

An Introduction by Diane Mc Guinness

What Is a Writing System?

Over the last few decades there has been an explosion of research on writing systems. This has illuminated how writing systems work and how the type of writing system children have to learn determines their ease of learning it. Classroom practice has also been put under the microscope to reveal which teaching practices matter and which are actually detrimental. As the Sound Reading System (SRS) is a product of this research, I want to provide some background before the lessons begin. I will start with the writing systems themselves because of the profound importance of these new discoveries.

What Is Reading and How Does a Writing System Work?

Recent surveys on the writing systems of the world, dating back over 5,000 years, have revealed some startling and unexpected findings. For decades it was believed that ancient writing systems were based on the whole word and gradually evolved into alphabets. This assumption is completely false. Instead, the true facts about writing systems reveal a set of laws or principles. These laws are based on how the human mind works.

The first important discovery was that no functional writing system, past or present, has ever been based on the whole word. It turns out that people can only memorize around 2,000 sound-symbol pairs, and no writing system has ever exceeded this number. As we need about 50,000 words just to carry on an ordinary conversation, a writing system marking only a fraction of our vocabulary would be useless.

The solution was to select units of sound below the level of the word, because there are far fewer of these units than words. Four types of sound units can be put to use:

- the syllable, used for the Chinese writing system;
- consonant-vowel pairs (CV diphones), used in India, Japan, Korea and South East Asia;
- consonants only (consonantal alphabets), used for Arabic and Hebrew; and
- consonants and vowels (true alphabets).

Consonants and vowels are known collectively as 'phonemes'. They are the smallest units of speech a human listener can hear.

Choosing a sound unit for a writing system is not arbitrary. It is based on three critical factors:

- the speech patterns, or 'phonological structure' of the language itself;
- the ease with which people can hear the unit; and
- the limits of memory.

The general operating principle is straightforward: choose the largest unit of sound that people can hear that fits the structure of the language and doesn't overload memory. If the language is based on a small group of syllable patterns, then a syllabary writing system is the best choice. The Chinese language has around 1,200 syllables; English has about 60,000. This is why Chinese is written as a syllabary and English is not. In fact, all European writing systems are alphabets by default, because nothing else will work.

Finally, no writing system uses more than one of these units. That is, no writing system ever mixes syllable signs, CV diphone signs and phoneme signs. This would make the writing system far too confusing to learn.

Because the laws governing writing systems are based on human language and memory, they have great relevance for reading instruction, both in the classroom and in remedial settings. Teachers need to know the basis for the writing system they are teaching in order to be able to teach it.

The laws provide some guidelines for dos and don'ts that apply to any writing system:

- Teach only the sound unit for which the code was written and no other unit. Teaching more than one sound unit (syllables, syllable fragments like word families, and phonemes), as advocated in some programmes, is tantamount to teaching more than one writing system at the same time.
- As people cannot memorize more than 2,000 word-symbol pairs, this puts all 'sight-word' methods off limits at the outset. And because sound units must never be mixed, this is a second reason to avoid memorizing sight words as a component of any reading programme.

The Problems of the English Writing System

In a writing system, speech units are encoded by a set of symbols which transforms the invisible and ephemeral speech patterns into a permanent (visible and transportable) record. What you want to say is encoded into symbols marked on bark, clay, or paper, transported to some remote location and another person decodes the symbols back into phonemes to recover the words. In a perfectly designed alphabetic writing system, scholars identify each phoneme in the language (most languages have between 25 and 50), and design a special symbol for each one. These perfect alphabet codes are known today as 'transparent alphabets', because it is obvious (transparent) how they work.

Most European alphabets are transparent, and many use the same phoneme – letter correspondences as the old Latin-based code. For example, the letter 'O' stands for the sound /oh/, not for the sound /o/ as in 'hot', as it does in English. And, like Latin, these European writing systems are 'good' codes. This is why children in countries like Italy, Spain, Germany, Sweden, Norway and Finland learn to read and spell to a high degree of accuracy in the first year of school.

The English writing system has had a far more troubled past. The Anglo-Saxon writing system was developed in 635 A.D. by King Oswald of Northumbria and Bishop Aidan who came from Ireland to help establish the Christian Church here. It was an almost perfect alphabetic writing system. It survived several attempts on its life including devastating attacks on the monasteries and libraries by the Vikings. It ultimately met its maker after the Norman invasion in 1066.

Three languages dominated in Great Britain from 1066 until the late 14th century, when English merchants and farmers began to gain the upper hand. Norman French was the language of the ruling classes. Local dialects survived among tradesmen and the farming communities, and Latin was the language of scholars, judges and the chancery. Over time, these languages 'leaked' into each other, as did their spelling systems, which were vastly different. Because spelling was never standardized, and people spelled any way they wanted to, things went from bad to worse. Schoolmasters clamoured for reform, but nothing happened for centuries.

Johnson's dictionary, unlike others before it, was an amazing success, and his spellings were adopted nearly universally. Noah Webster relied on Johnson's spellings almost completely in his great American dictionary. Today, English-speaking peoples around the world spell pretty much as Johnson dictated. But a key problem remains: Johnson may have succeeded in standardizing the spelling of words, but he failed to standardize the spelling of phonemes. If he had done that, he would have created a transparent alphabet, and this would have changed everything.

As a result, the English alphabet code holds pride of place as the most opaque writing system in the world. The reason English-speaking children have such difficulty learning to read and spell is not because they have funny brains, or because teachers aren't doing their job, but because no one could figure out a way to teach our complex spelling code so everyone could learn it. In one sense, the real and abiding mystery is not why children fail to learn to read and spell, but why so many do not!

How Writing Systems Cause Reading Problems

Until recently, reading researchers and educators had no understanding of the effects of a transparent versus opaque writing system on a novice reader. That changed in the early 1990s when Heinz Wimmer, a psychologist at the university in Salzburg, Austria, decided to study poor readers. Reading instruction begins in Austria at age six, and parents are urged by the education establishment to teach their children nothing before they start school. Once there, children learn the phonemes in the German language and how each one is represented by a letter or letter pair. Letter names are avoided, and sight word memorization is actively discouraged.

Wimmer asked all the primary school teachers in Salzburg to refer their 'worst readers' for special testing. They identified 120 children in the age range seven to nine years. Imagine Wimmer's surprise when all the poor readers could decode written German almost perfectly and spelled nearly as well. Their main difficulty was reading too slowly. No doubt they had been singled out by teachers because their ponderous reading speed made it difficult for them to keep up in the classroom.

But 'slow' is a relative term, and raises the question – slower than what? Wimmer decided to compare Salzburg children with children in London. In a study on children in a mainstream classroom, it was found that Austrian seven year-olds read as quickly as English nine year-olds, making half as many errors. Yet the English nine year-olds had been learning to read for four years; the Austrian seven year-olds, only one. Equal speed and twice the accuracy in a quarter of the time is an eight-fold increase in efficiency!

A second study was carried out on children pre-selected to be 'dyslexic'. Children ranged in age from 11 to 13 years. There is no concept of 'dyslexia' in Austria (and no word for it), because all children read accurately. Instead, the Austrian 'dyslexics' were identified by their reading speed compared to norms (average score at the 12th percentile). The English 'dyslexics' scored four years below chronological age on tests of reading and spelling accuracy (19th and 8th percentile). In a series of reading tests, the Austrian 'slow' readers scored five times higher on reading accuracy and, most surprisingly, read twice as fast as their English counterparts.

Wimmer's studies show that reading problems are relative, tied to specific writing systems and to methods of instruction. Austrian children (and children in Germany, Italy, Spain, Sweden, Norway and Finland) have the benefit of a nearly perfect transparent alphabet. It is hard for us to imagine what this must be like. Almost every sound in the language has one spelling, and every spelling pattern is decoded one way. The sound /oh/ is always spelled o, and the letter o is always decoded /oh/. In our writing system, the sound /o-e/ can be spelled oe, o-e, o, oa, ow, ou, ough, as in toe, cone, open, boat, grow, soul, though. The letter o can be decoded (read) as /o-e/, /o/, /u/, /oo/, as in the words: open, hot, ton, to.

No wonder it takes mere months for Austrian children to learn to read and spell to a high level of skill. No wonder so many English speaking children fail. This raises the fundamental question that if the writing system, or more accurately, the spelling system is the culprit, how could methods of instruction circumvent this difficulty? We can weep and envy our European cousins their great good fortune, and throw up our hands in dismay. Or we can do something more constructive. This is what the Sound Reading System does.

Conquering Complexity

Probably the most important lesson from the 5,000-year history of writing systems is that teachers must fully understand the structure of the writing system they have to teach. As little has been done historically to illuminate this structure, teachers have been at an extreme disadvantage. I want to take a look at this structure briefly and talk about how it can be managed so that young children and poor readers can learn with the minimum of effort. The focus of this training is about mastery of this structure and how to teach it.

I begin with the four main keys of the English alphabet code to illustrate why it is so opaque.

The Structure of the English Alphabet Code

There are approximately 44 phonemes in the English language but only 26 letters in our alphabet. This is the first problem. To solve the missing-letter problem, letters were paired to stand for the left-over phonemes, a practice that dates back to the Roman writing system. These letter-pairs are known technically as ‘digraphs’. The common consonant digraph spellings are:

- ch as in ‘church’;
- ng as in ‘sing’;
- sh as in ‘ship’; and
- th as in ‘thin’ or ‘then’.

(One spelling – th – is used for two phonemes that differ in voicing: /th/ in ‘then’ is voiced – vocal cords vibrating – and /th/ in ‘thin’ is not.) We teach these as the **second key of the code**.

Our alphabet has only six vowel letters to represent the 18 vowel sounds in the English language, so vowel digraphs are the rule rather than the exception. This problem is compounded by multiple spellings for almost every vowel. This brings us to the third key of the code, one which will be the focus of most of our attention in the lessons that follow. The majority of consonants – and every vowel except /a/ (‘cat’) – has multiple spellings. The vowel /ee/ has the most:

seem, seam, me, grief, receive, theme, honey, silly, radio, marine.

As you can see, vowel spellings are highly context dependent, entirely determined by the words they sit in and, for this reason, they are unstable to decode as well. For example, the digraph ea represents the sound /ee/ in some words (‘team’), the sound /e/ in others (‘head’) and the sound /ae/ in others (‘great’). The fourth key of the code – the multiple ways to decode the same spelling – turns out to be less problematic than it might seem, for reasons which will be addressed later. A chart of the four keys of the code is provided on page 34.

Understanding the Nature of Codes

All writing systems are codes. If that weren’t the case, there would be no way to master them and learning to read would be exactly like memorising the telephone directory. Codes have a specific nature and logic. The units of the code, the ‘things’ for which it was designed, are ‘real’ in the sense of being fundamental, already present, natural categories. The symbols for those units (which constitute the code) are unreal, abstract, artificial marks used to represent those categories.

In mathematics, we represent quantities by written symbols called numbers. Units of quantity are ‘real’, and the number symbols are arbitrary. In musical notation, we represent the music by black and white dots with stems and flags that sit on the lines and spaces of the musical staff. This arbitrary set of symbols represents musical pitch and rhythmic patterns.

All codes are reversible by definition. What you put into code (encode), you can decode to get out the original input. If you decode the notes on a musical score, you get the music back. If you decode letters on a page you get phonemes/words back.

The main message is this: in an alphabetic writing system phonemes are the natural category – the basic sound-units of a language – what the code was written for. The letters are the code. I stress this point, because it is important to keep this straight when you teach an opaque writing system.

If a child is made aware of the phonemes in his own speech and understands what the letters represent, he will be able to grasp the true logic of an alphabetic writing system. He will know that what can be encoded (spelled) can also be decoded (read) to get back the words. This will allow the code to fulfill its most important function: its reversibility. The 40+ phonemes of the English language provide an end point or pivot point around which the code can reverse. And because the spelling patterns remain linked to the 40+ phonemes in the language, this makes our complex spelling code manageable.

If I flip this on its head and take a look at how phonics is often taught, you can see why this is important. In this approach, children learn a letter-first strategy and are taught ‘the sounds the letters make’. (I call this ‘visual phonics’ as opposed to ‘linguistic phonics’.) Children have no idea where these sounds come from. Most five and six year-olds believe the sounds come from the letters themselves, if they think about it at all. Teachers often introduce multiple spellings for the same sound and never explain why. Let’s look at a simple example:

The teacher says: “Today, we’re going to learn the letter ‘see’ (writes c on the board). This letter makes the sound /k/, like in ‘cat’.” A week or so later, she may say: “Today, we’re going to learn the letter ‘kay’ (points to k). It makes the sound /k/ like in ‘kite’.” Several months later she says: “Today, we’re going to learn a letter-pair, see-kay, that makes the sound /k/ (writes ck on the board). You see this in words like ‘sock’” (writes ‘sock’ on the board).

Now do the children recognise that she has taught the same sound three times with three different spellings? She never points this out. Do they believe she has taught three entirely different sounds instead of one? She doesn’t clarify this either. As lessons progress and the children encounter more and more spelling patterns, they can become extremely confused. They know that what they are learning doesn’t make sense, but they don’t know why. Many believe they have to rely exclusively on visual memory, but it continues to fail them. They think it’s their fault that they haven’t made sense of it, and panic and dread begin to mount.

Teaching from the letters to the sounds means that the spellings continue to multiply – there are well over 300 spelling patterns in the English writing system. But there are not 300 phonemes in the English language. Teaching this way makes it impossible to get back to the 40 phonemes in the English language, and the code can’t reverse. As a result, spelling becomes divorced from reading as an unrelated activity, taught on different days, using different sets of words. Our writing system can no longer function as a code, and words have to be memorized one at a time.

The distinction between phoneme-first versus letter-first methods will become more obvious as the training progresses. Meanwhile, be aware that simply conveying the knowledge that our writing system is based on the 40 sounds in our language is a revelation to poor readers who have no idea how the alphabet code works, or even that it is a code. For them, it is like seeing the clouds part and the sunlight come streaming in. It gives them a reason and an understanding for their failure – the knowledge that it isn’t their fault.

Categorising Our Spelling System

I have outlined the superstructure of the English writing system, the special circumstances that cause problems, but, so far, we haven't solved anything. No one could tell you how to teach a child to read or spell from what I have said so far.

There is a major and final step that needs to be taken, and that is where the Sound Reading System is unique. A way had to be found to classify the spelling patterns so they could be taught simply, straightforwardly, and stick in memory. I took on this task about 10 years ago and, in part, the Sound Reading System is a product of that effort.

Despite our formidable spelling system, many people learn to read and spell to quite high levels of skill. How do they do this? We know that the brain can't process randomness. The sensory systems of the brain are designed to respond to patterns and the probabilities of those patterns (how often they repeat). The fact that people do learn to read and spell tells us that there must be a structure, a set of patterns in our writing system that makes it memorable. If we could discover this structure and those patterns, we could teach them. The goal, then, was to find and illuminate these patterns and set up a sequence of instruction to guarantee mastery.

The process began by identifying all legal syllable patterns (phoneme sequences) in the English language. More than 55,000 legal syllables were found. The next task was to classify or categorize the spelling patterns in all real words to determine which spellings were most to least common. This way it was possible to determine the probabilities of each spelling for each phoneme in a large corpus of words – the most common spelling, the next most common and the next. Once this was done, the information was set up in the following manner:

A Basic Code was established. This is essentially an 'artificial transparent alphabet' that assigns the most common spelling to each of the 40+ sounds. This gives the beginning reader easy access to the logic of an alphabetic writing system. It puts English-speaking children on a level playing field with the children in countries who learn a true transparent alphabet. This was done by identifying the most common spelling for each phoneme, then teaching only these spellings with a controlled vocabulary in simple words until this foundation is secure.

Then Advanced Code Spellings were introduced. At this step, one brings in the multiple spellings for the 40 sounds the child has already learned. This level can be introduced quite simply by the phrase: "You have learned the main way to spell this sound, now we're going to learn another way to spell it." If there are obvious patterns, which there often are, the teacher can go on to say: "I will show you some clues (or some words) for when we use this spelling."

It was necessary to make some critical choices at this juncture, given the hundreds of different spellings, some used often and some rarely seen in a lifetime. Spellings were divided into four categories:

- Common – those that appear often in a large corpus of words;
- Exception words – singular or rare spellings in words that appear frequently in print;
- The Latin layer of the code;
- Omitted – singular or rare spellings in words that do not appear frequently in print.

Altogether there are 176 common spellings for the 40+ English phonemes in our spelling system. Once the Basic Code is mastered, this number reduces to 136 more spellings to learn. The probability (or likelihood) of the spellings (most to least common) for each English phoneme is set out in order in the chart at the end of this introduction. As you can see, some phonemes have only one spelling, except for letter doubling, a requirement for certain verb transformations (rub rubbing; and not rub rubbing). Some phonemes have as many as ten (the spellings for /ee/).

'Exception words' are words with unusual spellings seen often in print – as in the words: 'the' 'one' 'of' (thuh, wun, ov). This set includes groups of three or four words with a spelling unique to those words. These are words like could, should, would (cood, shood, wood); great, break, steak (grait, braik, staik), who, whom, whose (hoo, hoom, hoose), and door, floor, poor (dor, flor, por). Altogether, there are about 100 of these words (see chart on page 27).

Exception words should be taught as part of the lesson on a particular phoneme, or when they are encountered in text or during creative writing. They should never be memorised all at once, purely 'by sight'. Keep in mind, very few words (if any) are spelled so irregularly that every letter is impossible to decode.

The Latin layer of the code must be handled differently. Here it makes sense to teach Latin suffixes as whole syllables with special spellings. These suffixes have funny spellings, while prefixes and root words use more common spellings. For example, the Latin suffix 'shun' has seven spellings (none of which is 'shun'). The most common is -tion, used in thousands of English words (nation, instruction, faction).

Next most common is -sion, which usually attaches to root words ending /s/ (express/expression, discuss/discussion); next comes -cian, reserved for occupations and persons (musician, physician), and then four rare spellings in words like: suspicion, martian, ocean, cushion.

The final group of words – those with rare spellings that appear infrequently in print, like 'sapphire' and 'catarrh' – are not taught. These must be learned when they are encountered in text. For the most part, words with rare spelling patterns are often easy to decode, just difficult to spell.

A more in-depth description of this categorical process and the advanced spelling code is set out in *Early Reading Instruction* (pp55-65) (see Recommended Reading).

What Kind of Instruction Matters?

The following are reviewed in depth in *Early Reading Instruction* MIT 2004 (see Recommended Reading on page 166).

In this final section, I want to cover some important research on what matters most in the classroom. Several large-scale studies in Canada and the U.S. were carried out in classrooms over a period of months. Every child was observed individually for a fixed time period per session and this was repeated many times. Observers recorded what each child actually did during reading instruction. The time spent on reading-related activities (time on task) was recorded for each child and correlated to measures of reading skill at the end of the school year. This approach illuminates what works regardless of the method or the teacher. The results were amazingly consistent.

Time spent on three activities strongly enhanced reading skill, as measured by reading comprehension and decoding accuracy:

- learning to segment and blend phonemes in real words;
- learning which letters (spellings) represent which phonemes in words; and
- copying or writing letters, words and sentences.

The effects were robust, showing a strong connection between time spent on these things and higher reading test scores.

Most activities had little or no effect on reading skills, such as learning letter names, how to turn pages, and having children read to the class. Two types of activity produced strong and consistently negative effects on actually learning to read, such that the more time spent on these activities, the worse the reading test scores were (i.e. the further the children fell below standardised norms):

- time spent memorising sight words
- teacher-directed language activities, such as reading stories to the class and vocabulary lessons

The message is clear: if your goal is to teach children to read and spell, then focus on these activities:

- Children should be taught to listen to phonemes in order to be able to isolate, segment and blend phonemes in words;
- they must learn the common spellings for each phoneme and how words with these spellings are decoded; and
- they must learn all this by copying and writing whenever possible.

The more these activities can be combined, the faster the child will learn.

The striking impact of writing on learning and memory confirms another group of studies showing that children learn letter–sound correspondences twice as fast when they copy letters and words by hand, than when they use letter tiles or a computer keyboard.

To summarise these points, I have outlined a ‘prototype’ reading programme see page 36, that best fits the current research. Clinical experience shows that a programme based on these elements fulfills all the necessary requirements to teach every child or adult to read, no matter how poor their reading skills are. And we know for certain that any classroom programmes containing these elements will be far more successful than programmes that do not, as shown by the National Reading Panel’s report summarizing the research in the U.K. and the U.S.

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