Ending the Reading Wars: Reading Acquisition from Novice to Expert

eTale 2022



A comprehensive tutorial review of the science of learning to read is presented, from children's earliest alphabetic skills to the fluent word recognition and skilled text comprehension characteristics of expert readers. The reason why phonics instruction is so central to learning in a writing system is explained, but research on what else children need to learn to become expert readers and considerations regarding how this might be translated into effective classroom practice are also reviewed.

Authors: Anne Castles, Kathleen Rastle & Kate Nation

Source: Castles, A., Rastle, K. & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest, 19*(1), 5–51, DOI: 10.1177/1529100618772271

There is intense public interest in questions surrounding how children learn to read and how they can best be taught. A wide gap remains between the state of research knowledge about learning to read and the state of public understanding. The aim of this article is to fill this gap. A comprehensive tutorial review of the science of learning to read is presented, from children's earliest alphabetic skills to the fluent word recognition and skilled text comprehension characteristics of expert readers. The reason why phonics instruction is so central to learning in a writing system is explained, but research on what else children need to learn to become expert readers and considerations regarding how this might be translated into effective classroom practice are also reviewed.

- Reading is the basis for the acquisition of knowledge, cultural engagement, democracy and success in the workplace.
- Illiteracy costs the global economy more than \$1 trillion annually in direct costs alone, and the indirect costs are far greater.
- Low literacy is a major contributor to inequality and increases the likelihood of poor physical and mental health, workplace accidents, the misuse of medication, participation in crime and welfare dependency.
- Thus, a vociferous argument has emerged over how children should be taught to read – a period of exchange that has become known as the 'reading wars'.
- The pendulum has swung between arguments favouring a phonics approach, in which the sounds that letters make are taught explicitly, and a whole-language approach, which emphasises the child's discovery of meaning through experiences in a literacy-rich environment.
- A rich literature has revealed a strong scientific consensus around the importance of phonics instruction in the initial stages of learning to read.
- However, this research has been slow to make inroads into public policy.
- There are two major limitations: First, although there have been many reviews describing the strength of the evidence for phonics instruction, it is more difficult to find an accessible tutorial review explaining why phonics works. Second, a full presentation of evidence in a public forum about reading instruction that goes

beyond the use of phonics is missing.



This paper is divided into three major parts:

- We explain why cracking the alphabetic code is so central to learning to read in alphabetic writing systems and why it forms the foundation for all that comes later.
- We move beyond alphabetic skills, reviewing the latest research on the acquisition of fluent word-recognition skills.
- We progress to text comprehension, which is multifaceted.

At the end of each major section, the implications of the science we have reviewed are considered with regard to the classroom, and controversies surrounding the teaching of these different aspects of reading are addressed.

Cracking the alphabetic code

- Reading is a learned skill, which typically requires years of instruction and practice.
- When children begin learning to read, they usually already have relatively sophisticated spoken-language skills, including a knowledge of the meanings of many spoken words.

- The challenge of reading is to learn to associate arbitrary visual symbols with those meanings.
- Children need to learn to analyse the printed forms of words and map these onto meanings.
- How this might most easily be accomplished depends on the nature of the writing system.

Writing systems and their implications for learning to read

- All writing systems are a kind of code for spoken language, and learning to read requires children to crack how the code works for their language.
- The code that children must learn varies across different languages.
- There are three major categories of writing system: alphabetic (in which symbols represent individual sounds or phonemes), syllabic (in which symbols represent whole syllables) and morphophonetic or logographic (in which symbols represent elements of both meaning and sound).
- In alphabetic systems, the phonemes of the language are represented by letters or groups of letters called graphemes.
- If a child learns to decode that symbol-to-sound relationship, then that child will have the ability to translate printed words into spoken language, thereby accessing information about meaning.
- Even among the alphabetic systems, there is substantial variation in their orthographic depth or the transparency with which symbols (graphemes) represent sounds (phonemes).
- Shallow orthographies are characterised by a consistent relationship between graphemes and phonemes (e.g. Italian), whereas deep orthographies are characterised by substantial inconsistency in this relationship (e.g. English).

- Orthographic depth has a substantial impact on acquiring spelling-sound knowledge in the initial stages of learning to read.
- However, we are unaware of any evidence that these initial gains as a result of shallow orthography translate to later advantages in reading comprehension.

The development of alphabetic decoding skills

- Reliable success in terms of the transfer task is only typically achieved when children are trained such that they can a) segment phonemes in spoken words and identify their initial phonemes and b) recognise the graphic symbols that correspond to the key sounds in the transfer task.
- There is a large body of research on the importance of the metalinguistic skill of phonemic awareness in reading acquisition.
- Thus, children must be able to abstract the relevant phonemic units from the stream of speech they hear. This is a nontrivial task because, in continuous speech, phonemes overlap and run together.
- In addition, children need to learn the visual symbols of the writing system that correspond to phonemes.
- Once children have acquired the alphabetic principle, they can move on to learning the specifics of the relationships between graphemes and phonemes in their writing system and to applying this knowledge in their reading and spelling.
- According to Ehri's phase theory (2005, 2017), children first move into a partial alphabetic phase where they begin to use a rudimentary form of decoding.
- Spelling is an important driver of the transition into the partial alphabetic stage.
- With further instruction and experience in reading and spelling, children move to what Ehri describes as a full alphabetic phase.

- Children now have a much more complete knowledge of grapheme-phoneme relations and can apply this knowledge consistently across a whole printed word.
- Children can now decode unfamiliar printed words, allowing them to access the pronunciations of these and, through them, their meanings (if the words are familiar in oral form).
- In this phase of reading acquisition, the child cracks the alphabetic code.



Implications for the classroom

- Systematic phonics refers to reading instruction programmes that teach pupils the relationship between graphemes and phonemes in an alphabetic writing system.
- Provided that children have adequate vocabulary, this sound-based representation can then be used to access the meanings of these words.
- Thus, systematic phonics instruction should be viewed as a natural and logical consequence of the manner in which alphabetic writing systems represent spoken language.
- Phonics programmes are systematic when they teach grapheme-phoneme correspondences in an ordered manner.
- Such instruction is more straightforward in shallow orthography than in deep orthography.
- The evidence of the effectiveness of phonics instruction is extensive.
- Phonics instruction improves decoding, spelling and text comprehension.
- Synthetic phonics programmes teach grapheme-phoneme correspondences individually and in a specified

sequence, and children are taught early on to blend (synthesise) individual phonemes together to make words.

- In contrast, analytic phonics programmes begin with whole words, and grapheme-phoneme correspondences are taught by breaking these words down into their component parts.
- By introducing grapheme-phoneme correspondences individually, it is possible to control the learning environment more effectively and to ensure that each correspondence is taught explicitly and in an optimal sequence.
- For example, English includes a number of high frequency words that are highly unusual, and many teachers address this problem by teaching these kinds of words as 'sight words' or 'tricky words', together with phonics instruction.
- Teachers may use flash cards with single words printed on them for children to name, activity sheets involving the words or weekly word lists for children to take home.
- In summary, teaching phonics provides children with the principal means of getting from the printed form of a word to its spoken form, but teaching some sight words can assist here as well.
- Decodable books are texts written for children that consist primarily of words that they can read correctly using the grapheme-phoneme correspondences that they have learned.
- These kinds of books provide children with an opportunity to practise what they have been taught explicitly in the classroom and to allow them to experience success in reading independently very early on in reading instruction.
- Evidence suggests that phonics teaching is more effective when children are given immediate opportunities to apply what they have learned to their reading.

Becoming a skilled word reader

- The acquisition of phonic knowledge is by no means all there is to learning to read, even at the single-word level.
- Skilled readers can generalise: they can read not only words that they are highly familiar with but also new words that they have never seen before.
- There is also substantial evidence that alphabetic decoding processes affect skilled readers' word recognition and comprehension.
- Thus, skilled readers of alphabetic writing systems continue to draw on the systematic relations between letters and sounds when they read and understand words.
- These skills, however, are not sufficient for fluent word reading.
- There are computational models that describe the precise cognitive operations involved in visual word recognition and reading aloud.
- All the models converge in that they represent two key cognitive processes in word reading: one that involves the translation of a word's spelling into its sound and then into its meaning and one that involves gaining access to its meaning directly from the spelling, without the requirement to do so via phonology.
- Together, they allow the optimal processing of words across the full spectrum, from being new and unfamiliar to a reader, where alphabetic decoding is critical, to being highly familiar, where direct access to the meaning is more efficient.
- This dual-pathway architecture for deriving meaning from printed words is also apparent in the neural implementation of the reading system.
- In summary, cognitive models converge in representing the fluent reading of familiar words as proceeding directly from print to meaning, without the requirement for alphabetic decoding.

The development of fluent word-reading skills

- As children progress toward becoming skilled readers, their heavy reliance on alphabetic decoding gradually decreases.
- That is, children make the transition from being 'novices' and reading words primarily via alphabetic decoding to 'experts' and recognising familiar written words rapidly and automatically and mapping their spellings directly onto their meanings without recourse to decoding, a process that is referred to as orthographic learning.
- Orthographic learning is an umbrella term that encompasses both the acquisition of the word-specific knowledge required to access a particular word's meaning from print and also the accumulation of more general knowledge about orthographic regularities within the writing system.
- The most influential theory of the transition to skilled word reading has been the self-teaching hypothesis, which sets out a theoretical framework and provides an experimental paradigm for exploring it.
- The self-teaching hypothesis has alphabetic decoding at its core, the so-called sine qua non of reading acquisition, but it further proposes that, by requiring the child to engage in the effortful process of translating print to sound and therefore to focus on the letters in the word and their sequence, the act of decoding also provides an opportunity to acquire orthographic knowledge.
- This knowledge is then available for future encounters with the word, lessening the reliance on alphabetic decoding.
- Thus, through the combination of alphabetic decoding and repeated exposure, children are able to self-teach through their independent reading.
- The process of acquiring direct mappings between printed

words and their meanings proceeds in an item-based fashion: At any particular point in time, a child may read some words slowly and with great effort while recognising and understanding other words rapidly and efficiently, with less reliance on alphabetic decoding.

- Lexical quality is the extent to which a stored mental representation of a word specifies its form and meaning in a way that is both precise and flexible.
- The precision of the representation knowledge of the exact spelling – is important because it allows a child to distinguish a written word from similar-looking words, permitting direct access to its meaning.
- The flexibility of the representation is important because it allows a child to adapt dynamically to different print-meaning combinations.
- As children build their experience with print, the average quality of the words in their lexicon steadily increases.
- As lexical quality builds, cognitive resources are freed up for comprehension.
- Understanding text is a complex task that places heavy demands on attention, memory and high-level language processes.
- When lexical quality is high, a reader's cognitive resources can be largely directed toward this challenging task because individual words are recognised rapidly, automatically and with minimal conscious effort.
- Lexical tuning means that the overall print exposure may interact with the nature of the orthography to shape the development of a child's word-recognition system.
- The lexical legacy hypothesis posits that the linguistic nature of people's experiences with particular words is also important, meaning that words that people experience in a range of different semantic and syntactic contexts might yield stronger orthographic representations than words that are repeated in the same

contexts.

- Cumulative frequency, the age of acquisition and semantic and contextual diversity have all been shown to affect skilled performance when reading words in isolation and in sentences.
- The acquisition of morphological knowledge presents a dramatic advantage in acquiring the mapping between spelling and meaning.
- Morphological awareness refers to a child's ability to reflect on and manipulate the morphological structure of words.

Summary of how to become a skilled word reader

- Expert readers can gain access to the meaning of many words directly from their printed forms, and this reading progress is characterised by a gradual transition from a profile of reading words primarily via alphabetic decoding to one of heavy reliance on this direct mechanism.
- Acquiring knowledge of morphological regularities is an important part of this transition, allowing the child to capitalise on systematic mappings between spellings and meanings.
- Exposure to print provides a dynamic database from which children can accumulate detailed orthographic knowledge, supported by a foundation of alphabetic decoding skills.



Implications for the classroom

 Teaching sight words plays a part in what we see as a deeper response to the question of how to promote fluent word reading — getting children to a point where they can read independently as quickly as possible.

- Reading for themselves allows children to build their experience with printed words, which is crucial for building word-reading fluency.
- Ultimately, it is children's own extensive, varied and rich experience in reading that undoubtedly plays the most important role in their transition from novice to expert readers.
- Because of the importance of morphology in relating word forms to their meanings, there is an argument for the explicit instruction of this issue when it applies to classroom practice.
- Several studies have often found an impact of morphological instruction on some measures, including vocabulary, reading aloud, reading comprehension and spelling.
- It is predicted that the benefits of explicit morphological instruction are more likely to be observed somewhat later in reading development, promoting learning as children accumulate the experience necessary to accomplish direct mapping between spellings and meanings.
- Teachers can seek to provide as much exposure to print as possible during classroom activities and homework, but what they can achieve will be minuscule compared with the exposure that children can attain themselves during their independent reading.
- Fostering a love of reading in children and the motivation to read independently has immense value.
- The most effective strategies for increasing children's motivation to read might be maximising the value of reading and making the choice to do so easy.
- Children will value the activity of reading more if they have opportunities to read texts that they are interested in, that their friends are reading or that are of some practical use to them.

- The amount of personal time that children spend reading depends not just on whether they want to read but also on whether they want to do it more than all the other available options.
- Reading material should be made highly visible to maximise the chance that children will pick something up and read it.
- Children are more motivated to read and engage with it more when they are good at it.
- Thus, one clear and achievable means of maximising motivation is to ensure that children have solid basic skills and consider being 'a reader' a key part of their identities.

Learning to comprehend text

- Children need to be able to identify the majority of words contained in a written text if they are to comprehend it.
- However, text comprehension requires much more than the capacity to identify and read individual words.
- The simple view of reading posits that reading comprehension is the product of two sets of skills: 'decoding' and 'linguistic comprehension'.
- There is general consensus that as people read, they construct a mental representation of the situation being described by the text, linking information from the text with relevant background knowledge.
- Thus, meaning emerges from the formation of a situation model that builds dynamically as people read, culminating in a rich representation of the text that goes beyond what is stated explicitly.
- The foundation of the situation model is delivered by the incremental analysis of words and their syntactic roles in phrases or sentences.
- This connects with knowledge drawn either from information provided explicitly in the text or from

readers' relevant background knowledge.

- Knowledge is broadly conceived and may include information such as the meanings of words, grammar rules, the knowledge of events and temporal relations, episodes, scenarios, emotions and characters.
- Inferences need to be made beyond what is overtly stated to establish meaning within and between sentences, and these need to draw on background knowledge.

Factors influencing the development of reading comprehension in children

- By the time children learn to read, they already have a sophisticated language system, which allows them to produce and comprehend oral language.
- Oral language sets a vital foundation for reading comprehension and its development.
- The reading systems framework identifies three constructs that underpin reading comprehension: the first is concerned with knowledge, be it linguistic knowledge, orthographic knowledge or general knowledge; the second describes processes involved in reading, which include decoding, word identification, meaning retrieval, sentence parsing, inferring and comprehension monitoring, along with the interaction of these processes with each other and with knowledge; and the third factor captures general cognitive resources, such as memory.
- A low level of vocabulary constrains comprehension, but limited knowledge itself might be a consequence of differences in processing.
- Knowledge is fundamental to comprehension.
- Overwhelming evidence indicates that vocabulary knowledge matters: understanding the majority of individual words within a text is a prerequisite to

understanding that text.

- Oral vocabulary sets the foundation for reading comprehension and successful reading itself and then provides opportunities to expand vocabulary.
- Rich vocabulary knowledge subsumes not just the number of individual words known but also how well they are known and how flexibly they can be used in a given context.
- Beyond single words, text comprehension demands knowledge of multiword utterances, idioms and other figurative expressions that occur frequently in text.
- Alongside lexical knowledge, children need to know how words in a sentence operate together.
- Like vocabulary, grammar and syntax knowledge is part of a child's spoken-language repertoire.
- Several processes, such as meaning activation, inference generation and comprehension monitoring, are engaged as people read.
- For example, comprehension monitoring is typically defined as the collection of strategies or skills used to evaluate one's own comprehension, to identify when comprehension has gone astray and, where appropriate, to repair any misunderstanding.

Factors influencing the development of reading comprehension in children

- Executive functions refer to a set of cognitive processes that allow people to plan, organise, control and regulate resources to achieve a goal.
- Working memory, cognitive flexibility and inhibitory control are examples of executive skills and have all been implicated in reading comprehension.
- Working memory can be defined as the mechanisms or processes involved in the control, regulation and active maintenance of task-relevant information in the service of complex cognition.

- The effective control of working memory may allow irrelevant information to be deactivated or suppressed, freeing up resources for ongoing comprehension.
- The availability of working memory resources should facilitate the building of a detailed, rich and wellconnected situation model.
- Working memory performance is associated with vocabulary and inference making – key factors that influence reading comprehension.

Summary of how to learn to comprehend text

- Word recognition and high-quality lexical knowledge provide necessary input into reading comprehension, but knowledge and processes beyond the individual word level are vital too.
- A range of oral language skills measured in preschool are closely associated with reading comprehension later on, and this relationship continues through the primary school years.
- In the early years of reading development, reading comprehension is constrained by limitations in terms of word-reading ability.
- As word-reading skills strengthen, reading comprehension becomes constrained by limitations of knowledge and the capacity to build a rich and coherent representation of language, regardless of whether the language is heard or read.
- The key messages highlight the complex and multifaceted nature of reading comprehension and the associated difficulty of separating knowledge, processing and general resources, such as memory.
- High-quality knowledge promotes efficient processing, which places fewer demands on resources.



Reading comprehension: Implications for the classroom

- The assessment of reading comprehension has a place in the classroom, allowing teachers to identify children who may need additional support. This is important because some children find reading comprehension difficult, despite being able to read words at an ageexpected level.
- Reading comprehension assessment is not easy to measure: it is not a single entity that can be cleanly and reliably captured by a 'gold-standard' test.
- Educators need to be aware of what a particular test is measuring, and this requires some knowledge about what reading comprehension is and why it can vary.
- It is beneficial to explicitly teach children strategies to prompt active engagement with text.
- Some key strategies emerge from the principles of reciprocal teaching, in which children are encouraged to discuss a text with peers and teachers using methods such as clarification, summarisation, prediction and question generation.
- The benefits of strategy instruction appear to emerge after relatively little instruction.
- More consistent effects are seen when strategy instruction is applied in later grades (approximately the fourth grade onward in the United States), probably reflecting the fact that a more reasonable level of reading fluency is needed before children can benefit properly from text-level strategy instruction.
- In a meta-analysis, Elleman et al. (2009) found that although vocabulary instruction led to significant improvements concerning custom-made comprehension

passages containing the taught words, the transfer to standardised assessments of reading comprehension was less impressive.

- This points to the utility of teaching content-relevant vocabulary before children are expected to use that vocabulary to learn from a text.
- Instruction that taught multiple and flexible strategies for establishing word meaning (e.g. using contextual cues, synonyms, syntactic constraints) showed a more general treatment effect.
- A fruitful approach might be to focus on specific types of words (e.g. those words that are not yet known but need to be learnt in order to comprehend a variety of texts and curricular topics).
- Likewise, systematic instruction in more formal or technical academic vocabulary holds promise, especially because such words are rare in speech.
- Inference instruction has been shown to benefit reading comprehension.
- Vocabulary, grammar and narrative skills at school entry and beyond predict later levels of reading comprehension. Even before children can read, interventions that target oral language lead to improvements in reading comprehension.

Conclusions

- Despite extensive scientific evidence, accumulated over decades, in favour of the centrality of alphabetic decoding skills as a foundation of learning to read, there remains resistance to using phonics instruction methods in the classroom.
- Limited knowledge about the nature of writing systems among many practitioners means that they are not equipped to understand why phonics works for alphabetic systems.
- Practitioners know that there is more to reading than

alphabetic skills, but a full presentation of the scientific evidence in relation to these more advanced aspects of reading acquisition in a public interest forum has been lacking.