Sight words, orthographic mapping, phonemic awareness

What, exactly, are sight words? How are they created? How are they related to orthographic mapping? What phonemic awareness skills are necessary for a child to become a competent reader and speller? And what method of teaching most facilitates sight word creation and orthographic mapping?

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To better understand these topics, some specialised vocabulary is helpful. Let's get that bit of housekeeping out of the way first.

A brief glossary

Phonological lexicon: A storage system in the brain consisting of individual word pronunciations.

Semantic lexicon: A storage system in the brain consisting of individual word meanings.

Orthographic lexicon: A storage system in the brain consisting of individual word spellings.

[Note: We're born with the ability to start acquiring the first two of these lexicons, without any explicit instruction, as a ready-to-go gift of evolution. The orthographic lexicon, however, is created and linked to the other two, if and only if, we engage in the process of learning to read.]

Phoneme: The most elemental unit of sound in a given language (usually designated by slash marks). For example, /a/ (lowercase) is the first sound you can hear in the word APPLE (before you close your mouth to articulate the P sound). The sound /A/ (uppercase) is the first sound you can hear in APRIL (long A). The words CAT, SHED, CHEAP, and TAUGHT (for example) have three phonemes each, despite the fact that they have three, four, five, and six letters respectively:

CAT = /k/ + /a/ + /t/

SHED = /sh/ + /e/ + /d/ (lowercase /e/ = short E)

CHEAP = /ch/ + /E/ + /p/ (uppercase /E/ = long E)

TAUGHT = /t/ + /aw/ + /t/

Grapheme: A letter (or a group of letters) that symbolise a single phoneme. Nearly all graphemes consist of one or two letters (as shown in the above examples). Be careful though: SH (no slash marks) is a grapheme that symbolises the phoneme /sh/ in the word SHED. CH and EA are graphemes that symbolise the phonemes /ch/ and /E/, respectively, in CHEAP. Other common two-letter graphemes are TH and OA (THIN and ROAD). IGH is an example of a three-letter grapheme. It symbolises the long I sound in a word like SIGH and FIGHT.

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There are a few four-letter graphemes as well such as AUGH, OUGH, and EIGH. The first two of these symbolise the phoneme /aw/ in words like TAUGHT and BOUGHT (3 phonemes each). EIGH symbolises the long A sound in words like EIGHT and NEIGHBOUR. For any given word, the number of phonemes and graphemes are equal.

[Note: For a more complete list of phonemes and graphemes, see Table 1 and Appendices P & Q in any of *my free books*. For a full discussion of the Alphabetic Code and all its phoneme-grapheme correspondences, see my blog *here*.]

Decoding: To see a written word, to assign a phoneme to each of its graphemes, and to smoothly blend those phonemes (left to right) to form a pronunciation – thereby 'sounding out' the word. If the word is then recognised by the child, because it's in his or her spoken (or listening) vocabulary, this process is also called reading.

Encoding: To hear a spoken word, to segment it into all its constituent phonemes, and to assign a grapheme to each of those phonemes – thereby spelling it.

Phonemic awareness: To become conscious of the phonemes in everyday speech. Most illiterate children (and adults) are unconscious of phonemes. Children develop an awareness of phonemes as they learn to read. Decoding and segmenting both require phonemic awareness.

Sight word: A written word that is recognised at a glance. A written word which no longer needs to be identified by decoding (sounding out).

Orthographic mapping: A process which involves making explicit the connections between the graphemes in a written word and the phonemes in its pronunciation. Orthographic mapping automatically creates sight words.

The brain's language centre

Children are born with a system already in place for acquiring spoken language. It's a gift resulting from a million years of evolution. As a result, children don't need formal instruction on how to speak or how to comprehend speech. Simply place them in a speaking environment, and their language will begin to develop spontaneously.

Input to this system is via the ears and consists of coarticulated phonemes, that is, phonemes which seamlessly blend together in any given word. With each new word a toddler learns, the sound of the word, with its individual phonemes sequenced automatically, is stored in the brain's phonological lexicon, while the meaning of the word is stored in the semantic lexicon.

Toddlers can easily hear and understand the difference between PET and GET (words differing only in the first phoneme), PET and PAT (differing only in the second), and PET and PEN (differing only in the last phoneme). When a toddler wishes to speak, her brain's language centre automatically and unconsciously gathers, orders, and coarticulates the necessary phonemes:

KITTY CAT = /k/ + /i/ + /t/ + /E/ + /k/ + /a/ + /t/

Throughout an individual's life, spoken words are constantly being added to his or her phonological and semantic lexicons.

What is a sight word?

The brain's language centre, however, has no built-in circuitry for reading and spelling (cf. Sally Shaywitz, *Overcoming Dyslexia*, Ch 5). The ingenious code that underlies those skills is a human invention which developed only a few thousand years ago. That's a blink of an eye in evolutionary terms – and too recent for evolution to have developed specialised brain circuits for handling symbolic speech whose characters (letters) enter the brain via the eyes instead of the ears.

As a child starts learning to read and spell, a third lexicon is created in the brain and linked to the two already there. This orthographic lexicon will slowly (at first) accumulate the exact letter sequence of each word the reader learns to recognise at a glance, that is, without decoding it (sounding it out).

So, for example, if CAT becomes a sight word, its spelling (C, A, T) gets linked to the pronunciation (/k/ + /a/ + /t/) and meaning (furry animal that purrs) that have already been stored in her brain since she was two. She'll never again have to sound out CAT to read it, or segment CAT to spell it.

A sight word, then, is one that a reader instantly and automatically recognises without conscious effort. She doesn't need to analyse it, decode it, or sound it out. Rather, as soon as she sees the word, she recognises it; its sound and meaning are immediately available to her. If instead, she first hears the word, its spelling and meaning are immediately available. And of course, if meaning comes first, spelling and sound instantly follow. For mature readers, most words are sight words.

[Note: Any word encountered by a reader, high-frequency or low, phonetically regular or irregular, can and should become a sight word.]

Creating sight words the hard way

Sight words are clearly useful, but how are they created? There's a hard way and an easy way – and both are necessary for skilled reading and spelling to develop. The hard way is to rote-memorise the spelling of the word visually, without regard to the sound value of its letters. For a longer word, this is akin to memorising passwords or phone numbers.

Here are some examples of words (or other symbolic representations) where rote-memorisation of the accompanying sound is a necessity: OF, ONE, CHOIR, YACHT, COLONEL, 7, @, $, and ♀. The five words in this list are so irregular that sounding them out is not feasible. (To be regular they would have to be spelled OV, WUN, KWIRE, YOT, and KERNAL.) The four non-alphabetic symbols have no possibility of being decoded, yet, when we see them, we instantly 'hear' SEVEN, AT, DOLLAR, and FEMALE.

All nine of these symbolic representations of sound are sight words for most mature readers (as are most of the words in this blog). So why not have new readers learn all words this way, visually, without regard to sound? This would effectively make our alphabetic system into a logographic one – similar, one might assume, to Chinese script. There are three huge problems with trying to do this:

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1. No purely logographic writing system has ever existed. Chinese characters (hanzi) are usually accompanied by a phonetic component to help with pronunciation and/or a semantic component (a radical) to help with meaning. Similarly, Japanese characters (kanji) are usually accompanied by pronunciation helpers (called katakana and hiragana) that symbolise syllables like 'ma' and 'ka'. Notably, for both Chinese and Japanese, memorisation of around 3000 characters is all that's needed for basic literacy. (See *here*.)

The trouble is, it takes 12 years of schooling to achieve this monumental feat of memorisation – even with the above phonetic helpers. That's about 250 characters per year – and it requires a level of intensity, drilling, and homework that would be unacceptable in most Western schools.

Suppose, for a moment, that our children could visually memorise 3000 sight words by the end of high school. Where would that leave them? They would be functionally illiterate. That's because English has over a million words, and a skilled, educated reader of English has a personal orthographic lexicon of *50,000* or more sight words. Do the math: 3000/50000 = 0.06. Conclusion: relying on visual rote-memorisation for sight word acquisition would, under the best possible circumstances, equip our children with only 6% of the sight words needed to become skilled readers. The reality? Most of our children do not learn even 100 sight words per year in this manner.

2. Self-teaching, in the sense of adding new sight words independently to one's orthographic lexicon, would be an impossibility. If the connection between spelling, on the one hand, and sound/meaning on the other, is visually rote-memorised, then, when a child comes across an unknown word, he must either guess the word's pronunciation (and meaning) or ask someone else what the word says.

That this is a critical issue can again be understood with a little math. If

a skilled reader of English has about 50,000 sight words in her orthographic lexicon after 12 years of schooling, she must have been memorising words at the rate of 50,000/12 or 4,166 new words each year. That's 23 new words, on average, per school day! No teacher is accomplishing that with her students and no student is consciously memorising sight words at such a phenomenal rate. (For more information on self-teaching, see *here*.)

3. To begin reading instruction with rote-memorisation of sight words is difficult and demoralising for many children. It gives them the false but unmistakable message that the skill of learning to read is not based on logic, but rather on blind memorisation and word-guessing. After a year of this type of 'schooling', many of them get frustrated and give up. Though these children are actually instructional casualties, they often end up classified as 'learning disabled' or 'dyslexic'.

Creating sight words the easy way: orthographic mapping

Calling this second way of creating sight words 'easy' is a bit of a misnomer – at least at the beginning. At the beginning, this manner of creating sight words is difficult too, as it has some requisite skills that themselves take time and effort to master. Researchers call this second mode of sight word learning orthographic mapping – OM for short. Let's see what it involves.

[Note: The two most prominent researchers in this space are Linnea Ehri and David Share. If you wish to learn more about orthographic mapping than is covered in this blog, these are the two people to read. (For Ehri, see *here* and *here*. For Share, see *here* and *here*.) If you completed your teacher training in the past two decades and you've never heard of these two authors, your school of education did you a significant disservice.]

Orthographic mapping is simply a process whereby a word's exact spelling is stored in permanent, long-term memory as a sight word. Words are mapped, one at a time, into an individual's long-term memory (orthographic lexicon) if that reader has the skills needed to make all the connections between the graphemes seen in an unknown word's written form and the phonemes heard in that word's pronunciation

But this is precisely what happens in the process of decoding a word. Suppose a child comes across an unknown written word, CHEAP for example. Let's assume he knows the three graphemes in this word are CH, EA, and P. Let's assume he correctly matches each grapheme with the correct phoneme: /ch/, /E/, and /p/ respectively. And, finally, let's assume he blends these three phonemes into the correct pronunciation and says proudly: "CHEAP! The word is CHEAP! I know that word! It means you hate to spend money!"

This child has made all the connections possible between the graphemes he sees in the spelling of CHEAP and the phonemes he just blended into a pronunciation. By making these connections explicit, the word CHEAP will become a sight word for him, automatically and unconsciously, after only 1-4 exposures to its written form. CHEAP easily becomes a sight word because his brain (like all brains) craves logic and because "making connections" is how brains work. Such connections are made explicit in the process of decoding.

When grapheme-phoneme (letter-sound) connections are explicitly made for a given word (CHEAP), its exact orthography (spelling), C-H-E-A-P, is directly 'mapped' into the brain's language centre and linked to the brain's sound lexicon and meaning lexicon. Essentially, by connecting individual phonemes and graphemes in this manner, he's training himself to accept specific words input, not through the ears, but through the eyes. Here's how Ehri explains it in one of her many *publications*:

> *[B]eginners remember how to read sight words by forming complete connections between graphemes seen in the written form of words and phonemes detected in their pronunciations. This is possible because they understand how graphemes symbolise phonemes in the conventional spelling system ... In applying this knowledge for forming connections in sight words, spellings become amalgamated or bonded to pronunciations of words already in memory ... [Beginners have] the ability to decode words never read before, by blending*

letters into a pronunciation. This knowledge [blending] enables [them] to form fully connected sight words in memory… Although [they] are able to decode words, this [blending] strategy for reading words is supplanted by sight word reading for words that are practised sufficiently often. (pp. 21-22)

In short, orthographic mapping (automatic sight word formation) will begin to occur as soon as children are able to decode. Decoding, in turn, has two prerequisites:

1. Knowledge of grapheme/phoneme (letter-sound) correspondences. For example: the letter A says (symbolises) the sound /a/, M says 'mmm', and N says 'nnn'.
2. The skill of blending. For example: the teacher places M A N on the board and demonstrates, explicitly, how to smoothly blend the sounds represented by these letters into the spoken word MAN.

[Note: A third skill, segmenting, is also useful here. Segmenting reinforces the 'complete connections' between graphemes and phonemes necessary for orthographic mapping, but it does so from the opposite direction: spelling rather than reading (encoding rather than decoding). Segmenting also helps students spell unfamiliar words (words not yet mapped as sight words).]

Phonemic awareness

Clearly, blending phonemes and segmenting phonemes requires children to have an 'awareness' of phonemes. But is there more to the topic of phonemic awareness (PA) than blending and segmenting? Should PA training be done without letters, as oral-only exercises? Should PA training include phoneme manipulations such as deletion, substitution, and reversal? What's essential and what isn't? Let's see what top reading researchers, and national inquiries in the US and UK, have to say:

The US *National Reading Panel* (2000):

The process of decoding words never read before involves transforming graphemes into phonemes and then blending the phonemes to form words with recognisable meanings. The PA skill centrally involved in decoding is blending. Another way to read words is from memory, sometimes called sight word reading. This requires prior experience reading the words and retaining information about them in memory. In order for individual words to be represented in memory, beginning readers are thought to form connections between graphemes and phonemes in the word. These connections bond spellings to their pronunciations in memory. (2-11)

[Note: If these last two sentences sound familiar, it's because Linnea Ehri was one of the Panel members.]

Various types of phoneme manipulations might be taught. However, two types, blending and segmenting, are thought to be directly involved in reading and spelling processes. Blending phonemes helps children to decode unfamiliar words. Segmenting words into phonemes helps children to spell unfamiliar words and also helps to retain spellings in memory. (2-21)

Programs that focused on teaching one or two PA skills yielded larger effects on PA learning than programs teaching three or more of these manipulations. Instruction that taught phoneme manipulation with letters helped children acquire PA skills better than instruction without letters. (2-28)

It is important to note that acquiring phonemic awareness is a means rather than an end. PA is not acquired for its own sake but rather for its value in helping children understand and use the alphabetic system to read and write. This is why including letters in the process of teaching children to manipulate phonemes is important. PA training with letters helps learners determine how phonemes match up to graphemes within words and thus facilitates transfer to reading and spelling. (2-33)

Teaching students to segment

In short, orthographic mapping (automatic sight word formation) will begin to occur as soon as children are able to decode

and blend benefits reading more than a multiskilled approach. Teaching students to manipulate phonemes with letters yields larger effects than teaching students without letters, not surprisingly because letters help children make the connection between PA and its application to reading. Teaching children to blend the phonemes represented by letters is the equivalent of decoding instruction. (2-41)

England's *Rose Report* **(2006):**

Having considered a wide range of evidence, the review has concluded that the case for systematic phonic work is overwhelming and much strengthened by a synthetic approach, the key features of which are to teach beginner readers:

- *grapheme/phoneme (letter/sound) correspondences in a clearly defined, incremental sequence*
- *to apply the highly important skill of blending (synthesising) phonemes in order, all through a word to read it*
- *to apply the skill of segmenting words into their constituent phonemes to spell*
- *that blending and segmenting are reversible processes.*

The sum of these represent 'high quality phonic work'. (paragraph 51)

[Note how these next two researchers refer to one another.]

Linnea Ehri:

To form connections and retain words in memory, readers need some requisite abilities. They must possess phonemic awareness, particularly segmentation and blending. They must know the major grapheme-phoneme correspondences of the writing system. Then they need to be able to read unfamiliar words on their own by applying a decoding strategy… [Doing so] activates orthographic mapping to retain the words' spellings, pronunciations, and meanings in memory to support reading and spelling.

David Share referred to this as a self-teaching mechanism. With repeated readings that activate orthographic mapping, written words are retained in memory to support reading and spelling. When readers can read words from memory rather than by decoding, text reading is greatly facilitated. Readers are able to read and comprehend more rapidly and to focus their attention on meanings while word recognition happens automatically. (p. 7)

David Share:

Since training studies tend to show that neither letter-sound knowledge alone nor phonemic awareness alone are sufficient for substantial gains in reading ability, we can conclude that phonemic awareness in conjunction with letter-sound knowledge is a causal co-requisite for successful reading acquisition. (p. 192)

There is an important qualification, however, to this broad conclusion regarding the causal, co-requisite status of phonemic awareness. The pattern of results appears to depend on precisely which phonemic awareness skills (synthesis versus analysis) are taught. When phonemic awareness training includes a blending component (in addition, of course, to knowledge of grapheme-phoneme correspondences), trained groups consistently outperform controls. When phonemic analysis (segmentation) alone is trained (even in conjunction with symbol-sound knowledge), findings are consistently negative. The research clearly points to synthesis (blending) as the critical factor as far as reading is concerned. (p. 193)

In summary, there is strong

> *evidence for a causal role of phoneme synthesis (blending) as a twin co-requisite (alongside symbol-sound knowledge) for successful reading acquisition. This conclusion is supported by both laboratory and field studies. Additional support comes from research comparing initial programs of reading instruction. Phonics programs which explicitly teach blending produce superior results compared to 'analytic' programs which generally do not include a blending component … It seems plausible that blending may be critical for reading but segmenting for spelling.* (p. 194)
>
> *There is strong support for Ehri's view that spellings can only be memorised when linked to phonemes detected in pronunciations. The process of letter-by-letter decoding and blending (amalgamating) into an integrated spoken unit, or in short, bottom-up decoding, may be ideally adapted for orthographic mapping. Spelling, of course, is another such process which obliges the explicit processing of letter order and letter identity.*

Re-cap: We've established what a sight word is and we've made the case there are two ways (both necessary) to create sight words. The hard way is to consciously rote-memorise a visual connection between the word as a whole and its sound and meaning. This is necessary only for a limited number of words whose spellings are seriously at odds with their pronunciations (for example: ONE, OF, COLONEL).

There is an easy way to create sight words but it requires the reader to master decoding and the two sub-skills that enable decoding: knowledge of letter-sound correspondences and blending (with letters). This set of skills, according to Ehri and Share, allow the novice reader to make 'full connections' between graphemes seen in the written form of a word and phonemes heard in the spoken form. Once these connections are made by the young reader, sight word creation becomes easy, unconscious, and automatic. The process of making the connections necessary to create sight words in long-term memory is called orthographic mapping. Segmentation reinforces letter-sound connections and it allows the spelling of words which have not yet been orthographically mapped.

Blending and segmenting, both with letters, are the only two phonemic awareness skills necessary for teaching a child to read and spell ** IF ** that child is taught using synthetic phonics. (If a child is taught in some other manner, all bets are off.) Decoding is the key to orthographic mapping and skilled reading. It is, in fact, the sine qua non of reading acquisition. See here.

Conclusion

Teaching the skill of reading is not as complex as many teachers and parents might believe. Written text is simply a code for our 44 speech sounds. We need only explicitly show our children how this code works, and most of them will, with delight, quickly catch on. Kids love codes. Kids love making weird sounds – sounds just like the 44 isolated phonemes. And kids especially love making weird sounds if their teacher or parent is willing to make those sounds with them. And, more than any other delight in the early stages of learning to read, kids love to determine what an unknown word is, all on their own, by decoding it.

Balanced literacy, a method for teaching reading used in many schools, starts reading instruction with sight words (learned the hard way) and guessing strategies (looking at pictures and 'three cueing'). Synthetic phonics, on the other hand, starts with isolated phonemes and blending instruction, leading directly to early decoding ability and orthographic mapping.

I've written about the superiority of synthetic phonics here and here so I won't repeat those arguments now. But only synthetic phonics takes sight word creation and orthographic mapping seriously. Synthetic phonics and phonemic awareness (blending and segmenting with letters) are inseparable, right from the start of instruction. And lest you think any of this is new, it's not. Here, again, is the National Reading Panel:

> *It is important to note that when Phonemic Awareness is taught with letters, it qualifies as phonics instruction. When PA training involves teaching students to pronounce the sounds associated with letters and to blend the sounds to form words, it qualifies as Synthetic Phonics. When PA training involves teaching students to segment words into phonemes and to select letters for those phonemes, it is the equivalent of teaching students to spell words phonemically, which is another form of phonics instruction. These methods of teaching phonics existed long before they became identified as forms of phonemic awareness training. Although teaching children to manipulate sounds in spoken words may be new, phonemic awareness training that involves segmenting and blending with letters is not. Only the label is new.* (2-34)

The paradox of reading instruction is this: decoding is necessary to activate orthographic mapping. Orthographic mapping is necessary to build a large sight word vocabulary. And only a large sight word vocabulary will (eventually) make decoding unnecessary.

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Acknowledgments

Thanks to the following people who graciously offered suggestions as I prepared this essay: Max Coltheart, Pamela Snow, Bob Sweet, Jim Rose, Dylan Wiliam, and Dan Parker.