for sounding-out words. It is an academic skill.
- PHONEMIC AWARENESS has to do with sounds in *spoken* words. It has nothing *directly* to do with letters.[6] It is an awareness of the sounds in *spoken* language. It is a mental/linguistic skill.

A good way to remember the difference between the two is that *you can do phonemic awareness with your eyes closed but you cannot do phonics with your eyes closed*. Phonemic awareness deals with *oral* input, phonics with *visual* input. Table 2.2 presents the differences.

There are many instances in which phonics and phonemic awareness are inconsistent with one another. If you spell *make* backwards, you get *ekam*. But if you *say* the word *make* backwards, you get the word *came*. Think about it. The first sound in *make* is /m/, followed by the long *a* sound (/A/), and finally the /k/ sound. Reverse the order of those sounds and you get /k/ /A/ /m/, that is, *came*. This doesn't work when you do phonics backwards, but it works when you say the *sounds* backwards. While they differ in various ways, phonics and phonemic awareness are both needed for students to become successful readers. How this is the case will be explained in Chapter 4.

	Field of Origin	*Domain*	*Skill Type*	*Role in Reading*[7]
PHONICS	Education	Written Language	Academic	Sounding out new words
PHONEMIC AWARENESS	Linguistics/ Speech Pathology	Spoken Language	Mental/ Linguistic	Supports word storage *and* phonics

TABLE 2.2
KEY DIFFERENCES BETWEEN PHONICS AND PHONEMIC AWARENESS

What does "awareness" mean in the term *phonemic awareness*?

By age one, most children can tell the difference between two words that differ by only one phoneme. For example, they can distinguish between *us* and *up,* or *toy* and *boy,* or *came* and *game*. Each word in these word pairs differs by one phoneme. Speech pathologists call this

[6]Phonemic awareness is certainly *related* to reading but the connection to letters is *indirect*. For example, the oral sound /z/ can be represented by different letters, like *s* (*has, is*) or *z*. Phonological awareness is about understanding and being aware of the sounds we make when we say words. The minute you introduce letters, you have left the realm of phonological awareness and entered the realm of phonics.

[7]This is a slight oversimplification. The letter-sound element of phonics is critical for permanent word storage, but the phonic rules are not. Also, phonemic awareness appears to assist with sounding out new words.

phoneme discrimination. However, it is not until age 6 or 7 that children can understand *why* these words sound different from one other. Understanding why words sound different is phonemic *awareness*. One of the earliest reports on phonemic awareness was from 1963 in *The Journal of Soviet Psychology and Psychiatry*.[8] The report describes a dialog between a researcher and two school children. The first child was four-year-old Sasha:

Researcher:	What's your name?
Sasha:	Sasha
Researcher:	Nice to meet you Asha
Sasha:	But my name is Sasha.
Researcher:	That's what I said, 'Asha,' right?
Sasha:	No, you said 'Asha' but my name is 'Sasha'
Researcher:	But aren't those the same, 'Sasha' and 'Asha'?
Sasha:	No!
Researcher:	Then how are they different? They sound the same to me.
Sasha:	(no response).

Sasha could not tell him *why* the names were different. She knew the two names sounded different, but had no idea why. Next, we are told of a first grade boy by the name of Igor.

Researcher:	What's your name?
Igor:	Igor.
Researcher:	Nice to meet you Gor.
Igor:	No, my name is 'Igor,' not 'Gor,' you forgot the *I* at the beginning.

Igor immediately knew *why* the names were different. This illustrates the *awareness* part of phonemic awareness. Both children had good phonemic *discrimination*—they immediately noticed the difference between their names and the names the researcher used. However, only the first grader knew *why* the names were different. Sasha did not have phonemic *awareness*. She was not aware of why the names sounded different. Being aware of the individual phonemes is not necessary to understand the flow of spoken language. But when oral language gets matched up with written letters, phoneme awareness becomes a necessity (see Chapter 4).

Important Note: If you suspect a student has difficulty with phonemic *discrimination,* refer that student to the school nurse and a speech pathologist. Impaired phonemic discrimination can affect both reading and general language development.

But don't most children read well without phonemic awareness training?

Absolutely! About 60% to 70% of children develop phonemic awareness very naturally, without being taught. Other children will never develop those skills unless they are directly taught. Yet phonemic awareness is not "optional" if one wants to be a good reader. It's just that some students develop it naturally as they learn to read, while others do not.

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[8]Russian speech pathologists discovered phoneme awareness in the 1950s. The connection between phonemic awareness and reading emerged in the late 1960s from the husband-wife team of Alvin Liberman, a linguistics professor at Yale, and Isabel Liberman, a cognitive psychologist at the University of Connecticut.

Phonemic awareness and intelligence

There is only a small correlation between phonemic awareness and IQ scores. Some children with low IQs develop good phoneme awareness and become good word readers. They often don't understand what they read, however. By contrast, there are many students with average to above average IQs who have poor phonemic awareness. These students represent the dyslexic or compensator type of poor readers mentioned in Chapter 1. Such students are puzzling to teachers and parents because of our intuitive assumption that if a student is "smart enough," he or she should be able to easily learn to read.

Which children should receive phonological/phonemic awareness training?

Starting in kindergarten, *all* children should receive phonological awareness training. This is due to the fact that not every child who is destined to have phonemic awareness problems can be identified in kindergarten.[9] If *all* children are trained starting in kindergarten, potential reading difficulties can be prevented or minimized. This prevention effect has been demonstrated in many studies. By training *all* children starting in kindergarten, fewer children struggle later. This manual provides everything needed for such training.

Second, typical first and second graders can learn to read more quickly and efficiently when they are trained in phonemic awareness. All schools are interested in boosting the performance of their "average" students. Early phonological awareness training is a great way to do it. This would allow students to focus more on comprehension earlier in their reading careers because they can more quickly build a large sight vocabulary.

Finally, there are many bright students who never develop to their potential because teachers are not aware these students have phonemic awareness difficulties. These are the compensators mentioned in the previous chapter. With much effort and compensation, these bright children perform average to low average in word-level reading. But because their overall reading comprehension is average, they normally do not receive extra help. They simply underachieve relative to their potential. Training all students in phonemic awareness could prevent much of this type of problem (see Chapter 13).

Which ages or grades should receive training?

Training the most basic phonological awareness skills (e.g., rhyming, alliteration, first sound awareness, and syllable segmentation) can start in pre-school. This would involve reading stories that contain rhyming and alliteration and various word games. One British study demonstrated that children with exposure to the classic nursery rhymes in preschool were better readers by the end of second grade than children without such exposure. This was true even though the two groups were matched for socioeconomic status. Thus, reading stories with rhyming and alliteration may help develop phonological awareness. Other studies have

[9]Most basic phonological awareness problems can be detected as early as the first half of kindergarten, before reading problems have a chance to develop. However, not *all* children with this problem can be detected early.

also shown this link. Children who are read to in preschool (and beyond) tend to have stronger letter knowledge and phonological awareness than children who were not.[10]

Formal approaches to training phonological awareness can start with kindergarteners, including rhyming, alliteration and clapping out syllables. This should start in early in the kindergarten year. Children should arrive at first grade with the phonological awareness they need to efficiently acquire reading.[11]

Phonological awareness continues to develop along with early reading skills. All students should get phonological awareness training through the end of second grade. After second grade, students should be screened for phonemic awareness skills using phonological manipulation activities (see Chapter 7). If a student seems to have mastered these skills and is doing a fine job reading, then further training is unnecessary. However, students who have not mastered these skills should get training. *There is no age where a student is "too old" for phonemic awareness training—if the skills have not been mastered, the student should get training*. Research has shown that older, struggling readers almost always have difficulties in phonemic awareness that were never addressed. Such individuals will continue to struggle with reading until this difficulty is corrected.

High school students and adults who are weak in phonemic awareness (and therefore weak readers) should get training. In our public middle schools, high schools and colleges, students who are weak readers are provided with strategies to "work around" their weak reading skills. It is assumed that if they have not developed proficient reading by that point, they won't ever develop it. However, as mentioned, these students almost always have phonemic awareness difficulties that were never detected or trained. This is a perfectly correctable cause of their difficulties, and we are unknowingly letting them continue to struggle when they really do not need to. *There is no statute of limitations on training phonemic awareness skills when they are weak* If students at any age are poor readers, check their phonemic awareness skills, and address them if they are inadequate.

Summary

Phonemic awareness is a linguistic skill that is essential for learning to read. It is different from phonics, though the two are both important for reading. Phonemic awareness works alongside phonics to allow children to master the skill of word recognition. Phonemic awareness is arguably the most common source of reading difficulties. The good news is that it is trainable. This manual provides everything needed for that training.

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[10]For most children, phonemic awareness difficulties have a genetic basis. There are many children whose parents read to them in their early years yet they still struggle in reading. The good news is that even phonological awareness difficulties of genetic origin generally respond to direct phonological awareness training.

[11]This assumes the reading approach is developmentally appropriate, which most are not (see Chapter 5).

CHAPTER 4

ORTHOGRAPHIC MAPPING AND SIGHT WORD LEARNING:
WHY WE NEED PHONEMIC AWARENESS

Phonemic awareness is a critical cognitive/linguistic skill needed to store words for immediate, effortless retrieval. The connection between phonemic awareness and permanent word storage is not the least bit obvious. Our intuitions ask, "Isn't phonemic awareness *auditory* and our memory for words *visual*?" In this chapter, you will learn what scientists have discovered about how words are stored. You will also see why phonological abilities are so important in this process. The focus will be on *phonemic* awareness and not *phonological* awareness. This is because storing words in permanent memory requires *phoneme* level skills.

In education, the term *sight word* has at least three meanings.[1] We will be using only one. A *sight word* is a familiar written word that we recognize instantly, automatically, and effortlessly, without sounding it out or guessing. It doesn't matter if the word is phonically regular or irregular. The point is that a word is immediately recognized. A *sight word vocabulary* (or simply *sight vocabulary*), refers to all of the words a student knows instantly and automatically. Phonemic awareness plays a central role in building a student's sight vocabulary. This may seem puzzling because most people assume that we store words based on visual memory. However, we will see how scientists have shown that this is not the case.

What scientists used to think about how we store words

Until recently, almost everyone thought that we store words by having some type of visual image of every word we know. This assumption is based upon strong intuitive evidence. It *feels* like we are rapidly accessing words from a visual storage bank of some sort. As soon as we see words, they *look* familiar so we recognize them as quickly as we recognize other visual input like objects or faces.[2] The process would look something like this:

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[1]The term *sight word* is used by many to refer to irregular words that cannot be easily sounded-out. We will call those words "irregular words" or "exception words." *Sight word* has also been used to refer to a type of reading approach, the *sight word approach,* which has also been called the *whole word, look-say* or *basal approach*.

[2]Actually, good readers can recognize printed words faster than objects and colors! This speed difference was discovered and reported in a scientific journal about 130 years ago (Cattell, 1886). It was an early, unrecognized clue that word recognition does not use the same memory process as visually remembering objects.

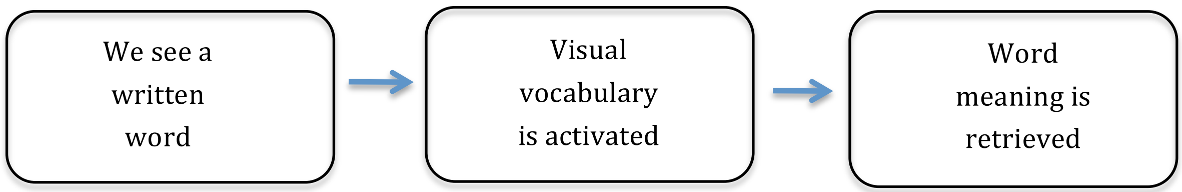

FIGURE 4.1

A TRADITIONAL VIEW OF SIGHT-WORD MEMORY AND RETREIVAL

It was assumed this visual memory system contained all the familiar visual images of the words we know. Almost everyone believed some version of this theory, but it turns out that everyone was wrong! Despite the strong intuitive appeal and widespread acceptance, scientific research has demonstrated that this view is incorrect. There are several types of research findings that disproved the "visual memory" theory of word storage. I will describe one.

Researchers had college students read words in mixed case (e.g., every other letter in each word was uppercase; WoRdS lOoKeD lIkE this). The researchers reasoned that because mixed case words do not match a previously stored visual image, students would have to slow down to identify the words. Not surprisingly, the adult readers (i.e., college students) identified the mixed case words more slowly than normally printed words. At first, researchers thought this supported the "visual memory" view. Later studies, however, showed that the slower pace was because the students were not accustomed to seeing words printed in this unusual manner.[3] So they trained the students using a set of mixed case words so they would get used to seeing words printed that way. After the training, students read a fresh pool of words they had *never seen* in mixed case. The students were able to recognize these new words in mixed case as fast as they could recognize those same words in normal print! This convinced the researchers that these readers were not matching those words to stored visual images because they had never seen those specific test words printed that way before.[4] Something else was going on.

Years ago, I had an experience that illustrates this finding. By late second grade, my second son Kevin was a fluent reader. We had borrowed some *Calvin & Hobbes* comic strip books. Kevin had *no* previous exposure to comic strips. Yet with his first try, he read them aloud as quickly and fluently as he read anything else. This surprised me because comic strips are written in all capitals! There was no way Kevin had seen all those words before in all capitals so that he could have already stored visual images of them. Something else was going on.

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[3]We have all experienced this when we get a wedding invitation or graduation announcement and it uses a very ornate font. It is difficult to read the first few words or sentences, but by the end we adjust and can read it just fine.

[4]In a different study, researchers flashed mixed-case words on a screen very quickly (1/20th of a second), just fast enough to be seen and processed. Students had no difficulty recognizing the words. Many students didn't even notice that the words were mixed case. A few students argued with the scientists, insisting the words were not mixed case! Thus, it was the *the specific order of the letters* that allowed them to identify the words. That letter order apparently registered in their brain faster than a conscious awareness of the physical way the letters were printed. So the letter order was important for recognizing the word while how the word actually looked was not.

One thing we know isn't going on when we read that quickly is phonic decoding. There is no way Kevin (or those college students) could "sound-out" and blend words that quickly. If they were not sounding out these words, and they were not retrieving a visual image, then something entirely different was involved. It had to be something that was not very obvious at all. It was something that had escaped reading researchers for nearly a century. But one thing was certain. We are not simply retrieving a visual image of every word we read.

Challenging the belief that word recognition is based on visual memory

Most people assume that words are stored in visual memory. Many teaching approaches presume this. We assume that if students see the words enough, they will learn them. This is not true. Children with reading problems often cannot remember new words, even after many exposures. When they finally learn new words, they may forget them over school breaks or even long weekends. We mistakenly blame their visual memories. Meanwhile, average readers learn new words very quickly. Good readers only need one to five exposures to new words to learn them. Then, once learned, they don't forget them.

I believe this assumption that we store words based on visual memory is a major reason why we have widespread reading difficulties in our country. *Until we properly understand how to promote permanent word storage, we will continue to have many weak readers.* Listed below are several factors that demonstrate how scientists know that we do not remember words based on "visual memory." The list is not exhaustive, but should establish the point:

1) As described above, mixed case experiments have demonstrated that we are not retrieving words from a visual memory bank.

2) Closely related to the first is the everyday phenomenon of reading words fluently in various fonts and typestyles, all capitals (like comics), and a wide variety of people's personal handwriting, whether their handwriting is cursive or manuscript. It is difficult to believe that that we have a visual memory for all those versions of all the words we know.

3) A footnote above indicated that about 130 years ago it was discovered that word recognition is faster than visual recognition of objects. Participants in the study said, "chair" faster when they saw the word *chair* than when they saw a picture of a chair. This provided an early hint that visual object recognition and word recognition may not involve the same mental process.

4) If word reading involves accessing visual memory, we would expect that children with reading problems would have poor visual memory. This is not the case. Research since the 1970s has shown that as a group, children with reading disabilities alone (i.e., they have no math or other learning difficulties) generally perform as well on visual memory tasks as children who are good readers.

5) There is only a very small statistical correlation between visual memory skills and sight vocabulary. By contrast, there is a huge statistical correlation between phonemic awareness and sight vocabulary. If word reading is based upon visual memory, why would an auditory/phonological skill like phonemic awareness correlate far more strongly with word recognition than with visual memory skills? This finding suggests that visual memory is not a major component of word recognition. While visual memory does not contribute much to word recognition, it does contribute to other aspects of reading (see below).

6) Studies using high-tech brain scanning techniques indicate that the regions of the brain activated when performing the visual memory task of naming objects (a chair, a house, a fork, etc.) differ from

the regions activated when naming familiar or unfamiliar written words. This finding is not consistent with the view that reading involves the retrieval of visual images of words.

7) Research on the deaf population is inconsistent with the visual memory view of word reading. Most students who are deaf graduate high school with about a third to fourth grade reading level. If reading was based on visual memory, those who are deaf should not be so impaired in reading. Thus, there are is no alternative "visual memory" approach the deaf population uses for efficient word recognition.[5]

8) Consider the fact that we all temporarily forget the names of common objects or familiar people. We "block" on them and it is frustrating. Consider how we occasionally block on the names of people we've known for years. By contrast, we do *not* forget printed words. When a familiar word is sitting in front of us, we do not block on it like we do in other visual memory situations. Reading is not like visual memory – something different is going on.

9) Scientists who study visual memory (unrelated to reading) have shown that we do not have a precise enough visual memory for efficient word storage. Our *visual* memory system is not capable of storing 40,000 to 90,000 words for immediate retrieval. Consider the following examples:

> Here's a visual memory quiz: In what direction(s) are the presidents facing on a penny, nickel, dime, and quarter? Researchers have tested adults' visual memories for such things and find it is far weaker than people realize. We have been exposed to those coins hundreds of times, and most people cannot correctly guess the proper direction of all four of them! How can we expect to remember thousands of words—many that look very similar to each other (e.g., *black, block, blink, bleak, brick, brink, break, broke, brisk, brush, blush,* etc.)? Our visual memories are neither precise enough nor efficient enough for that type of visual information (strings of letters). Many types of visual-spatial experiments have demonstrated similar results. We overrate our visual memory, plain and simple.
>
> When you look up a phone number, it is a visual task. The number is visual and your response is visual-motor (touching the phone's keypad). If our visual memories were so good that we could remember 40,000 to 90,000 words for immediate retrieval, then remembering a visual image of a phone number for 15 seconds should be very easy. But it is not. We translate that visual number out of the visual realm and into the auditory realm (we repeat it out loud or in our heads). Then we translate it back into the visual realm as we dial the number. Our visual memory is relatively weak and imprecise for sequences of numbers and letters. So, we must translate out of the visual mode to remember the number.[6]

Does visual memory play any role in reading?

The section above demonstrates that we do not store words based primarily upon visual memory. However, visual-perceptual skills, including visual memory, play important roles in other aspects of the reading process. The following are some of these aspects:

Alphabet recognition. Learning the alphabet letter names and letter sounds is based on visual-phonological memory. Children need to learn that the letter *m* makes the /m/ sound, and *s* makes the /s/ sound, etc. There is nothing about those little squiggly figures we call letters that would suggest any

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[5]It is encouraging that some researchers have had recent success with developing phonological awareness in people with profound deafness. Interestingly, their innovative techniques are linguistically based, and use multisensory techniques to develop those linguistic abilities (e.g., finger spelling, attention to verbal articulation and segmenting of speech sounds). Also, students with cochlear implants who are able to perceive the phonemes in language often develp normal reading skills.

[6]The example of the phone number deals with our temporary working memory buffer, while remembering words involves our long-term memory. However, similar results have been found with both types of memory.

given sound—it is all a matter of visual-phonological memorization. Also, visual memory is required to distinguish the letters *b, d, q,* and *p*. So, *visual memory is absolutely essential for letter learning*. But notice the difference between letter learning and word learning. For good readers, it only takes one to five exposures to new words and they are remembered. However, with letters, it takes children hundreds of exposures for a letter to become fully automatic in memory. Another interesting point is that this visual memory aspect of learning letters is typically *not* the culprit when children stuggle remembering their letter names or sounds. Recent studies have shown that it is the phonological aspect of this visual-phonological learning that is the problem.

Reading comprehension. There is a correlation between visual memory and reading comprehension. Presumably, if you can create a good mental visual-spatial representation of what is going on in the reading, you are better able to understand it. Also, such a representation may assist in later recall.[7]

So, visual-spatial-perceptual memory *is* likely to be a contributor to at least two aspects of the reading process (letter learning and reading comprehension). However, it must be made clear that there is no evidence that visual memory directly contributes to word recognition or reading fluency. As outlined above, we have enough evidence to dismiss the ingrained notion that we store words based upon visual memory. We need to stop teaching our children to read using methods based upon a faulty understanding of the reading process. However, this discredited view is still held by almost everyone in elementary and special education and it drives our teaching practices. *Adherence to this traditional view will guarantee that we will continue to have widespread reading failure. We will not improve the performance of poor readers until we adopt a proper understanding of how we store words.*

How then do we store words? We will now turn to this question.

What scientists now think—the discovery of Orthographic Mapping

Orthographic mapping is the mental process we use to permanently store words for immediate, effortless retrieval. Orthographic mapping is the process minds use to take an unfamiliar printed word and turn it into an immediately recognizable sight word. Orthographic mapping occurs fairly naturally and “behind the scenes” for most students. Simply expose children to literacy activities and over time they will learn to “map” words to permanent memory. In the research, orthographic mapping has gone by various terms like *direct mapping, the bonding hypothesis, unitization, the amalgamization hypothesis,* or *the representation hypothesis*. However, the developer of the theory now calls it “orthographic mapping.”

Having a good understanding of how words are stored will determine *what* we teach, and *how* we teach it. When a student’s orthographic mapping skills improve, his or her sight vocabulary grows. This leads to improvements in reading fluency and reading comprehension. So orthographic mapping is critical to reading fluency and comprehension.

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[7]Several studies in the research suggest that visual-spatial-perceptual skills influence reading comprehension. However, most researchers agree that more study of this needs to occur before they reach any conclusions.

An overview of Orthographic Mapping

When people talk, the words they say are represented by sequences of sounds. We immediately recognize those sound sequences as familiar words. It works lightning fast and looks something like this:

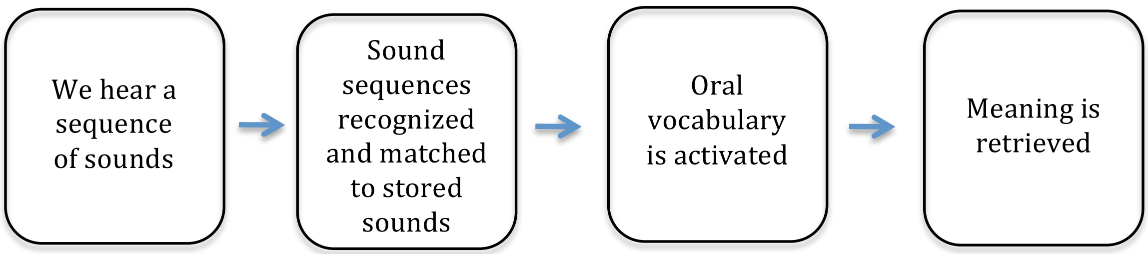

FIGURE 4.2

ACCESSING WORD MEANINGS IN LISTENING

We have a highly organized and efficient oral/mental filing system that allows us to instantly access the words that we hear. Our oral dictionaries are very fast. If they weren't, we would struggle to understand spoken language. The stream of sounds that we hear activates our oral/mental dictionaries. If someone speaks in an unfamiliar language, that stream of syllables is meaningless to us. Those sounds find no matches in our oral filing system.

The big discovery regarding orthographic mapping is that this oral "filing system" is the foundation of the "filing system" we use for reading words. We have no "visual dictionary" for reading that runs alongside our oral dictionary. I suspect that the reason this idea was not obvious to researchers for the last 100 years is simple: speech is *auditory* and reading is *visual*. Because reading involves visual *input,* everyone presumed that it also involved visual *storage*. However, input and storage are not the same thing. Like in the example from earlier in the chapter, we may *input* a phone number visually, but we *store* it auditorily.

To understand orthographic mapping you must understand the concepts of *meaningful letter strings* and *familiar letter strings*. A *meaningful letter string* is a sequence of letters in a meaningful order. For example, USA is a meaningful letter string because it stands for the United States of America. Those same letters in a different order are not meaningful letter strings (i.e., UAS or SUA). They are not meaningful because they are not in the order of the words they represent. There are two types of meaningful letter strings, 1) familiar and 2) unfamiliar. A *familiar letter string* is a string of letters that you immediately recognize, based on past experience. Consider the following "letter strings":

Meaningful letter strings				Random strings of letters	
Familiar strings		Unfamiliar strings		(not meaningful or familiar)	
FBI	NFL	NASP	IEEE	QNZ	STE
SPCA	IRS	SSSR	SBE	BASM	RWR

TABLE 4.1
EXAMPLES OF TYPES OF LETTER STRINGS

For those who live in the United States, the first group of letter strings in Table 4.1 should be familiar.[8] They are acronyms for four organizations in the United States. These strings of letters are meaningful because each letter in the string stands for a word (e.g., FBI stands for *Federal Bureau of Investigation*). As acronyms, these letter strings gain their meaningfulness because the letters represent the first letters of each word in the organization's name.

The letter strings in the second column also represent organizations. These letter strings are probably *not* familiar to the reader because the reader is probably not familiar with these organizations (e.g., SSSR stands for the *Society for the Scientific Study of Reading*).[9] Because they are acronyms, these letter strings are *meaningful*. However, the letter sequences in the second column are not familiar letter strings to most readers. They are not familiar because the reader does not have past experience with them. The letter strings in the first and second columns are equally *meaningful* (they are all acronyms), but they are not equally *familiar*.

Once familiar, these letter strings become *unitized*. That is, we treat that sequence of letters like a unit. For example, when we see FBI, we do not say "Hmm, F – B – I . . . Oh, FBI!" No, we see the letter string FBI and instantly know what it is. It is familiar to us, while FBU, or MBI are not familiar. we no longer have to *consciously* focus on the "parts" of the FBI letter string. Rather, we recognize that sequence of letters as a unit. However, any change in that sequence throws us off, as the examples FBU or MBI illustrate. So, it is the *sequence of letters in that specific order* that becomes familiar to us, and that sequence is made up of a precise set of individual letters, in a precise order, regardless of the "look" of the sequence (i.e., in what font it is printed or in whose handwriting it is written).

The last column contains random letter strings. As far as I know, they don't mean anything. They are non-meaningful, so there is almost no chance they are familiar. Familiar letter strings are familiar because we have remembered them. We have remembered them because they are meaningful. *Sequences that are not meaningful are very difficult to remember*. Because they are meaningless, there is little or nothing we can use to anchor them in permanent memory. By contrast, acronyms are easy to remember because when we first learn them, we recognize that they match up with the first letter of words, which help make them familiar more quickly.

Because acronyms are not words, they only provide an *analogy* to word reading. Yet they provide a helpful way to illustrate the concepts of meaningful letter strings and familiar letter strings. We must now apply these concepts to words. We will seek to answer two questions:

1) What is meaningful about the letter strings that make up printed words?
2) How do the letter strings become so familiar that we can instantaneously and effortlessly recognize them?

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[8]For those outside the United States: FBI = Federal Bureau of Investigation; NFL = National Football League; SPCA = Society for the Prevention of Cruelty to Animals; IRS = Internal Revenue Service.

[9]NASP is the National Association of School Psychologists, SBE is the Society of Broadcast Engineers, and IEEE is Institute of Electrical and Electronics Engineers.

Why written words are meaningful letter strings

The letter sequences in words are meaningful because the order of the letters is designed to match the order of the sounds in spoken words. For example*,* each letter in the word *stamp* is in the same order as its corresponding phoneme in the spoken word. If the letter order used to represent the oral word *stamp* was different, say *smapt,* then that order does not meaningfully represent the oral sounds in the word. This is the whole idea behind alphabetic writing systems. The letters are designed to represent the *sounds* in the oral words. While it is true that English has many "irregular" words (this will be addressed later), the basic idea of alphabetic writing is that the order of the written letters matches the order of the sounds in the spoken word. Hence, the letter strings represent the oral strings of phonemes in a meaningful way. Therefore, *by their very nature, written words are meaningful letter strings!*

Meaningful strings of letters (i.e., written words) can be anchored into permanent memory *if the reader is able to recognize why those letter stings are meaningful*. As mentioned, the letter sequence is meaningful because it matches the stored oral sequences of phonemes in spoken words. If a student has phoneme awareness, he can recognize this connection. If he does not have phoneme awareness, these letter strings are not meaningful to him, so it will be very difficult to remember those letter strings—it will be difficult for these letter strings to become "familiar." If they don't become familiar, reading is seriously compromised.

Consider this analogy. You have a room full of adults participating in a memory study. Half of the people are American sports fans. Half are Australians with no knowledge of American sports. Both groups have equal command of the English language. You give both groups the task of remembering random letter strings. They are told that the following strings of letters are random and should be committed to memory:

NFL	NBA	LPGA	MLB
WNBA	PGA	NHL	NCAA

Later, those in our imaginary study are asked to recall as many of the letter strings as they can. You can bet that the American sports fans would do far better than the Australians who had no exposure to American sports. All of the above letter strings are acronyms for American sports leagues. These are meaningful strings to American sports fans, and not meaningful to the Australian non-sports fans. The Australians were *not aware that these letter strings are meaningful,* so they would have a very hard time remembering them. To them, they were memorizing random strings of letters, which is very difficult.

It is roughly similar with orthographic mapping. First graders with basic phonemic awareness and good letter-sound skills are like the American sports fans. They immediately recognize that letter sequences in printed words have a meaningful relationship with the phonemes they hear in a spoken word. This is how they anchor words into permanent memory. They associate the string of phonemes in the word's pronunciation with the letter order in the written word. By contrast, children who are weak in phoneme awareness or letter-sound skills are like the Australians from our example. Because they lack one or both of these skills, *they do not recognize the meaningfulness of the letter strings that make up printed words*. For these students, remembering letter strings is very difficult because they do not have a reliable way to do it. It is as if they were trying to remember random letter sequences. Thus, they have an uphill battle trying to make those letter strings "familiar" and instantly recognizable. They therefore cannot remember words efficiently, so they struggle in reading.

This is the basic difficulty in reading acquisition. Children who struggle with phonemic awareness and/or letter-sound skills struggle in reading. Why? *Because the letter strings they see are not meaningful to them, which makes them very difficult to remember*. These children rely on ineffective cues and hints to remember words, such as guessing based on the first letter of the word, the length of the word, and context. Until these foundational skills are developed, a student will not have an efficient way to make letter strings familiar. Students with good phonemic awareness naturally associate printed letter strings with the sounds in spoken words and therefore remember the words they read. Phonemic awareness allows the student to make effective use of the lightening-fast oral dictionary we use for spoken language.

While phonemic awareness and letter-sound skills are equally important for mapping, phonemic awareness difficulties are more commonly the problem. The vast majority of students with word recognition difficulties lack sufficient phonemic awareness. Students with problems in both struggle the most.

In recent years, a greater emphasis has been placed on phonics or letter-sound skills due to the research supporting its importance. But research has also supported the importance of phonemic awareness in learning to read. Yet while many teachers have heard phonemic awareness is important, there is not much clarity as to why it is important. As teachers learn more about the mapping process, it should become clear why both phonemic awareness and basic phonics (i.e., letter-sound skills) are critical for remembering words as sight words.

To illustrate, consider two students in late first grade. For the first time, they see the word *sent*. They both have the letter-sound skills needed to sound it out. The first student has phonemic awareness while the second does not. The first student immediately notices that the spelling of *sent* aligns perfectly with the phonemes in the spoken word *sent* (/s/ /e/ /n/ /t/). For this student, it will be easy to remember that sequence and distinguish it from other, similar looking sequences (e.g., *set, send, scent,* or *cent*). However, the student with weak phonemic awareness skills will not be aware of the sounds in *sent*. He will not notice the meaningful relationship between the spelling *s-e-n-t* and the phoneme sequence in the spoken word. To him, *s-e-n-t* is no more meaningful of a way to represent *sent* than *s-n-e-t, s-t-e-n,* or *s-e-t-n*. Why would *s-e-n-t* be a more suitable way to represent the spoken word *sent* than those other ways if the student has no way of noticing the sounds within the spoken word *sent*? There is really *no* reason that *s-e-n-t* is more meaningful than those other letter orders (e.g., *s-n-e-t*) *unless* you have an awareness of the individual sounds within the spoken word *sent*. But that is precisely what students with poor phonemic awareness do not have. They are not aware of the oral sequences within spoken words, so there is little or nothing meaningful about the letter order in the printed words they see.[10] If there is nothing meaningful about the letter order, then

[10]The exception to this is with the first letter and first sound in a word. Even most reading disabled students can notice the first sound in spoken words and they can match first sound to the first letter. But with so many words

only inefficient, raw memorization is possible, and sight vocabulary growth is dramatically hindered.

This is the essence of what researchers call the *alphabetic principle*. The alphabetic principle is the idea that at some point, it dawns on children that the written letters match up to the phonemes in spoken words. This may seem obvious to us, but to a beginning reader, it is not. They gain this insight through early literacy activities and/or phonics instruction. Without the combination of good phonemic awareness and good letter-sound skills it is very difficult for students to develop the insight we call the alphabetic principle.

Making letter strings familiar: How we map

Letter strings are considered *familiar* if we can immediately recognize them. In fact, the concept of "familiar letter strings" is another way of saying "words in our sight vocabulary." You will recall that a *sight word vocabulary* refers to the pool of words we can instantly recognize, without guessing or sounding them out. How do we make letter strings familiar? It is a multi-step process that begins with the letters. Without automatic letter-sound skills, orthographic mapping is inefficient or impossible. This cannot be emphasized enough. Letter-sound skills are not optional for the efficient permanent storage of words—they are essential.[11]

When a student learns a letter/sound combination to the automatic level, the sight of that letter immediately and effortlessly activates the sound associated with it.[12] When the student sees the letter *t,* the /t/ sound is instantly activated in the temporal lobes (the area of the brain that stores auditory/phonological information). Letter-sound associations are learned during preschool, kindergarten, and first grade for most students. Children often require hundreds or even thousands of exposures to letters before they are mastered to the point of automaticity.[13] Once automatic, the sight of the letter will activate the sound in memory just as quickly and efficiently as if the student heard someone produce the sound orally. In other words, whether they see the letter *t* or hear the /t/ sound, the memory for that sound is activated in the temporal lobes of the brain. This is probably why the areas of our brains that interpret speech are active even during *silent* reading. Whether sound information involves visual input (written letters) or auditory input (oral phonemes), similar memory centers in the brain are activated.

As skills develop, a string of two or more letters can activate the sounds associated with that letter combination. For example, when we see *ip* in a word, we do not have to determine the pronunciation of *ip* by sounding out both of the letters, *i* and *p*. We treat that letter combination and its pronunciation together, simply as *ip*. This means that *ip* is a "familiar letter string" which activates the corresponding pronunciation /ip/. There are many common words parts, such as rime units (*–et, –ig, –ap, –ot, –ut,* etc.), blends (*tr, bl, sn, cr, str,* etc.), suffixes (*–ing, –ed, –tion)* and prefixes (*re–, con–, un–, dis–*). When we see these common

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beginning with the same letter, this focus on the first sound is not very efficient.

[11] See Chapter 12 for more on letter-sound learning.

[12] Technically, it can activate more than one sound, if the letter has more than one sound associated with it. The context of that letter allows us to determine the correct sound and the others get "discarded." This happens so quickly that cognitive scientists call it "pre-cognitive," meaning it happens before we have time to think about it.

[13] As mentioned earlier, *letter* recognition is based on visual memory, even though *word* recognition is not.

letter strings in the context of words, their respective pronunciations are activated. When we see a rime unit, we don't have to access each letter sound separately. Rather, we treat the letters as a unit. If you identify *ip* by sounding it out one letter at time, that's phonic decoding. But if you instantly recognize *ip* because of past experience with it, that means it has become a familiar letter string to you. You no longer need to break it apart letter-by-letter.

But how do words or parts of words become familiar if not visually? Here is where phoneme awareness comes into play. Word parts, such as /ip/, are not words, yet they are still part of our existing oral language system. While /ip/ never appears by itself in our language, the sound /ip/ is familiar to a student with phonemic awareness. That student has /ip/ filed away in his oral dictionary as a *familiar part* of words such as *dip, hip, lip, rip, sip, zip, chip, clip, drip, flip, grip, snip, trip, whip,* etc.[14] If a student does not have phonological awareness, the simple two-letter string *ip* will not anchor to anything in particular in his memory. For that student, *ip* represents two random letters that must be memorized—he doesn't notice (i.e., doesn't have the *awareness*) that /ip/ is a common part of a whole bunch of words he knows. By contrast, if a student *has* phonemic awareness, he can notice (i.e., have *awareness* of) parts of oral words. Such awareness allows him to participate in a connection forming process between the letter combination and its pronunciation. This is the essence of phonemic awareness—being aware of the sound structure of spoken words. The letters of our printed language are supposed to represent the sounds of our spoken language. Therefore, we need to be aware of those sounds in spoken words in order to anchor their printed forms in permanent memory. The oral form of the word is already stored in memory. When we map, the letters of the printed form of the word piggyback onto the phonemes in our existing rapid oral filing system, which we use to understand spoken language. *If a student is not attuned to the sounds within oral words, there is no efficient way for printed words to become familiar letter strings.* There is nothing to which they can efficiently connect the strings of letters for later retrieval.

Some readers may think I'm suggesting that when we read we are doing "phonics" very quickly. This is not the case. I had the same first impression when I began to read the research on mapping back in 1997. What I am describing here is immediate sight word recognition, not sounding out words. Sounding out words takes longer than instant recognition. Phonic decoding focuses on one or two letters at a time. Immediate word recognition involves processing all of the letters at once. All of the letters in the word can be seen with a glance of the eye, and the entire letter string is recognized as a familiar. How is this?

Clues from Eye Movement Research

When we read, we attend to virtually every letter of every word we read. Various types of clever experiments have demonstrated this. If we did not attend to every letter of the words we read, we could not instantly recognize words that differ from one another by only one letter.[15]

[14]Not to mention the multisyllabic words that contain *ip (e.g., tulip, zipper, eclipse)*

[15]There has been a notion promoted by some in educational circles that we don't attend to every letter of every word we read. This may be true for weak readers, or good readers who are skimming. It is not true for typical reading. There is a popular e-mail "forward" circulating that purports to prove this. But that e-mail demonstrates a phenomenon called *contextual facilitation* and does not represent our normal word recognition processes.

Second, when we read, we experience the illusion that our eyes sweep evenly across the page. However, extensive eye movement research has demonstrated that our eyes move across a line of text in little jumps. We stop and fixate on a spot briefly, and then jump to the next spot.[16] Our eyes jump so quickly that during the jump, we take in no useful information—just an extremely quick blur. But during each fixation, we take a very brief "picture" of what we see. The perceptual system within our brain then "stitches together" these little visual "photographs" so that we feel like our eyes are moving smoothly across the page.

When our eyes fixate on a spot, we take in about 7-8 letters to the right of the fixation, and about 4-5 to the left.[17] This perceptual span of 11-13 letters allows us to take in all the letters of a big word, or all of the letters of a few small words. Those letters are taken in simultaneously, not in a sequence like when we phonically sound out words. When a reader encounters a string of letters, he or she immediately recognizes it as a familiar letter string, which in turn activates the oral word and its meaning. This does not occur one letter at a time from left to right, as is the case with phonic decoding. Rather, the visual span takes in *all* the letters at once; so all the letters simultaneously activate the oral word (just like we instantly perceive all the letters in acronyms like USA, NFL, and FBI). This simultaneous perception of all of the letters is why it feels like we read words as whole units. In one sense, we are reading them as whole visual units, given that all of the letters are activated at the same time. Yet it is not visual memory that activates the word, as was pointed about before. The activation occurs at the letter-phoneme level. *We recognize a letter string as familiar,* which in turn activates the word it represents. If activation did not occur at the letter level, we would constantly confuse look-alike words. The word's pronunciation and meaning are all activated together because they are all connected in memory, once the word is permanently mapped.

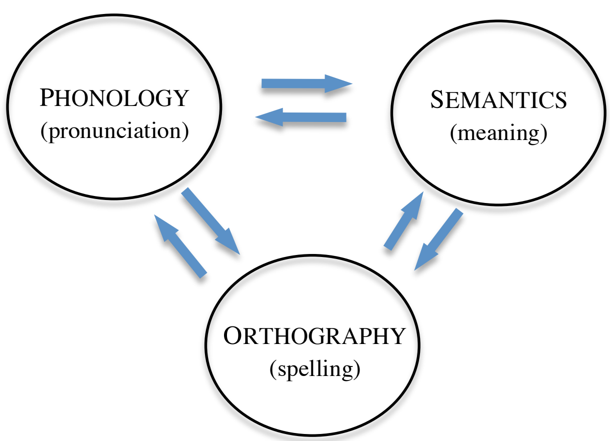

FIGURE 4.3

ACCESSING WORD MEANING IN READING

Earlier in the chapter, Figure 4.2 illustrated the processing of oral language. Figure 4.3 shows the interaction between the visual input of familiar letter strings (or orthography) and the instant activation of both the word's pronunciation and its meaning. Whether we actually hear a word spoken or see a familiar, mapped letter string, the word gets activated in our brains. Oral words are made up of sequences of oral sounds. Written words are strings of letters designed to represent those sounds. A word's pronunciation (phonology) and

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[16]You don't need experimental equipment to see this for yourself. Have someone read the top lines of a book. Watch his or her eyes closely because it happens very quickly. You may see this jump-fixate-jump-fixate pattern.

[17]Readers of modern Hebrew and Arabic show the opposite pattern, with a perception of 7-8 letters to the left and 4-5 to the right. This is because Hebrew and Arabic are read from right to left rather than left to right.

meaning (semantics) is connected in memory with the word's spelling (orthography), so when the printed word is seen, the pronunciation and meaning are instantly accessed. There is no guessing or sounding out the word. The word just pops into your mind effortlessly.

Notice this recognition process is not simply a matter of visual memory. Researchers prefer to use the term "orthographic memory" because it is a memory *for a specific sequence of letters,* not a visual-spatial memory for the "look" of the word based on its visual properties. It does not matter if the letters are all uppercase, lowercase, handwritten, or in differing fonts. The visual look of the word is not important as long as the letters are legible. Once the word's letters enter the visual system, orthographic memory takes over. Rather than visual memory, it is a memory for a specific letter string. That particular a letter string has become familiar and unitized in the memory system.

Consider when you type a web address into a web browser (e.g., Internet Explorer, Safari, Firefox). It tries to "guess" the address you are typing based upon what is in the browser's memory. So when I type in *www.a,* I get *www.apple.com,* because I have an Apple computer. The Apple address is in my browser's memory. Regardless of what site I try to visit that starts with the letter *a*, I still get that Apple address after typing the letter *a*. That is because the computer is limited to one letter at a time for its "guess." If I follow the letter *a* with the letter *d,* then *www.adobe.com* comes up automatically. That is a software company in my browser's memory. Again, the browser is simply making the best guess given the limited information it has available so far. It appears that our brains work in a similar way, except much more efficiently. When we read, our brain has access to *all* of the letters in the word at the same time. While the web browser has only one letter at a time available to make its best guess, and narrows the choices as it goes along, our brains get all the letters at once to activate the word! This is a far more efficient system. It is not like phonics, sounding out one letter at a time. Rather, it is a whole letter string rapidly accessing a stored word based upon the previous association between that letter string and the phonemes in the word's pronunciation. *The letter string becomes familiar because the person had the phonemic awareness to connect the oral phonemes in the word to the letters used to represent that word in print*. This process informs us about what a sight vocabulary actually represents. Words mapped in memory have bonded the oral sounds (which are already stored in our oral/mental dictionary) with the written letter strings that are designed to represent those oral words. When words have been completely mapped, those familiar letter strings activate the oral words instantly.

So, once a letter string becomes familiar, it becomes *unitized*. We treat the letter sequence as a unit. For example, when we see *spend,* we don't say, "Hmm, s – p – e – n – d, Oh, *spend*!" Rather, we see that letter string *spend* and instantly recognize it as familiar. *Spend* is familiar to us, while *stend* or *slend* are not. And, we don't confuse the letter order in *spend* with words like *send,* or *spent,* because those are different strings of letters that have been unitized in their own right. Thus, we no longer have to *consciously* focus on the "parts" of the letter string, but recognize the whole letter sequence as a unit. However, any change in that sequence throws us off, as the examples of *stend* or *slend* illustrate. So, it is the *sequence* of letters that becomes familiar to us, and that sequence is made up of a precise set of individual letters, in a precise order, that is, the word's orthography. It is familiar regardless of font or case. The unitization phenomenon is why it *feels* so holistic as we read words.

Going back to our analogy of acronyms from earlier in the chapter, we feel like we "holistically" process acronyms like NFL, NHL, and NBA[18]. However, this instant recognition only occurs by correctly perceiving the actual sequence of letters that distinguish them from any other sequence. NLF or FNL do not make us think of pro football, but NFL does.

The relationship between orthographic mapping and phonic decoding

Mapping must not be confused with phonics. Mapping and phonics differ in some very important ways. The biggest reason they seem similar is that both require proficiency with letter-sound relationships. However, mapping and phonic decoding use these letter-sound relationships differently. Phonic decoding starts with an unfamiliar printed word. The letters are translated into sounds, which are then blended together to identify the spoken word. By contrast, mapping is a two-way process that requires an awareness of the phonemes in the spoken word (i.e., phonemic awareness). When a student encounters an unfamiliar word and sounds it out via phonic decoding (text to brain), behind the scenes, unconsciously, our brains naturally attach the phonemes in the pronunciation to the letters in the printed word (brain to text). This cannot happen efficiently unless a student has very proficient phonemic skills to the point that they can segment words without even thinking about it (explained in more detail in Chapter 7). Being proficient with the sounds in the spoken language and the letter-sound relationships in the printed language assists the student in anchoring the sequence of phonemes in the word's pronunciation to the letter string used to represent that particular oral word. The word's pronunciation is already in long-term memory, and mapping helps the printed letter string anchor to that pronunciation in long-term memory, making it familiar. The key is to go from pronunciation to letters (mapping) rather than letters to pronunciation (phonic decoding). After a few exposures, the process of mapping is complete. The word is "mapped," so it is now a familiar letter string, and seeing that familiar letter string instantly activates that word's pronunciation. No more phonic decoding or guessing are needed for that particular word.

Another way to see the difference between phonic decoding and mapping is that phonic decoding uses the letter-to-sound relations to *activate* oral words from an unfamiliar letter string. By contrast, orthographic mapping uses sound-to-letter relationships to *anchor* phonemes in a word's pronunciation to the printed letter strings into long-term memory for future retrieval. Phonic decoding uses letter-sound skills to *identify* words while orthographic mapping uses letter-sound skills to *establish a memory* of printed words. Mapping does not involve identifying unfamiliar words; it involves a connection-forming process that turns unfamiliar printed words into familiar printed words. These are different processes; both essential to reading. Yet both rely heavily on the letter-sound relationships, even if they do so in different ways.

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[18]NFL – National Football League; NHL – National Hockey League; NBA – National Basketball League.

The three components of orthographic mapping

In essence, orthographic mapping has three components (see Figure 4.4). To be good orthographic mappers, children need to develop three skills: 1) Automatic letter-sound associations, 2) highly proficient phonemic awareness, and 3) word study. Word study represents a conscious or unconscious process of connecting the phonemes in spoken words to the written form of the word, which does not happen efficiently if the first to components (letter-sound proficiency and phonemic proficiency) are not in place. Basically, *word study is the process of matching the oral phonemes to the letters as a memory aid for future retrieval*. When beginning to read, while the first two components are still developing, the word study process may be somewhat conscious. But as letter-sound and phonemic skills become automatic, the word study aspect of the orthographic mapping process generally occurs without conscious effort, as we encounter unfamiliar words. Thus, word study (conscious or unconscious) is the connection making process used to remember words. The word study aspect of mapping is the superglue that anchors words in permanent memory. But for this to happen, students must have good letter-sound skills and good phonemic awareness skills.

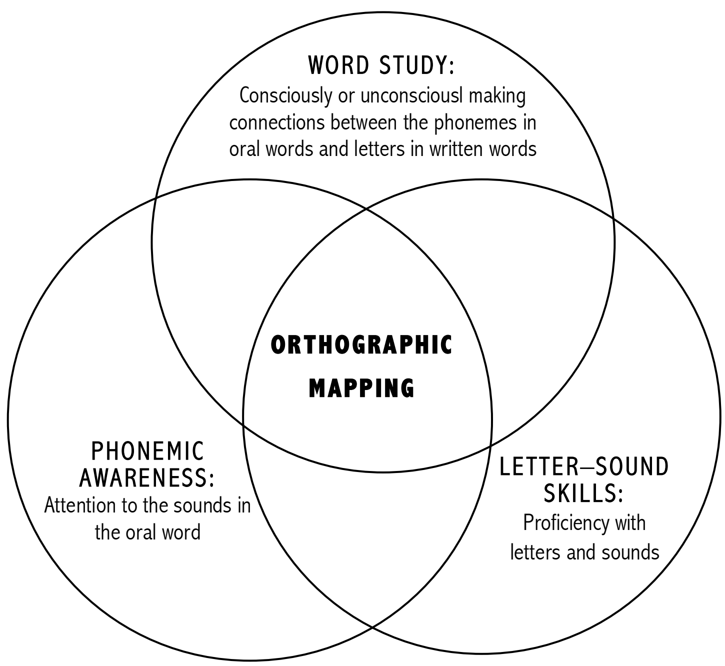

FIGURE 4.4
THREE CRITICAL SKILLS NEEDED FOR ORTHOGRAPHIC MAPPING

The traditional *whole word* and *whole language* approaches do not adequately address the three components of permanent word storage. However, most good readers develop these three skills naturally, without being directly taught. Through exposure to letters and words, children destined to be good readers naturally make connections between sounds and letters. But those with phonological awareness difficulties don't make these connections, so reading is a major struggle for them. Then, we blame the student and give him names like "dyslexic," or "learning disabled," or "reading disabled." The lack of adequate attention to letter-sound skills and phonemic awareness in two of the three major traditional reading approaches helps us understand why we have 30-34% of our fourth graders in the U.S. reading substantially below grade level, based on government statistics. Instead of "learning disabled," Philip McInnis called these students "curriculum disabled" because the curriculum did not provide them with what they needed to be successful readers. Our curricula are largely designed to facilitate the reading progress of students who are bound to learn to read regardless of the approach we use. Phonics fares better because it explicitly teaches the letter-sound component. However, phonics programs typically do an insufficient job with the other two components. The fact is that all three components should be explicitly taught and reinforced, starting in kindergarten. All of the classical methods (phonics, whole word, whole language) were developed before the discovery of orthographic mapping, so they cannot be faulted for missing some or all of the components of permanent word storage. Given the research findings about permanent word storage, we can now make the training and support of these components a central part of early reading instruction and reading remediation. If we do this, we can make substantial reductions in the percentage of struggling readers (see Chapter 5).

Let's return to some comments made in Chapter 1. It said there that a huge study conducted by the State University of New York at Albany was able to reduce the number of students with reading problems to a tiny fraction of the usual number of poor readers. How? They addressed the issue of permanent word storage by teaching skills consistent with the mapping process. Students were trained in phoneme awareness, letter-sound skills, and word study skills. This allowed them to map words efficiently to permanent memory. As a result, they became good readers and no longer required extra reading help. Others studies have shown similar results.

In addition, similar results have been found for many years among schools using McInnis' ARL program. ARL was using these techniques long before researchers began to understand the mapping process. Rather, McInnis used these techniques *because they worked*. Only in recent years have we figured out *why* they worked. But the kind of training used in the Albany study and by ARL have not been commonly used in our schools. This is likely because of the prominent role the whole language philosophy (also presented as literacy based instruction and balanced instruction) has played in our educational systems. The whole language/balanced instruction approach stresses meaning, context, and good literature, but puts insufficient emphasis on phonological awareness and word study.

Getting orthographic mapping into the knowledge base of teachers

Since 1999, I have presented this information about mapping to hundreds of teachers, school psychologists, school administrators, parents, and to my undergraduate college students in my course on learning disabilities. I realize that it is usually not well understood the first time through. Don't get discouraged if it is difficult to understand the orthographic mapping concept. It took a while for me to grasp it as well. Rereading this chapter may help.

What you really need to know is the bottom line: we use our oral filing system as the basis for sight word storage and retrieval. The point of entry into our permanent filing system for written words is at the level of letters and phonemes, not "whole words" as our intuitions mislead us to believe. If students notice that the phonemes in spoken words are represented by letters in printed words, they can make those sequences in written words familiar. If students do not easily notice the phoneme structure of spoken words (i.e., they lack sufficient phonemic awareness), then for them, there is nothing special or meaningful about the letter order in printed words. As a result, it is very difficult to remember those letter sequences and make them familiar. This means that words are added to a student's sight vocabulary very slowly, and a limited sight vocabulary is a threat to reading fluency. If a student is poor at word recognition and fluency, reading comprehension typically suffers. When reading comprehension suffers, all of a student's school experience is negatively affected. This whole chain of events is preventable in most cases if we make sure that all students have adequate phonemic awareness and letter-sound skills. This book contains a comprehensive and carefully sequenced curricula of phonological awareness skills starting in kindergarten that you can use to help prevent most reading difficulties. It is designed to supplement the many phonic programs already available.

My goal in giving a detailed account in this chapter of orthographic mapping is for the reader to understand that:

- We do not store words based on visual memory.
- We use our oral-linguistic filing system as the basis for word recognition.
- Phonemic awareness and letter-sound skills are not optional—they are central to the process of permanent word storage and sight vocabulary development. Either we are going to leave children on their own to figure it out themselves, or we will directly train them. They cannot read efficiently without these skills.

The next step is to look at how we should approach teaching reading now that we have a good working understanding of how words are learned. What should schools do to make sure children become efficient orthographic mappers? The following two chapters address this question.

Chapter 11

Assessment of Phonological Awareness:

The Phonological Awareness Screening Test (PAST)

Assessing phonological awareness can be a simple matter. The *Equipped for Reading Success* program provides three ways to evaluate these skills, two informal and one formal.

1) The simplest way to evaluate phonological awareness is to take note of the level at which the student is working. Is he or she able to do Level E3? Level H? Level K? This informal assessment tells you how far along in the program a student has progressed. It is important to notice a student's *speed* when doing One-Minute Activities to see if he or she is at the knowledge stage or the automatic stage.

2) If you want a quick assessment of a student's skill, you can simply give half of a One-Minute Activity (i.e., five items) from any given level. How well the student does helps you know how well he or she is progressing. Also make note of speed.

3) Use the formalized *Phonological Awareness Screening Test* (PAST)[1] in Appendix C. Detailed instructions for administering the PAST are included in this chapter. The PAST is best used with students as part of a formal reading assessment to determine a student's level of phonological awareness. A comprehensive reading assessment should include tests of working memory, rapid automatized naming, as well as phonological awareness and oral blending.[2] All of these lower level linguistic skills are assessed on the *Comprehensive Test of Phonological Processing-Second Edition* (CTOPP-2),[3] which I strongly recommend. The CTOPP-2 should be used alongside the PAST. I have found the PAST and the *Elision* subtest (the CTOPP-2's phonological awareness test) tend to yield similar results. However, in the cases where they differ, the PAST is usually (but not always) more consistent with a student's reading skill.

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[1]An Internet search will turn up another test that uses the acronym PAST called the *Phonological Awareness Skills Test*. This test samples from the various classical tasks like rhyming, segmentation, etc. Like nearly all other phonological awareness tests, it does not provide a timing element nor does it have items that are difficult enough to assess advanced phonemic awareness.

[2]These tests would be, of course, in addition to tests of context-free word identification, nonsense word reading, reading comprehension, and listening comprehension.

[3]As mentioned in an earlier chapter, blending may be average in weak readers with poor phonological awareness/analysis skills the CTOPP-2's *Blending Words* subtest must be interpreted with caution. If it is average, it does not rule out phonological awareness difficulties. The *Blending Words, Elision* (manipulation/deletion) and *Phoneme Isolation* subtests all get combined on the CTOPP-2 for an overall Phonological Awareness Composite. Do not use that composite if Blending Words is average and the Elision and/or Phoneme Isolation are weak.

INSTRUCTIONS FOR THE PHONOLOGICAL AWARENESS SCREENING TEST (PAST)

The *Phonological Awareness Screening Test* (PAST) can be found in Appendix C. There are four forms; A, B, C, and D. This allows teachers to do formalized assessment a few times a year to track a student's progress.

There is a "history" behind the title "PAST." First, PAST stands for Phonological Awareness Screening Test. Second, the acronym acknowledges the work of others in the *past*. The PAST originated as the *Auditory Analysis Test* (AAT) of Rosner & Simon (*Journal of Learning Disabilities,* 1971). Dr. Philip J. McInnis revised the AAT by adding segmentation items (the AAT only used deletion items) and adding levels to make it more developmentally appropriate. His version was first called the *Language Processing Assessment* (LPA) and then the *Phonological Processing Test* (PPT). Since 2003, I have used a modified, updated version of this time-tested assessment.[4] So, while this is my "version" of the test, it is based upon the work of my predecessors (hence, the "PAST").

General principles of administration

Do not administer the PAST unless 1) you have carefully read and understood the directions, and 2) you have had the chance to practice it with feedback before testing a student. If you are experienced using the One Minute Activities, the PAST will be easy to learn.

Use of sample. Follow the sample line at the beginning of each level. Administer each item at a given level the same way. ***Note that you are always deleting or substituting the sound represented by the letter(s) in the parentheses*** (e.g., *cow(boy)* means "boy" gets deleted).

Proper pronunciation of sounds. When giving directions for Levels F through M, use letter *sounds*, not letter names. When you say "change /a/ to /i/," you say the *sound* made by the letter, not the name of the letter. The exception is with the "long" vowel sounds (Level J II). Long vowel sounds are represented by uppercase letters in brackets (i.e., /A/). These long vowel sounds match the letter name (e.g., the *a* in words like *cake, tame,* or *made*).

Also, don't add an "uh" sound when you pronounce consonants in isolation (e.g., /m/ is pronounced *mmm,* not *muh*). *Proper pronunciation of sounds in isolation will be essential for children to understand what phoneme you are asking them to manipulate*. For help with pronunciation when administering the PAST, see Chapter 12 and Appendix E.

The assessment of automaticity. All items are timed. When you administer an item, as soon as you finish speaking, immediately count in your head "one thousand *one*, one thousand *two*." Use a stop watch or sweep second hand at first to be sure your counting very closely approximates two seconds. If the student responds correctly before you get to the word *two* in

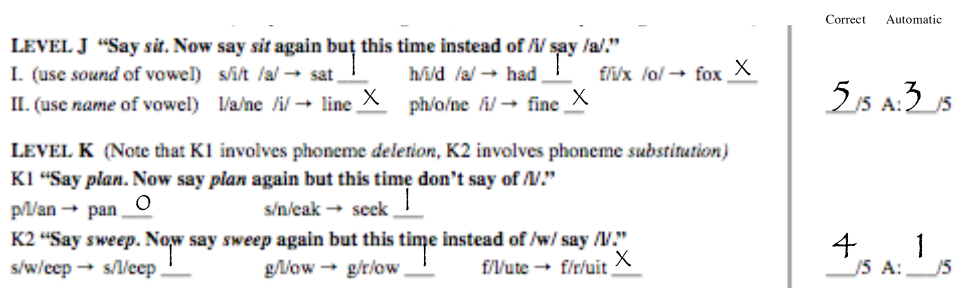
[4]My version 1) adds a timing element to assess automaticity; 2) adds or modifies levels to make smoother transitions (see Appendix B for program comparisons); 3) provides corrective feedback for *every* incorrect item, and 4) for Forms A, B, C, and D in Appendix C, most items are "orthographically inconsistent" to limit the possibility of correctly responding to test items via a mental spelling strategy rather than by phonological awareness (e.g., going from *gave* to *game* by exchanging an /m/ for a /v/ can easily occur via mental spelling while going from *both* to *boat* by exchanging a /t/ for a /th/ does not as easily yield to a mental spelling strategy).

the phrase "one thousand two," he or she receives credit for an automatic response. Put an "X" in the blank next to the word to indicate the response was automatic. If the student answers correctly, but after the two second count, mark a "1" next to that item. Incorrect items are marked with a zero (0). See Figure 11.2 below.

When doing the mental count, continue counting until the student responds. If you reach "one thousand-five" and the student has not yet responded, repeat the item to give the student a second chance. After repeating the item, resume the mental counting. If the student responds correctly within five seconds of this second chance, score the item as correct (i.e., a "1"). However, *an automatic score can only occur within the first two seconds of the first try*. The second chance is given because students sometimes forget what you asked. Also, if the student asks you to repeat the item, do so. However, repeated items cannot be scored as automatic, only as correct or incorrect. If the student does not respond after the second five-second count, score the item as incorrect and provide the correct feedback on the item (see below on providing feedback).

If you mis-speak a word, excuse yourself, skip the item, and go on to the next one, so long as it was not the last item at that level. Go back to the item you spoiled before going on to the next level and score normally (i.e., they can receive an automatic score if they answer in less than two seconds). If this occurs on the last item of a level, repeat that item immediately and use your best judgment about scoring.

Occasionally, a student will respond to the previous item. For example, you have the student go from *sit* to *sat* (Level J). On the next item, you ask the student to go from *hid* to *had*, but instead of *had,* the student says *sad,* accidentally carrying over sounds from the previous item. This may not be the result of a phonological awareness problem, but may result from confusion or a working memory issue. If you judge that a student has carried something over from the previous example, re-administer the item. However, the student cannot receive an automatic score on a re-administered item, only correct (1) or incorrect (0).



Correct Automatic

LEVEL J "Say *sit*. Now say *sit* again but this time instead of /i/ say /a/."
I. (use *sound* of vowel) s/i/t /a/ → sat 1 h/i/d /a/ → had 1 f/i/x /o/ → fox X
II. (use *name* of vowel) l/a/ne /i/ → line X ph/o/ne /i/ → fine X
5/5 A: 3/5

LEVEL K (Note that K1 involves phoneme *deletion*, K2 involves phoneme *substitution*)
K1 "Say *plan*. Now say *plan* again but this time don't say of /l/."
p/l/an → pan 0 s/n/eak → seek 1
K2 "Say *sweep*. Now say *sweep* again but this time instead of /w/ say /l/."
s/w/eep → s/l/eep 1 g/l/ow → g/r/ow 1 f/l/ute → f/r/uit X
4/5 A: 1/5

FIGURE 11.1
SAMPLE SCORING

Automatic responding typically takes about a second or less, so a count of two is generous. Therefore, only give automatic credit if students have begun a correct response by the time you have mentally said *two* in the silently phrase "one thousand *two*."

Repeating an item. If a student seems confused, or seems to lapse in attention, it is okay to repeat an item. However, when you repeat an item, that item cannot be scored as automatic.

Students can only receive a 1 if the response was correct or a 0 if it was incorrect.

Pacing. One important reason to be thoroughly familiar with the administration procedures and to have practiced the test beforehand is *pacing*. It is important to administer the PAST at a good pace to keep things moving. A moderately quick pacing prevents lapses of attention, boredom, or prevents you from unnecessarily taxing a student's working memory.

Providing feedback. A unique feature of the PAST is that the examiner provides corrective feedback for every incorrect item. Feedback on the PAST is based on the assumption that a student is not going to develop phonological awareness skills in the 4 to 8 minutes it takes to administer this test. Give feedback for *every* incorrect response. The standard correction is: "The answer is *tall*. When you say *ball,* and change the /b/ to /t/ you get *tall*. *Ball–tall*. See how that works?"[5] No further demonstration or explanation is permitted (especially, no visual cues). Also, you must *never* refer to the location of the sound within the word. Correct every incorrect item, even if it is the last item at a level. It is also okay to acknowledge that the student got an item correct ("that's right!"), especially if he or she responds tentatively.

HOWEVER:

1) Do NOT teach any item or level. This is a test, not a teaching session. While oral feedback is provided, no teaching, manipulatives, or explanations are allowed.

2) NEVER say anything about the POSITION of the sound within the word because this is a big part of what you are testing. For example, *never* say anything like "see how I switched the /b/ to a /t/ at the beginning of the word?" A key part of phonological awareness is being able to isolate a sound, so saying anything about position is like giving away the answer.

Routing procedure to speed administration. Students are not administered all 50 PAST items. For younger students, many of the later items are too difficult and there is a discontinue rule (described below). For more skilled students, it would be unnecessarily tedious to administer all of the easy items. To keep the test a reasonable length, there is a routing procedure, which works differently at each of the *syllable, onset-rime,* and *phoneme* levels.

Syllable Levels (D1 to E3)

- *Everyone* taking the PAST, including high school students and adults, start at Level D1. Explain to students that this "word game" starts out very easy. The easy ones help students understand the nature of the task without ever having to explain the nature of the task. There are no explanations or practice items when administering the PAST.
- If the first item of D1 is responded to automatically (i.e., 2 seconds or less), skip down to the first item of D2. If that is automatic, skip to first item of E2, then E3. When you score later, if the first D1 through E3 items are automatic, score any un-administered items at those levels as automatic (thus a 5/5 at that level).
- However, if any item is either 1) incorrect, or 2) correct but not automatic (i.e., correct response after 2 seconds), administer all items at that level and score normally. For example, if the first D2 item is correct but not automatic, administer the other D2 items.

---

[5] Typically you say that last part ("See how that works?") only with the first incorrect item.

However, the routing procedure resumes with E2. If the first item in E2 is automatic, do not administer the other E2 items and score those unadministered items as automatic.[6]

Onset-Rime Levels (F & G)

For kindergarten to second grade:

- If the first three F or G items are automatic, skip the final two items at that level and score them as automatic.
- If any of the first three F or G items are incorrect, or correct but not automatic, administer all five items at that specific level (i.e., F or G) and score normally.

For third grade through adults:

- Use the same general procedure as with the the kindergarten through second graders except only the first *two* items need to be automatic before skipping on to the next level.

Phoneme Levels (H to M)

- For Levels H through M, give *all* items at each level. Continue administering until the discontinue rule is reached or you come to the end of the test.

Discontinue Rule. If the combined "correct" score on two levels in a row is 0, 1 or 2 out of 10, discontinue the test. Consider all items in the levels beyond the discontinue level as incorrect. For example, a student got only two items at Level I and none at level J (thus 2/10 across the two levels). Discontinue the test. Do not administer K, L, or M. All items on the un-administered levels are scored 0.

SCORING THE PAST

Passing a level. A level is considered passed if either all items or all item except one are correct (e.g., 4 out of 5). A level is considered automatic if all or all but one of the items at that level were responded to automatically. Levels with 3 out of 5 or fewer are not considered passed and represent a level that should receive instructional attention. Keep in mind, each level yields two scores: 1) a *correct score* and 2) an *automatic score*. Students commonly pass a level with their correct score but not with their automatic score. These differences are preserved for the total scoring (see Figure 11.2 and *The Total Scores* section below). Only levels passed at the automatic level do not require instructional attention.

Item scoring. It should be clear by now that items are scored in one of three ways:

1) Incorrect (Score = 0)
2) Correct but not automatic (Score = 1)
3) Automatic i.e., the student responds in two seconds or less (Score = X)

At each level, count every score of 1 and X and put the total in the "correct" column on the

[6]The reasoning is that if students can do a higher syllable level (E2 or E3), they likely can do the easier ones, but were incorrect or not automatic due to the novelty of the task rather than a lack of phonological awareness. It is not unusual for a student to get one of these earlier items incorrect or non automatically as a result of the unusual nature of the task then go on and display automatic responding at higher levels. In such cases, administering all subsequent syllable level items after an early error or slow response is unnecessarily tedious. If they have an automatic response to the first item at any given syllable level, do not administer any more at that level and score unadministered items as automatic, even if they had an incorrect or slow response on an easier syllable level.

right. Scores of 1 or X are both scored as “correct” items. In the “automatic” column, only include the items with Xs for that level (see Figure 11.1 above for an illustration).

The Total Scores. As mentioned, students receive two scores at each level, a correct score and an automatic score. Transfer the totals from the right hand columns to the top of the first page of the test. There are two sides to this. First, the student receives a score that indicates how many were correct and how many were automatic at the *syllable, onset-rime,* and *phoneme* levels. Second, the other side gives the highest level passed. Remember a level is passed as correct if at least 4 out of 5 at that level are correct on most levels.[7] A level is considered automatic if at least 4 out of 5 items were automatic. Thus, for most children, the highest correct level will be higher than his or her highest automatic level (see Figure 11.2 for an illustration). It is also important to note any levels not passed that were below the highest level passed.

RESULTS:

	Correct	Automatic		
Basic Syllable	10 /10	8 /10	**Highest Correct Level:**	J
Onset-Rime	10 /10	10 /10	(Levels not passed below the highest correct level)	—
Basic Phoneme	8 /10	4 /10		
Advanced Phoneme	6 /20	2 /20	**Highest Automatic Level:**	I
Test Total	34 **/50**	24 **/50**	(Non automatic levels below highest automatic level)	E, H

FIGURE 11.2

SAMPLE OF SCORING RESULTS

INTEPRETING THE *PAST*

Even though the PAST correlates powerfully with reading, it does not have traditional norms. However, based on 1) McInnis’ 35 years using these levels; 2) my 12 years working with the PAST; 3) several studies that show when children developmentally can do specific phonological manipulations; as well as 4) several studies I have done on the PAST, the following is a guide to interpreting the results:

	Grade Level	Typically *Achieving Readers*	*Low Achieving Readers*
1)	Mid Kindergarten	D1-E2 sometimes higher	none correct or D1-D2
1)	Late Kindergarten	D1-E2, F, G, sometimes higher	D1-D2; E2 or lower
2)	Mid First Grade	E3, F, G, I or higher	E2, F, G or lower
3)	Late First Grade	F, G, H, I, J	F, G, I, or lower
4)	Mid Second Grade	H, I, J or higher	F, G, H, I, or lower
5)	Late Second/Early Third Grade	H to M mostly automatic	H, I, maybe J or lower
6)	Mid Third Grade	All levels, mostly automatic	Many levels ‘correct,’ I to M mostly not ‘automatic’
7)	Fourth Grade to Adulthood	All levels automatic	Most levels ‘correct,’ but J to M not all ‘automatic’

[7]Except for the levels that do not have five items. At D1 is 4/6 is used to dermine if the level is passed and/or automatic and 3/4 is required for D2.

If a student's performance matches the shaded *Low Achieving Readers* column, it suggests that phonological awareness may be a concern. If a student's level is lower than is listed in that column, then a phonological awareness problem is almost certain. In either case, those students will require training beyond what they may be receiving in whole-class instruction.

Notice above how subtle the differences can be, especially early on (i.e., K-1). Except for obvious cases of very low performance, the differences may be very small. This is why all kids should get whole class or small group phonological awareness training in kindergarten and first grade. Next, note that over time, typical students start to pull away from those with reading difficulties. Automaticity becomes a bigger factor with time, especially after second grade. After third grade, lack of automaticity at any level may indicate that a phonological awareness difficulty may be present.

Do not be surprised by inconsistent performance across some levels. A student may struggle with an easier level, and pass a higher level. This is because different levels involve different types of manipulations. For example, H and K involve splitting initial blends. If a student struggles with awareness of sounds in blends, he may not pass H, but may pass J, which does not involve blends. Students who struggle with awareness of ending sounds may do poorly with Level I and L but do well with H, J, and K. Some students may have a difficult time with E2 and E3 but do well with onset-rime or even phoneme-level tasks. Most likely, such students took a while to "warm-up," to the task. Their phonological awareness may be fine, but you may want to check their working memory and ability to focus.

Appendix C

PHONOLOGICAL AWARENESS SCREENING TEST (PAST)

The following eight pages contain four versions (Form A through D) of the *Phonological Awareness Screening Test* (PAST). The multiple versions are designed for periodic updates throughout the school year. *For instructions on administering the PAST and for more information about phonological awareness assessment, see Chapter 11.*

Also note: No one should administer this assessment unless he or she has thoroughly read the instructions in Chapter 10 and practiced it at least three times on students for whom the results are not needed.

PHONOLOGICAL AWARENESS SCREENING TEST (PAST) FORM A

David A. Kilpatrick, Ph.D. © 2010
Adapted from the levels used in McInnis (1999) & Rosner (1973)

Name: ____________________________ Date: ______________ Grade ______ Age ______
Teacher: _________________________ D.O.B.: __________ Evaluator: _________________

INSTRUCTIONS: See *Equipped for Reading Success* Chapter 11: "Assessment of Phonological Awareness" for detailed instructions on the PAST.

RESULTS:

	Correct	Automatic
Basic Syllable	____/10	____/10
Onset-Rime	____/10	____/10
Basic Phoneme	____/10	____/10
Advanced Phoneme	____/20	____/20
Test Total	**____/50**	**____/50**

Highest Correct Level: ______
(Levels not passed below the highest correct level) _______

Highest Automatic Level: ______
(Non-automatic levels below highest automatic level) _______

Approximate Grade Level (Circle):	***PreK/K***	***K***	***late K/early 1st***	***1st***	***late 1st/early 2nd***	***2nd***	**late 2nd to adult**

Note: The grade levels listed throughout the *PAST* are estimates based on various research studies and clinical experience. They are not formalized norms.

I. SYLLABLE LEVELS

Basic Syllable Levels (D, E2 - preschool to mid kindergarten; E3 - mid to late kindergarten)

LEVEL D "Say *bookcase*. Now say *bookcase* but don't say *book*."
FEEDBACK: "If you say bookcase without saying book, you get case. Okay? Let's try another one."

Correct Automatic

D1 (book)case ____ (sun)set ____ space(ship) ____
D2 (sil)ver ____ (mar)ket ____ gen(tle) ____ ___/6 A: ___/6

LEVEL E "Say *October*. Now say *October* but don't say *Oc*."
FEEDBACK: "If you say October without saying Oc, you get tober. See how that works?"

E2 (Oc)tober ___ (um)brella___
(fan)tastic ___ (um)brella___

___/4 A: ___/4

Basic Syllable Total: ___/10 A:___/10

II. ONSET-RIME LEVELS

Onset-Rime Levels (kindergarten to mid first grade)

LEVEL F "Say *feet*. Now say *feet* but don't say /f/."
FEEDBACK: "If you say feet without the /f/, you get eat; feet-eat, see how that works?"

Correct Automatic

/f/eet → eat ___ /b/irth → earth ___
/t/ame → aim ___ /t/ime → I'm ___ /c/one → own ___ ___/5 A: ___/5

LEVEL G "Say *done*. Now say *done* but instead of /d/ say /r/."
FEEDBACK: "If you say done, and change the /d/ to /r/, you get run; done-run."

/d/one /r/ → run ___ /m/ore /d/ → door ___ ___/5 A: ___/5
/g/um /th/ → thumb ___ /l/ed /s/ → said ___ /f/ull /w/ → wool ___

Onset-Rime Total: ___/10 A:___/10

PAST Form A

III. PHONEME LEVELS

Basic Phoneme Levels (early to late first grade)

LEVEL H

H1 (Deletion) **"Say *sleep.* Now say *sleep* but don't say /s/."**

FEEDBACK: "If you say sleep without the /s/, you get leap; sleep-leap, see how that works?"

/s/leep /s/ → leap ___ /c/rane /k/ → rain ___

H2 **"Say *true.* Now say *true* but instead of /t/ say /g/."**

FEEDBACK: "If you say true, and change the /t/ to /g/, you get grew; true-grew."

/t/rue /g/ → grew ___ /p/lowed /k/ → cloud ___ /f/lows /k/ → clothes ___

LEVEL I "Say *went*. Now say *went* but don't say /t/."

FEEDBACK: "If you say went without the /t/, you get when; went-when."

I1 wen/t/ /t/ → when ___ ran/g/e /j/ → rain ___

I2 whea/t/ /t/ → we ___ nie/c/e /s/ → knee ___ dri/v/e /v/ → dry ___

Basic Phoneme Total:

Advanced Phoneme Levels (early to late second grade; Level M is early third grade to adult)

LEVEL J "Say *ran*. Now say *ran* but instead of /a/ say /u/."

FEEDBACK: "If you say ran, and change the /a/ to /u/, you get run; ran-run."

I. (use *sound* of vowel) r/a/n /u/ → run ___ k/i/t /u/ → cut ___ h/u/ff /a/ → half ___

II. (use *name* of vowel) b/ea/k /A/ → bake ___f/i/ne /O/ → phone ___

LEVEL K

K1 (Deletion) **"Say *bread.* Now say *bread* but don't say /r/."**

FEEDBACK: "If you say bread without the /r/, you get bed; bread-bed."

b/r/ead → bed ___ s/n/eak → seek ___

K2 (Substitution) **"Say *crew.* Now say *crew* but instead of /r/ say /l/."**

FEEDBACK: "If you say crew, and change the /r/ to /l/, you get clue; crew-clue."

c/r/ew → c/l/ue ___ p/r/oud → p/l/owed ___ s/n/eeze → s/k/is ___

LEVEL L "Say *some*. Say *some* but instead of /m/ say /n/."

FEEDBACK: "If you say some, and change the /m/ to /n/, you get sun; some-sun."

so/m/e /n/ → sun ___ rhy/m/e /d/ → ride ___

nigh/t/ /s/ → nice ___ see/m/ /t/ → sea/t/ ___ kee/p/ /z/ → keys ___

LEVEL M

M1 (Deletion) **"Say *ghost.* Now say *ghost* but don't say /s/."**

FEEDBACK: "If you say ghost without the /s/, you get goat; ghost-goat."

gho/s/t → goat ___ co/s/t → caught ___

M2 (Substitution) **"Say *west.* Now say *west* but instead of /s/ say /n/."**

FEEDBACK: "If you say west, and change the /s/ to /n/, you get went; west-went."

we/s/t → we/n/t ___ cra/f/t → cra/ck/ed ___ dea/l/t → de/n/t ___

Advanced Phoneme Total:

	Correct	Automatic
H	___/5	A: ___/5
I	___/5	A: ___/5
Basic Phoneme Total	**___/10**	**A:___/10**
J	___/5	A: ___/5
K	___/5	A: ___/5
L	___/5	A: ___/5
M	___/5	A: ___/5
Advanced Phoneme Total	**___/20**	**A:___/20**

PHONOLOGICAL AWARENESS SCREENING TEST (PAST) FORM B

David A. Kilpatrick, Ph.D. © 2010

Adapted from the levels used in McInnis (1999) & Rosner (1973)

Name: _____________________________ Date: _______________ Grade ______ Age ______

Teacher: _________________________ D.O.B.: ___________ Evaluator: _________________

INSTRUCTIONS: See *Equipped for Reading Success* Chapter 11: "Assessment of Phonological Awareness" for detailed instructions on the PAST.

RESULTS:

	Correct	Automatic
Basic Syllable	____/10	____/10
Onset-Rime	____/10	____/10
Basic Phoneme	____/10	____/10
Advanced Phoneme	____/20	____/20
Test Total	**____/50**	**____/50**

Highest Correct Level: ______

(Levels not passed below the highest correct level) _______

Highest Automatic Level: ______

(Non-automatic levels below highest automatic level) _______

Approximate Grade Level (Circle):	*PreK/K*	*K*	*late K/early 1st*	*1st*	*late 1st/early 2nd*	*2nd*	late 2nd to adult

Note: The grade levels listed throughout the *PAST* are estimates based on various research studies and clinical experience. They are not formalized norms.

I. SYLLABLE LEVELS

Basic Syllable Levels (D, E2 - preschool to mid kindergarten; E3 - mid to late kindergarten)

Correct Automatic

LEVEL D "Say *flashlight*. Now say *flashlight* but don't say *flash*."

FEEDBACK: "If you say flashlight without saying flash, you get light. Okay? Let's try another one."

D1 (flash)light ____ (door)bell ____ rail(road) ____

D2 (cor)ner ____ (mem)ber ____ mar(ble) ____ ___/6 A: ___/6

LEVEL E "Say *gymnastics*. Now say *gymnastics* but don't say *gym*."

FEEDBACK: "If you say gymnastics without saying gym, you get nastics. See how that works?"

E2 (gym)nastics ___ (i)dea ___ ___/4 A: ___/4

(Sep)tember ___ (car)nation ___

Basic Syllable Total: ___/10 A:___/10

II. ONSET-RIME LEVELS

Onset-Rime Levels (kindergarten to mid first grade)

Correct Automatic

LEVEL F "Say *far*. Now say *far* but don't say /f/."

FEEDBACK: "If you say far without the /f/, you get are; far-are, see how that works?"

/f/ar → are ___ /n/ame → aim ___

/w/ait → ate ___ /b/eg → egg ___ /l/oan → own ___ ___/5 A: ___/5

LEVEL G "Say *kite*. Now say *kite* but instead of /k/ say /r/."

FEEDBACK: "If you say kite, and change the /k/ to /r/, you get right; kite-right."

/k/ite /r/ → right ___ /c/ane /r/ → rain ___ ___/5 A: ___/5

/d/ime /r/ → rhyme ___ /g/uess /y/ → yes ___ /c/aught /b/ → bought ___

Onset-Rime Total: ___/10 A:___/10

PAST Form B

III. PHONEME LEVELS

Basic Phoneme Levels (early to late first grade)

LEVEL H

Correct Automatic

H1 (Deletion) **"Say *sleeve*. Now say *sleeve* but don't say /s/."**

FEEDBACK: "If you say sleeve without the /s/, you get leave; sleeve-leave, see how that works?"

/s/leeve /s/ → leave ___ /g/reat /g/ → rate ___

H2 (Substitution) **"Say *breeze*. Now say *breeze* but instead of /b/ say of /t/."**

FEEDBACK: "If you say breeze, and change the /b/ to /t/, you get trees; breeze-trees."

/b/reeze /t/ → trees ___ /c/rew /t/ → true ___ /p/roud /c/ → crowd ___ ___/5 A: ___/5

LEVEL I "Say *sword*. Now say *sword* but don't say /d/."

FEEDBACK: "If you say sword without the /d/, you get sword; sword-sore."

I1 swor/d/ /d/ → sore ___ bol/t/ /t/ → bowl ___

I2 sea/t/ /t/ → see ___ grou/p/ /p/ → grew ___ hou/se/ /s/ → how ___ ___/5 A: ___/5

Basic Phoneme Total: ___/10 A:___/10

Advanced Phoneme Levels (early to late second grade; Level M is early third grade to adult)

LEVEL J "Say *man*. Now say *man* but instead of /a/ say /e/."

Correct Automatic

FEEDBACK: "If you say man, and change the /a/ to /e/, you get man; man-men."

I. (use *sound* of vowel) m/a/n /e/ → men ___ r/o/ck /e/ → wreck ___ wh/e/n /u/ → won ___

II. (use *name* of vowel) l/oa/n /I/ → line ___ s/i/de /E/ → seed ___ ___/5 A: ___/5

LEVEL K

K1 (Deletion) **"Say *truth*. Now say *truth* but don't say /r/."**

FEEDBACK: "If you say truth without the /r/, you get tooth; truth-tooth,"

t/r/uth → tooth ___ b/r/eeze → bees ___

K2 (Substitution) **"Say *crime*. Now say *crime* but instead of /r/ say /l/."**

FEEDBACK: "If you say crime, and change the /r/ to /l/, you get crime; crime-climb."

c/r/ime → c/l/imb ___ b/r/aid → b/l/ade ___ s/p/eed → s/k/ied ___ ___/5 A: ___/5

LEVEL L "Say *hen*. Now say *hen* but instead of /n/ say /d/."

FEEDBACK: "If you say hen, and change the /n/ to /d/, you get head; hen-head."

he/n/ /d/ → head ___ whe/n/ /t/ → wet ___

sou/p/ /n/ → soon ___ to/n/e /d/ → toad ___ kni/f/e /t/ → night ___ ___/5 A: ___/5

LEVEL M

M1 (Deletion) **"Say *desk*. Now say *desk* but don't say /s/."**

FEEDBACK: "If you say desk without the /s/, you get deck; desk-deck."

de/s/k → deck ___ she/l/f → chef ___

M2 (Substitution) **"Say *rift*. Now say *rift* but instead of /f/ say /s/."**

FEEDBACK: "If you say rift, and change the /f/ to /s/, you get wrist; rift-wrist."

ri/f/t → wri/s/t ___ te/s/t → te/n/t ___ ro/p/ed → roa/s/t ___ ___/5 A: ___/5

Advanced Phoneme Total: ___/20 A: ___/20

PHONOLOGICAL AWARENESS SCREENING TEST (PAST) FORM C

David A. Kilpatrick, Ph.D. © 2010

Adapted from the levels used in McInnis (1999) & Rosner (1973)

Name: ____________________________ Date: ______________ Grade ______ Age ______

Teacher: _________________________ D.O.B.: ___________ Evaluator: _________________

INSTRUCTIONS: See *Equipped for Reading Success* Chapter 11: "Assessment of Phonological Awareness" for detailed instructions on the PAST.

RESULTS:

	Correct	Automatic
Basic Syllable	____/10	____/10
Onset-Rime	____/10	____/10
Basic Phoneme	____/10	____/10
Advanced Phoneme	____/20	____/20
Test Total	**____/50**	**____/50**

Highest Correct Level: ______

(Levels not passed below the highest correct level) _______

Highest Automatic Level: ______

(Non-automatic levels below highest automatic level) _______

Approximate Grade Level (Circle):	*PreK/K*	*K*	*late K/early 1st*	*1st*	*late 1st/early 2nd*	*2nd*	late 2nd to adult

Note: The grade levels listed throughout the *PAST* are estimates based on various research studies and clinical experience. They are not formalized norms.

I. SYLLABLE LEVELS

Basic Syllable Levels (D, E2 - preschool to mid kindergarten; E3 - mid to late kindergarten)

Correct Automatic

LEVEL D "Say *footprint*. Now say *footprint* but don't say *foot*."

FEEDBACK: "If you say footprint without saying foot, you get print. Okay? Let's try another one."

D1 (foot)print ____ (row)boat ____ mid(night) ____

D2 (ta)ble ____ (o)ver ____ pan(da) ____ ___/6 A: ___/6

LEVEL E "Say *Invention*. Now say *Invention* but don't say *In*."

FEEDBACK: "If you say invention without saying in, you get vention. See how that works?"

E2 (in)vention ___ (ma)gician___ ___/4 A: ___/4

(me)chanic ___ (re)member___

Basic Syllable Total: **___/10 A:___/10**

II. ONSET-RIME LEVELS

Onset-Rime Levels (kindergarten to mid first grade)

Correct Automatic

LEVEL F "Say *bat*. Now say *bat* but don't say /b/."

FEEDBACK: "If you say bat without the /b/, you get at; bat-at, see how that works?"

/b/at → at ___ /ph/one → own ___

/n/ame → aim ___ /c/ore → oar ___ /c/ough → off ___ ___/5 A: ___/5

LEVEL G "Say *loop*. Now say *loop* but instead of /l/ say /s/."

FEEDBACK: "If you say loop, and change the /l/ to /s/, you get soup; loop-soup."

/l/oop /s/ → soup ___ /p/ut /f/ → foot ___ ___/5 A: ___/5

/p/ool /r/ → rule ___ /w/ait /g/ → gate ___ /s/auce /l/ → loss ___

Onset-Rime Total: **___/10 A:___/10**

PAST Form C

III. PHONEME LEVELS

Basic Phoneme Levels (early to late first grade)

LEVEL H

H1 (Deletion) **"Say *sled*. Now say *sled* but don't say /s/."**

FEEDBACK: "If you say *sled* without the /*s*/, you get *led*; *sled-led*, see how that works?"

Correct Automatic

/s/led /s/ → led ___ /s/weet /s/ → wheat ___

H2 (Substitution) **"Say *true*. Now say *true* but instead of /t/ say /g/."**

FEEDBACK: "If you say *true*, and change the /*t*/ to /*g*/, you get *grew*; *true-grew*."

/t/rue /g/ → grew ___ /f/roze /g/ → grows ___ /t/roop /g/ → group ___ ___/5 A: ___/5

LEVEL I "Say *word*. Now say *word* but don't say /d/."

FEEDBACK: "If you say *word* without the /*d*/, you get *were*; *word-were*, see how that works?"

I1 wor/d/ /d/ → were ___ lam/p/ /p/ → lamb ___

I2 boa/t/ /t/ → bow ___ toa/d/ /d/ → toe ___ wi/d/e /d/ → why ___ ___/5 A: ___/5

Basic Phoneme Total: **___/10 A:___/10**

Advanced Phoneme Levels (early to late second grade; Level M is early third grade to adult)

LEVEL J "Say *bat*. Now say *bat* but instead of /a/ say /i/."

FEEDBACK: "If you say *bat*, and change the /*a*/ to /*i*/, you get *bit*; *bat-bit*."

I. (use *sound* of vowel) b/a/t /i/ → bit ___ g/e/m /a/ → jam ___ m/a/tch /u/ → much ___

II. (use *name* of vowel) sh/ee/p /A/ → shape ___ ch/o/se /E/ → cheese ___ ___/5 A: ___/5

LEVEL K

K1 (Deletion) **"Say *breeze*. Now say *breeze* but don't say /r/."**

FEEDBACK: "If you say *breeze* without the /*r*/, you get *bees*; *breeze-bees*,"

Correct Automatic

b/r/eeze → bees ___ c/l/aim → came ___

K2 (Substitution) **"Say *crows*. Now say *crows* but instead of /r/ say /l/."**

FEEDBACK: "If you say *crows*, and change the /*r*/ to /*l*/, you get *close*; *crows-close*."

c/r/ows → c/l/ose ___ s/w/arm → s/t/orm ___ c/r/uise → c/l/ues ___ ___/5 A: ___/5

LEVEL L "Say *set*. Now say *set* but instead of /t/ say /d/."

FEEDBACK: "If you say *set*, and change the /*t*/ to /*d*/, you get *said*; *set-said*."

se/t/ /d/ → said ___ ri/s/e /m/ → rhyme ___

migh/t/ /s/ → mice ___ tu/b/e /th/ → tooth ___ cou/gh/ /t/ → caught ___ ___/5 A: ___/5

LEVEL M

M1 (Deletion) **"Say *swept*. Now say *swept* but don't say /p/."**

FEEDBACK: "If you say *swept* without the /*p*/, you get *sweat*; *swept-sweat*."

swe/p/t → sweat ___ bo/l/t → boat ___

M2 (Substitution) **"Say *rent*. Now say *rent* but instead of /n/ say /s/."**

FEEDBACK: "If you say *rent*, and change the /*n*/ to /*s*/, you get *rest*; *rent-rest*."

re/n/t → re/s/t ___ dri/f/t → dri/pp/ed ___ wor/k/ed → wor/s/t ___ ___/5 A: ___/5

Advanced Phoneme Total: **___/20 A:___/20**

PHONOLOGICAL AWARENESS SCREENING TEST (PAST) FORM D

David A. Kilpatrick, Ph.D. © 2010

Adapted from the levels used in McInnis (1999) & Rosner (1973)

Name: ____________________________ Date: ______________ Grade ______ Age ______

Teacher: _________________________ D.O.B.: __________ Evaluator: _________________

INSTRUCTIONS: See *Equipped for Reading Success* Chapter 11: "Assessment of Phonological Awareness" for detailed instructions on the PAST.

RESULTS:

	Correct	Automatic
Basic Syllable	____/10	____/10
Onset-Rime	____/10	____/10
Basic Phoneme	____/10	____/10
Advanced Phoneme	____/20	____/20
Test Total	**____/50**	**____/50**

Highest Correct Level: ______

(Levels not passed below the highest correct level) _______

Highest Automatic Level: ______

(Non-automatic levels below highest automatic level) _______

Approximate Grade Level (Circle):	*PreK/K*	*K*	*late K/early 1st*	*1st*	*late 1st/early 2nd*	*2nd*	late 2nd to adult

Note: The grade levels listed throughout the *PAST* are estimates based on various research studies and clinical experience. They are not formalized norms.

I. SYLLABLE LEVELS

Basic Syllable Levels (D, E2 - preschool to mid kindergarten; E3 - mid to late kindergarten)

LEVEL D "Say *sidewalk*. Now say *sidewalk* but don't say *side*."

FEEDBACK: "If you say *sidewalk* without saying *side*, you get *walk*. Okay? Let's try another one."

			Correct	Automatic
D1 (side)walk ____	(door)way ____	week(end) ____		
D2 (dol)phin ____	(car)pet ____	mor(ning) ____	___/6	A: ___/6

LEVEL E "Say *tornado*. Now say *tornado* but don't say *tor*."

FEEDBACK: "If you say *tornado* without saying *tor*, you get *nado*. See how that works?"

E2 (tor)nado ___	(per)mission___	___/4	A: ___/4
(com)puter ___	(de)partment___		

Basic Syllable Total: ___/10 A:___/10

II. ONSET-RIME LEVELS

Onset-Rime Levels (kindergarten to mid first grade)

LEVEL F "Say *band*. Now say *band* but don't say /b/."

FEEDBACK: "If you say *band* without the /*b*/, you get *and*; *band-and*, see how that works?"

			Correct	Automatic
/b/and → and ___	/w/ise → eyes ___			
/j/ar → are ___	/f/ake → ache ___	/sh/ove → of ___	___/5	A: ___/5

LEVEL G "Say *read*. Now say *read* but instead of /r/ say /n/."

FEEDBACK: "If you say *read*, and change the /*r*/ to /*n*/, you get *need*; *read-need*."

/r/ead /n/ → need ___	/h/er /f/ → fur ___		___/5	A: ___/5
/c/ode /t/ → toad ___	/l/ed /s/ → said ___	/th/ese /ch/ → cheese ___		

Onset-Rime Total: ___/10 A:___/10

PAST Form D

III. PHONEME LEVELS

Basic Phoneme Levels (early to late first grade)

LEVEL H

H1 (Deletion) **"Say *tried*. Now say *tried* but don't say /t/."**

FEEDBACK: "If you say tried without the /t/, you get ride; tried-ride, see how that works?"

Correct Automatic

/t/ried /t/ → ride ___ /s/lam /s/ → lamb ___

H2 (Substitution) **"Say *froze*. Now say *froze* but instead of /f/ say of /g/."**

FEEDBACK: "If you say froze, and change the /f/ to /g/, you get grows; froze-grows."

/f/roze /g/ → grows ___ /t/rees /f/ → freeze ___ /f/ries /p/ → prize ___ ___/5 A: ___/5

LEVEL I "Say *port*. Now say *port* without the /t/."

FEEDBACK: "If you say port without the /t/, you get poor; port-poor, see how that works?"

I1 por/t/ /t/ → poor ___ col/d/ /d/ → coal ___

I2 sa/m/e /m/ → say ___ pla/c/e /s/ → play ___ nee/d/ /d/ → knee ___ ___/5 A: ___/5

Basic Phoneme Total: ___/10 A:___/10

Advanced Phoneme Levels (early to late second grade; Level M is early third grade to adult)

LEVEL J "Say *hit*. Now say *hit* but instead of /i/ say /a/."

FEEDBACK: "If you say hit, and change the /i/ to /a/, you get hat; hit-hat."

I. (use *sound* of vowel) h/i/t /a/ → hat ___ wh/e/n /i/ → win ___ t/oo/l /e/ → tell ___

II. (use *name* of vowel) g/a/te /O/ → goat ___ c/a/pe /E/ → keep __ ___/5 A: ___/5

LEVEL K

K1 (Deletion) **"Say *try*. Now say *try* but don't say /r/."**

FEEDBACK: "If you say try without the /r/, you get tie; try-tie."

t/r/y → tie ___ s/l/ope → soap ___

Correct Automatic

K2 (Substitution) **"Say *snail*. Now say *snail* but instead of /n/ say /t/."**

FEEDBACK: "If you say snail, and change the /n/ to /t/, you get stale; snail-stale."

s/n/ail → s/t/ale ___ f/l/ows → f/r/oze ___ s/m/ile → s/t/yle ___ ___/5 A: ___/5

LEVEL L "Say *foam*. Now say *foam* but instead of /m/ say /n/."

FEEDBACK: "If you say foam, and change the /m/ to /n/, you get phone; foam-phone."

foa/m/ /n/ → phone ___ je/t/ /m/ → gem ___

bo/th/ /t/ → boat ___ wro/t/e /p/ → rope ___ tee/th/ /ch/ → teach ___ ___/5 A: ___/5

LEVEL M

M1 (Deletion) **"Say *wisp*. Now say *wisp* but don't say /s/."**

FEEDBACK: "If you say wisp without the /s/, you get whip; wisp-whip."

wi/s/p → whip ___ de/n/t → debt ___

M2 (Substitution) **"Say *bent*. Now say *bent* but instead of /n/ say /s/."**

FEEDBACK: "If you say bent, and change the /n/ to /s/, you get best; bent-best."

be/n/t → be/s/t ___ so/f/t → sa/l/t ___ ri/pp/ed → wri/s/t ___ ___/5 A: ___/5

Advanced Phoneme Total: ___/20 A:___/20