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REVIEW ARTICLE

Bridging the Gap from Research to Practice: Structural Insights and Evidence-Based Strategies for Children with English Word Reading Difficulties

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ABSTRACT

This article situates literacy within the context of early childhood education, emphasising its role not merely as a school subject but as a fundamental tool for communication, participation, and agency in modern society. In this era where information and knowledge form the pillars of progress, the inability to acquire foundational reading and writing skills places struggling readers at a profound disadvantage, limiting their capacity to engage with the world around them. As such, the past few decades have seen countless research studies done with the goal of improving literacy abilities of struggling learners. However, despite brain research studies and meta-analyses demonstrating the powerful impact that phonics instruction has on children's reading development, systematic and explicit phonics instruction is not widely or effectively implemented in English literacy instruction or interventions. This is because for reading instruction or intervention to be effective, a strong grasp of the English alphabetic system, phonemic awareness, and grapheme-phoneme correspondences, amongst others, is required. Without this knowledge, instructions or interventions risk being fragmented and confusing for struggling learners. Grounded in a multidisciplinary literature search spanning education, psychology and neuroscience, this article aims to serve as a resource for English language classroom teachers and educational therapists by (1) examining structural features of the English language that contribute to reading difficulties, (2) reviewing models of reading development, and (3) presenting evidence-based strategies to support children with word reading challenges. By promoting the translation of research into instructional practices, the inequity and learning gaps between the disadvantaged children and the more privileged ones can be narrowed. Finally, this paper discusses key implementation challenges by identifying practical implementation barriers and outlines critical directions for future research.

Keywords: *Science of Reading, reading difficulties, systematic phonics instruction, English language system, evidence-based practice, reading development*

1. INTRODUCTION: THE IMPORTANCE OF LITERACY

Former UN Secretary-General Kofi Annan once asserted that literacy, being the "building block of development", is the mechanism through which “every man, woman and child can realize his or her full potential” [1]. Indeed, when applied to early childhood development, literacy is a critical building block. For a child who fails to acquire the foundational skills of reading and writing, the deficit extends far beyond the report card. He is not simply failing a school subject. More importantly, he is losing the ability to understand and communicate with the world around him. In this modern era where information is the primary currency of progress, literacy becomes the indispensable tool for a child to navigate in the society and participate as an active agent.

At a functional level, literacy in all its different forms has become a major part of everyday life. Even for a child, it is virtually impossible to go through a day without taking part in some form of literacy practice [2]. It may involve reading the class timetable, learning of subject content in school, reading the instructions on how to play a board game, writing a birthday card, searching for videos on YouTube; the list goes on and the ability to carry out these activities greatly hinges on the ability to read.

Given the importance of literacy, this article aims to serve as a resource for English language classroom teachers and educational therapists (especially for those who are school-based) by (i) examining structural features of the English language that contribute to reading difficulties, (ii) reviewing models of reading development, and (iii) presenting evidence-based strategies to support children with English word reading challenges. To address these objectives, a narrative review approach has been selected over a systematic review methodology, as the latter would be more optimised for aggregating data to address a specific and more narrowly defined question.

This article, however, aims to translate linguistic, cognitive psychology and neuroscience research into actionable classroom practice or intervention plans. Hence, a narrative approach that provides the interpretive flexibility to holistically synthesise research findings across different domains is more suitable. By synthesising the research findings and implications from these diverse sources and integrating them in a cohesive narrative, this article can serve as a multi-dimensional and comprehensive resource for teachers and therapists. By promoting the translation of research into instructional practices, the inequity and learning gaps between the disadvantaged children and the more privileged ones can be narrowed.

2. SEARCH STRATEGY AND SELECTION CRITERIA

To ensure a comprehensive synthesis of the literature, a structured search strategy was adopted by utilising a combination of controlled vocabulary and free-text keywords that are categorised into four conceptual domains, as shown in Table 1.

Table 1. Search keywords by conceptual domains

Domain	Search keywords
Linguistics	English orthography, grapheme-phoneme correspondence, alphabetic principle
Early literacy and reading development	Early literacy, word recognition difficulties, dyslexia, phonemic awareness, phonological awareness, “Scarborough Rope Model”, “Simple View of Reading”, “Ehri’s Stages of Word Reading Development”, “Chall’s Stages of Reading Development”, “Cognitive Foundations Framework”, “Carnine Letter-Sound Sequence”
Reading Intervention	Synthetic phonics, explicit phonics instruction, struggling readers, reading intervention, neuroplasticity
Neuroscience	Dyslexia, reading difficulty, reading intervention, visual word form area (VWFA)

The search was performed using three primary academic databases including ERIC, Google Scholar and PsycINFO and covered publications from 1990 to 2026 to ensure inclusion of both foundational theoretical models and more recent empirical studies. Only English-language sources were included and priority was given to peer-reviewed journal articles, systematic reviews, major meta-analyses and authoritative book chapters. Seminal works were included for theoretical grounding, while more recent publications were emphasised for current evidence on instructional practices and implementation. Further relevant studies were found by manually screening the reference lists of key articles. This approach enabled a broad yet critically informed synthesis of the literature on bridging research to practice in supporting children with word reading difficulties.

This narrative review was guided by the SANRA checklist [3] to ensure comprehensive and transparent reporting for this narrative review.

3. FOUNDATIONAL MODELS OF READING AQUISITION

In this modern society, being literate is of utmost importance, as it affects one's level of functioning in terms of communication, civic participation and personal agency in the society. The ability to read then becomes a critical skill that every child should be equipped with. According to Moats [4], reading failure, and consequently, illiteracy, can be prevented in all but a small percentage of children with severe reading disorders. By carrying out instruction based on the substantial body of evidence-based practices that are now collectively known as the science of reading (SoR) [5], most children, except for a small proportion with severe reading disorders can be taught how to read [6,7]. In doing so, the chronic disparity between the more advantaged and under-resourced learners can be bridged or eliminated.

Literacy instruction or intervention that is not anchored to a sound theoretical framework or model would risk being haphazard and ineffective. To establish a comprehensive, neurobiologically grounded foundation for instructional practice, this review synthesises three complementary reading models: the Simple View of Reading (SVR) [8], Scarborough's Reading Rope [9], and the Cognitive Foundations Framework (CFF) [10]. By triangulating these three frameworks, the synthesis maintains macro-level theoretical rigour while providing the micro-level diagnostic precision required by educational therapists and classroom teachers, as shown in Table 2.

Table 2. Overview of Reading Models [8-13]

	Simple View of Reading (SVR)	Scarborough's Reading Rope	Cognitive Foundations Framework (CFF)
Focus level	Macro-Level	Meso-Level	Micro-Level
Theoretical focus	Dual-component parsimonious formula of R = D x L [8]	Multi-stranded developmental continuum.	Granular sub-skill breakdown.
Key mechanisms & overall framework	Establishes reading as the multiplicative product of two non-negotiable domains and that a complete deficit in either variable yields a total product of zero (R = 0) [8].	Illustrates how lower word recognition strands undergo increasing automatization, while upper language comprehension strands become increasingly strategic [9].	Delineates the underlying cognitive skills such as phonemic awareness, letter knowledge and print concepts that feed directly into word recognition and language comprehension [10].
Clinical & pedagogical implications	Demonstrates that reading comprehension is not possible without accurate word-level decoding [11]	Visually tracks how sub-skills weave together over time fluent reading comprehension [12]	Identifies precise cognitive bottlenecks, enabling educational therapists and classroom teachers to design targeted interventions [13].

3.1 The Simple View of Reading (SVR) Model

Based on the Simple View of Reading (SVR), reading comprehension (R) is the product of two independent components: decoding (D) and language comprehension (L) [8]. Reading comprehension

is defined as the ability to extract and construct meaning from linguistic discourse represented in print, and language comprehension is defined as the ability to extract and construct meaning from linguistic discourse represented in speech [10]. The SVR model is represented by the equation D x L = R (see Figure 1). Decoding (D) and language comprehension (L) are each thought of as variables ranging from 0 (nullity) to 1 (perfection), and them being combined multiplicatively captures the relationship of necessity, coupled with non-sufficiency; success in reading comprehension (R) requires both components (D and L) to be non-zero [8].

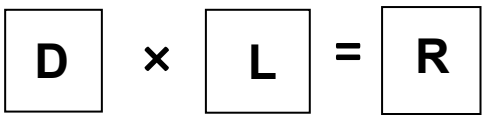


Figure 1. Simple View of Reading (SVR) Model [8]

Educators can make use of the above SVR equation to assess students' areas of strengths and weaknesses in reading, as well as identify the different types of reading difficulties a student may have: dyslexia, hyperlexia, and mixed types poor reading (see Figure 2). Students with deficits in visual word processing and language comprehension processes are the most common in schools. Identifying reader profiles will enable practitioners to design targeted classroom instruction or literacy interventions.

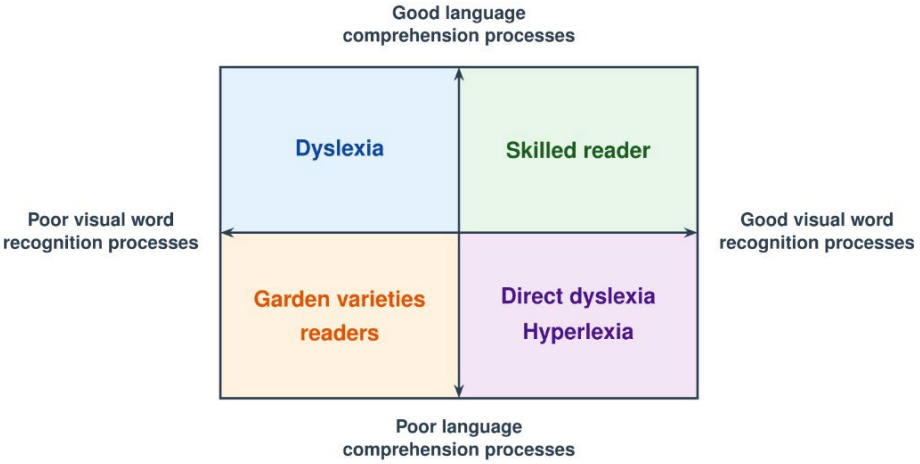


Figure 2. Reader profiles based on the SVR model (Adapted) [14].

3.2 The Scarborough Rope Reading Model

Apart from the SVR model and the CFF, the Scarborough Rope Model is another reading model that identifies language comprehension and word recognition as the important contributors to successful reading, represented as two key strands. The finer strands within each key strand represent the various skills of language comprehension and word recognition that a child has to acquire to become a skilled reader (see Figure 4). According to Scarborough [9], skilled readers who are able to derive meaning from printed text accurately and efficiently do so by fluidly coordinating these component skills.

In Figure 3, the two key strands, language comprehension and word recognition, are illustrated separately at first, implying that each strand could be taught explicitly, with phonics taught through systematic instruction and language comprehension through intentional, meaning-rich read-aloud texts [15]. This approach of addressing each component separately in a targeted manner can be adopted in the earlier phases of reading instruction or intervention. Subsequently, the two key strands intertwine into one rope as the learner becomes increasingly skilled in reading. This intertwining feature illustrates the interaction between the two key strands, something that is not evident from the SVR model. For

example, fluent decoding from the word recognition strand frees up cognitive space for meaning making, while inferencing from the language comprehension strand gives purpose to decoding by connecting words to ideas [15].

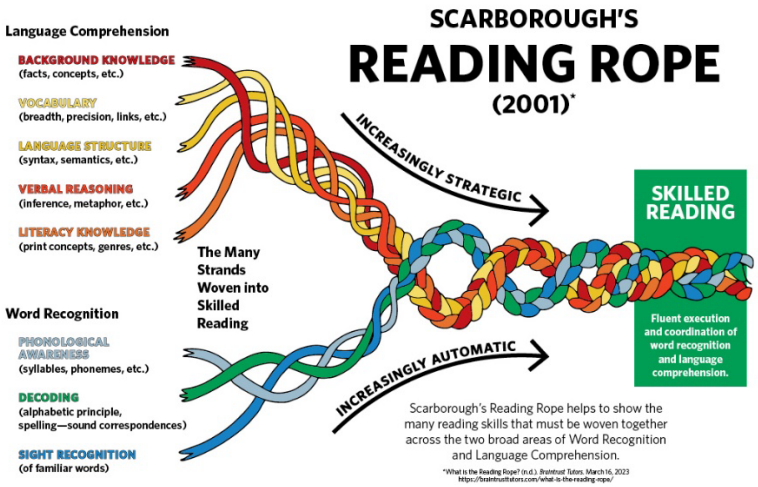


Figure 3. Scarborough Rope Model [9].

Scarborough's rope model is also a strong complement to Tunmer and Hoover's CFF [10] that identifies the key cognitive capabilities underlying language comprehension and word recognition. The identification of the literacy components needed to comprehend language and recognise words provides a framework for teachers and therapists to translate research into instructional practice. It also serves as a useful framework for assessing the struggling reader's profile, in terms of the sub-skills that need to be worked on.

3.3 Cognitive Foundations Framework

The SVR model was subsequently expanded to the CFF. The original structure of the SVR model is retained but the sub-components within the decoding (D) and language comprehension (L) components are unpacked [16]. The CFF is more elaborate as it maps out the key cognitive skills underlying each component (see Figure 4)[10]. These cognitive capacities are aligned to the 'big five' instructional components: (1) phonemic awareness, (2) phonics, (3) fluency, (4) vocabulary, and (5) comprehension, as recommended in the US National Reading Panel Report [17].

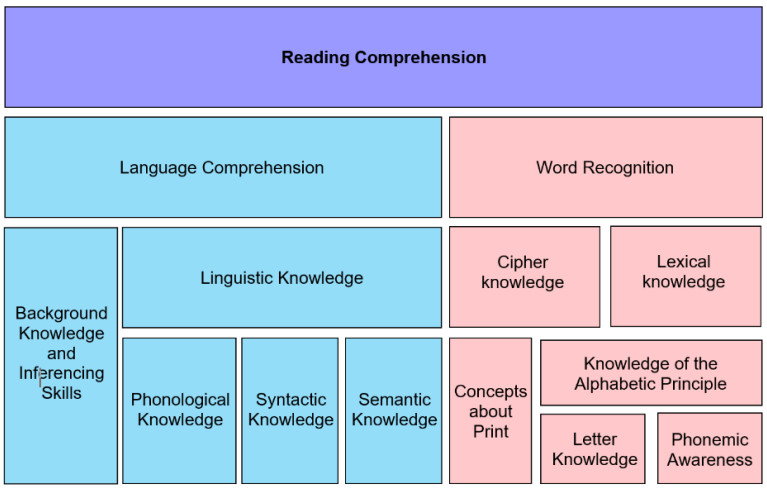


Figure 4. Cognitive Foundations Framework [10]

The CFF can also serve as a diagnostic tool for reading assessment and based on the cognitive skills that are found to be under-developed, specific instructional strategies or targeted intervention can be planned for the struggling reader [10]. For example, for emergent readers who are lagging significantly in reading comprehension relative to their peers, the framework enables the teacher or therapist to pinpoint if their difficulty lies in word recognition, understanding the language, or confluence of both factors. If the learner has been assessed to have poor word recognition skill, the CFF is useful in isolating the precise sub-skill impairments that he or she might have, such as deficiencies in alphabetic coding, an inadequate grasp of the alphabetic principle, limited letter knowledge, or poor phonological awareness [10]. Hence, learning difficulties faced by struggling readers can be analysed through the lens of the CFF and the corresponding intervention can be planned.

4. FROM SPEAKERS TO READERS

As evident from the models of reading, word recognition has been consistently represented as a critical component in developing skilled readers. This section will therefore explore the different mechanisms through which early readers learn to read printed words.

Young children first come into contact with the spoken language before learning about the written language. Pre-reading children understand words they hear and can find words to express their thoughts and feelings. This means that they have already established a semantic lexicon, an internal dictionary containing the meanings of all the words they know, and a phonological lexicon containing the pronunciations of all the words they know [18]. Word reading processes are built on these pre-existing foundations of spoken language.

To understand a child's developmental trajectory from speakers to readers, we can look at Chall's framework on reading development [19] and Ehri's phases of word reading development [20]. Stage theories can give us a lens with which to look at the processes children are using as they learn to read words. It also provides a useful assessment framework for the teacher or therapist to group the learners and carry out developmentally appropriate instruction or intervention.

To facilitate clarity in the remaining part of this paper, a glossary of standard reading science and linguistic terminology is provided in Appendix A [11,21].

4.1 Chall's Stages of Reading Development

The framework by Jeanne Chall [19] provides a detailed mapping of how children learn to read, highlighting the critical transition from spoken language to independent reading skills. Table 3 below shows a description of the various stages, but the focus of this article will be on the earlier stages from Stage 0 to Stage 2.

Table 3. Chall's Stages of Reading Development [19]

Stage	Description of child
Stage 0: Pre-reading and "pseudo-reading" (6 months to 6 years)	• Mimics reading behaviours and recounts narratives based on memory recall or illustrations in books. • Identifies alphabetical letters and common environmental signs. • Write their own name and engages in exploratory play with writing materials and books.
Stage 1: Initial Reading and decoding (6 to 7 years)	• Grasps the relationship between graphemes (letters) and phonemes (sounds), as well as print and speech. • Able to read basic level material with common sight words and phonetically decodable words. • Applies phonetic strategies to independently sound out novel, single-syllable words.

Stage 2: Confirmation and fluency (7 to 8 years)	• Develops smoother, more automatic reading habits on predictable texts. • Strengthens foundational decoding, expands sight word recognition, and utilizes contextual clues to enhance comprehension during familiar narratives.
Stage 3: Learning the new (9 to 14 years)	• Utilizes reading as a tool to acquire unfamiliar concepts and information, develop broader emotional awareness or perspectives (typically from a singular viewpoint). • Engages with more advanced texts that require the development of new schema, specialized vocabulary, and active comprehension tactics.
Stage 4: Multiple Viewpoints (15 to 18 years)	• Reads multifaceted materials across numerous disciplines extensively, including both informational (expository) and creative (narrative) texts, written from varying viewpoints.
Stage 5: Construction & Reconstruction (18 years and above)	• Synthesises personal insights with external information to analyse and formulate original ideas. • Demonstrates highly rapid, purposeful, and efficient reading capabilities.

Based on this framework, for a young learner at the pre-reading level to become a skilled reader at the fluency level, alphabetical and decoding skills must be taught. Poor literacy instruction at the decoding level would affect the child's ability to recognise words to a large extent, and subsequently, his reading comprehension ability. Reading instruction in the early school years and early intervention for struggling readers usually involve transitioning a child from Stage 0 (emergent level) progressively to Stage 2 (fluency level). Stage 3 of Chall's model corresponds to the part where the two key strands in Scarborough's rope model start to intertwine, marking the development of a skilled reader who is now reading to learn, instead of learning to read [19].

4.2 Ehri's Model of Word Reading Development

Ehri [20] formulated a theoretical framework mapping the progression of reading acquisition, specifically focusing on words. According to this model, the acquisition of reading proficiency is portrayed as a series of four sequential phases, each defined by the predominant type of alphabetic connection used by the child to read words [20], as shown in Table 4.

Table 4. Ehri's Phases of Word Reading Development [20]

Phase	Description of child
'Pre-alphabetic phase'	• Possesses minimal letter knowledge and phonemic awareness to enable them to read words using letter-sound relations • Makes use of visually or semantically salient cues to figure out the word • May read certain words based on context cues rather than letters (e.g., reading out "McDonald's" on seeing the golden arches)
'Partial-alphabetic phase'	• Has acquired alphabetic knowledge (letter identification, orthographic forms and letter sounds) and phonemic awareness • Starts to read and spell words by making use of partial letter-sound cues • Able to read limited number of words due to partial knowledge of letter-sound relations and lack of knowledge on vowel spellings and consonant clusters • Typically, a beginning reader or an older struggling reader
'Full alphabetic phase'	• Able to identify and process every phoneme in target vocabulary. • Has a more solid grasp of the main grapheme-phoneme correspondences and use them to read and spell words • Able to process novel vocabulary by converting letters into phonetic sounds and blending them to recognise familiar words • Children build a sight vocabulary by linking a word's spelling directly to its pronunciation, allowing them to store and retrieve practiced words from long-term memory.

'Consolidated alphabetic phase'	• Forming of spelling units to aid in word recognition. These spelling units can consist of grapheme-phoneme blends that form syllabic or sub-syllabic units such as: o morphographs such as im-, in-, pre-, mis-, -ed, -ing, -ness and -able o rime spellings such as -ate, -at, -up, -ive o common syllable spellings such as CVC, CCVC, VCe, vowel team, R-controlled vowels, C-le • Consolidating letter patterns into units and pronouncing the units as wholes instead of sounding out letter by letter. o For example, the word 'interesting' can be decoded into four syllabic units instead of 9 individual phonemes. • Sight words are primarily retained in memory by grouping them around familiar spelling patterns, syllables, or meaningful word parts (morphographs). o For example, the word 'uncountable' is remembered as 'un + count + able' instead of the individual letters 'u-n-c-o-u-n-t-a-b-l-e'

4.3 Different Ways to Read Words

Ehri [22] also identified four essential methods employed by children to facilitate word recognition during their developmental stages of literacy. A close examination of the methods presented in Table 5 indicates that a child taught to read through a decoding method can subsequently draw upon the acquired grapheme–phoneme knowledge to extend his or her reading capacity via the analogy and prediction methods.

Table 5. Ways that Children Learn to Read [22]

Method	Description	Implication for emerging readers
By sight	The learner has read the word several times and stored the orthographic representation of the word, together with its pronunciation, in his or her long-term memory. The word can be read from memory automatically by sight.	Requires recurrent exposure to the word, allowing the orthography to be bonded to its pronunciation in memory to form one lexical unit.
By analogy	This method involves using a known word (a "base" or "anchor" word) to decode an unfamiliar word with the same spelling pattern. A child who can read 'team' would be able to figure out how to read 'stream', 'gleam' and 'beam' by recognizing the spelling pattern of -eam.	Requires the learner to have a store of written words in memory and remember the spellings of keywords they needed to analogise.
By prediction	This method works when the child knows a word orally but not in print, so he or she uses the sentence context and some letter sounds to predict the word. For example, 'Heat turns ice into l----d" can provide the context for the child to derive the last word as 'liquid'.	Requires letter-sound knowledge, comprehension of a word's meaningful context, and a vocabulary of spoken words.
By decoding	This method requires the learner to sound out and blend letter-sound units.	Requires the learner to have knowledge of grapheme-phoneme correspondences and higher-order units of the writing system like onsets, rimes, syllables and morphemes.

Based on both Chall's and Ehri's frameworks [19,20] for reading development described above, phonics instruction stands out as a critical mechanism in advancing children through the various stages of reading development. However, despite systematic phonics instruction being recommended and backed by research for more than two decades, many teachers still struggle or hesitate to deliver an effective phonics-based instruction or intervention. Why is that so? A closer study of the structure of the English language system may shed some light on this long-held frustration.

5. KNOWLEDGE OF THE ENGLISH ALPHABETIC LANGUAGE

Classroom teachers and education therapists may be skilled readers themselves, but this does not necessarily mean that they are equipped with the knowledge needed to teach struggling readers, particularly those transitioning from the emergent to the decoding stage in Chall's Stages of Reading Development [19], or those who struggle to progress from the partial alphabetic phase to the full alphabetic phase in Ehri's model [20].

A solid understanding of the English alphabetic system is needed in order to teach phonemic awareness and deliver phonics-based instruction effectively. A lack of sufficient insight about how to segment words into phonemes and how graphemes in the spellings of words correspond to phonemes could make the teaching or intervention confusing and inconsistent for the beginning and struggling learners [20]. The following discussion will therefore highlight some of the complexities of the English writing system to clarify why many children find word recognition inherently challenging.

5.1 English as an alphabetic language system

Writing systems around the world all evolved from spoken language and capture spoken language in visual form. Writing systems are graphic, making use of a limited set of strokes configured in different ways to represent language [18]. There are three main types of writing systems: logographic, syllabic and alphabetic (see Table 6).

Table 6. Types of Writing Systems [18]

Writing System	Description	Examples
Logographic	Each symbol represents a whole word or a morpheme (a unit of meaning) rather than a sound.	• Japanese kanji • Chinese characters
Syllabic	Each symbol represents a full syllable: a combination of a consonant and a vowel or a single vowel.	• Japanese Katakana • Cherokee syllabary • Cree syllabics
Alphabetic	A standardised set of letters, where each letter typically represents a phoneme: a single sound (or consonant/vowel segment).	• English • Greek • Turkish • Hebrew • Bahasa Indonesia

The English language is an alphabetic system that is made up of 26 letters, and these 26 letters, alone or combined in various ways, represent 44 speech sounds (called phonemes) in the language.

5.2 Grapheme-Phoneme Correspondence (GPC) in English

Out of these 44 phonemes in the English language, 24 of them are consonant phonemes and 20 of them are vowel phonemes (see Appendix B) [23, 24]. Each of these phonemes is represented by a single letter or combinations of letters (called graphemes) [18]. Grapheme-Phoneme Correspondence (GPC) [25] is therefore the matching of written symbols to spoken sounds. There are three types of GPC [2, 16, 18, 20, 26-29]: (i) The first type is a one-to-one GPC, where a single grapheme represents a specific phoneme. (ii) The second type of GPC is where a single grapheme can be used to represent multiple phonemes. (iii) The third type of GPC is where a single phoneme can be represented by different graphemes. Examples to illustrate each type of GPC can be found in Table 7.

From Table 7, we can see that the lack of a one-to-one correspondence for each of the 44 phonemes is one of the main challenges in learning how to read and spell English words [28]. While a teacher will have no trouble teaching the class how to read 'cow' and 'snow', he or she might find it hard to explain to students why 'cow' and 'low' do not sound similar, when graphically, they only differ by one letter. It

is not uncommon to hear teachers dismiss such questions from curious learners with comments like "That's how it is…" or "Well, the rules don't work all the time for English …" Without the teacher or therapist introducing the relationship between graphemes and phonemes in a structured manner, the learner would not be able to find a stable approach towards learning how to read words [30]. For at-risk learners or learners with disabilities like dyslexia, word reading becomes perplexing and unpredictable learning experience [30].

Table 7. Types of GPCs [2, 16, 18, 20, 26-29]

Type 1: One grapheme corresponding to one phoneme		
Phoneme (speech sound)	Grapheme (letter / letters representing he sound)	Example words
/h/	Letter 'h'	hat
/w/	Letter 'w'	Wet
Type 2: Multiple graphemes corresponding to one phoneme		
Phoneme (speech sound)	Grapheme (letter / letters representing the sound)	Example words
/k/	Letter 'c'	cat, cookie
	Letter 'k'	key, kick
	Letter 'q'	quay, quote
	Letters 'ch'	chemistry, stomach, anchor
/dʒ/	Letter 'g'	germ, germinate
	Letter 'j'	jump, jail
/f/	Letter 'f'	funny, five
	Letters 'ff'	bluff, staff
	Letters 'ph'	phone, photo
	Letters 'gh'	laugh, graph
Type 3: One grapheme corresponding to multiple phonemes		
Phoneme (speech sound)	Grapheme (letter / letters representing the sound)	Example words
/ʊ/	Letters 'oo'	book, foot, wood
/uː/		moon, zoom, boom
/oʊ/	Letters 'ow'	low, snow
/aʊ/		cow, how

The process of learning how to read words would be less confusing or appear less random if the assumption of a consistent one-to-one correspondence between grapheme and phoneme is addressed right from the start of the literacy instruction or intervention programme. If the teacher or therapist introduces explicitly the three types of GPCs as an introduction to the English language, the question of why 'cow' and 'low' do not sound similar can be rationally resolved by highlighting that the grapheme 'ow' corresponds to two sounds (/aʊ/ as in the word "cow" and /oʊ/ as in the word "low"). The concept can then be reinforced by creating short literary texts that incorporate words with a specific type of GPC [26] (see Appendix C for an example of literary text and extension activities developed by the author to illustrate how instruction of Type 3 GPC in Table 7 can be designed and implemented by teachers or educational therapists).

Based on the three types of GPC above, the 24 consonant phonemes are represented by about 70 graphemes, and the 20 vowel phonemes are represented by about 80 graphemes. A list of the common graphemes used to represent the 44 phonemes in the English language can be found in Appendix B [23, 24], and this list can be used as a guide when planning lessons or interventions.

5.3 Digraphs - A Tale of Two Letters

Apart from having different types of GPCs, the existence of digraphs adds on to the complexity of word reading in English. When two letters correspond to a single phoneme, the resulting grapheme is a digraph [11]. There are 4 main types of digraphs, as shown in Table 8.

For the vowel-consonant digraphs, the general rule is that the vowel will be sounded (transparent phoneme) while the consonant will not be sounded (opaque phoneme). The existence of opaque phonemes makes word reading in English more difficult, since the learner can see the letters but not hear their sounds [19]. Furthermore, not all consonants in vowel-consonant digraphs are opaque, however. In Table 8 [30], out of the three examples provided for Type 3 digraphs, the 'ey' and 'ay' are pronounced as the long vowel 'e' sound and long vowel 'a' sound respectively. However, for the 'oy' digraph, the consonant 'y' is not silent. In fact, it appears as a vowel phoneme, and together with the first vowel 'o', makes the sound /ɔɪ/, as in the word 'toy'. In this case, the digraph 'oy' becomes a diphthong, where the sound starts with the short vowel 'o' sound (/ɔ/) and glides into the short vowel 'i' sound (/ɪ/) [18]. Another example of such irregularity can be observed in the Type 4 digraphs as well. When the consonant is the letter 'r', the consonant letter 'r' will be sounded instead of being silent. These irregularities make English appear as unstable and unpredictable to the emerging readers [18].

Table 8. Different Types of Digraphs [18, 30]

Type 1: Vowel Digraphs			
Vowel + Vowel	Example of Digraph	Phoneme	Example word
	ea	/iː/	bead, sea
		/e/	bread, head
		/eɪ/	great
	ai	/eɪ/	pain, sail
	oa	/əʊ/	boat, road
	oi	/ɔɪ/	boil, soil
	au	/ɔː/	August, sauce
Type 2: Consonant Digraphs			
Consonant + Consonant	Example of Digraph	Phoneme	Example word
	ch	/tʃ/	chair, much
	ck	/k/	kick, snack
	sh	/ʃ/	shoe, brush
Type 3: V-C Digraphs			
Vowel + Consonant	Example of Digraph	Phoneme	Example word
	ey	/iː/	key, money
		/eɪ/	Hey, they
	ay	/eɪ/	play, say
	oy	/ɔɪ/	toy, boy
Type 4: V-C (R-controlled) Digraphs			
Vowel + Consonant R	Example of Digraph	Phoneme	Example word
	ar	/ɑːr/	car, star
	or	/ɔːr/	for, storm
	er	/ɜːr/	farmer, after
	ir		bird, stir
	ur		fur, purple
Type 5: Split Vowel Digraphs			
Vowel + Consonant + Vowel	Example of Digraph	Phoneme	Example word
	a-e	/eɪ/	made
	e-e	/iː/	these
	i-e	/aɪ/	pine
	o-e	/əʊ/	home
	u-e	/uː/	rule

Digraphs, as an orthographic device, can be a huge conceptual leap for emerging readers, who, for the first time, learn that two letters can work together to make one sound. In the case of the split vowel digraphs, these two letters are not even beside each other in the word [26]. After coming to terms with

that, the children have to cope with the irregularities in the pronunciation of some digraphs, where the existence of transparent and opaque phonemes makes the orthographic mapping even harder.

5.4 More Irregularities: The Existence of 'Heart' words

There are times when a teacher gets really baffled and frustrated over a student who fails to read short words comprising of only two or three letters. However, the length of word does not necessarily determine the ease of reading it. For example, long words like "fantastic" and "sunflower" are fully decodable and thus, easier to read. Conversely, short high frequency words like "to", "are", "one", "the" and "was" are harder to read, as their pronunciations are not consistent with the general phonics rules, meaning they are irregular words (see Table 9). These words are then best taught as 'Heart words' [31], meaning words with pronunciations must be memorised by heart, instead of decoded using phonics rules. Such irregular words can still be orthographically mapped and stored in their long-term memory [28,31].

Table 9. Examples of 'Heart' Words [31]

Word	Explanation
to	The letter 'o' neither makes the short vowel 'o' sound (/ɒ/) nor "long vowel 'o' sound (/oʊ/). Instead, it makes the 'oo' sound (/u:/).
are	This word takes the form of split vowel digraph (a-e). While conforming to the common rule of the second vowel (letter 'e') remaining silent, the first vowel (letter 'a') did not make the long vowel 'a' sound (/eɪ/). Instead, it makes the "ah" (/ɑː/) sound.
one	Starts with a /w/ sound that isn't written, and the letter 'o' makes the short vowel 'u' sound (/ʌ/).
the	The letter 'e' usually makes a schwa sound (thuh) rather than a short vowel 'e' sound (/ɛ/) or long vowel 'e' sound (/i:/).
was	The letter 'a' neither makes the short vowel 'a' sound (/æ/) nor "long vowel 'a' sound (/eɪ/). Instead, it makes the short vowel 'o' sound (/ɒ/). The letter 's' makes the sound /z/ instead of /s/.

6. FROM RESEARCH TO PRACTICE

Compared to languages like Turkish or Bahasa Indonesia, which feature highly transparent orthographies with predictable, one-to-one grapheme–phoneme correspondences, learning to read in English is far more challenging due to its complex grapheme-phoneme correspondences [29,31]. This section of the article will share some of the research-based findings pertaining to phonics instruction and provide some suggestions on how they can be translated into practice in early reading instruction or intervention.

6.1 Overview of various approaches

Dilgard et. al [32] conducted a systematic literature review on the different types of instructional activities used during interventions and the practices that had the highest impact on word level decoding and spelling in one or more studies are shown in Table 10 below. This table can be used as an evidence-based repository of effective methodologies for professionals working with struggling or emerging readers.

6.2 Evidence-based Practices & Interventions

From the research findings in Table 10, it is evident that most of the instructional activities that have been found to have a high impact on developing word recognition ability in children are phonics-based in nature. This section will therefore examine the seven characteristics of strong phonics instruction

identified by the International Literacy Association [26]. Examples of instructional activities or tips associated with each characteristic are also provided to illustrate their potential application in clinical and classroom settings.

Table 10. High-Impact Instructional Activities and Supporting Research (adapted) [32-39,45-52].

Type of Instructional Activity
Synthetic activities [33]
Alphabetic principal activities [33-36]
Writing activities to strengthen orthographic mapping [33, 34, 37, 38]
Explicit / direct phonics activities [36, 39-45]
Group turns/choral responses [34, 39, 46]
Decodable texts [39, 45, 47]
Systematic phonics [39, 45, 47, 48]
Word sorts [36-38, 49, 50]
Color-coded rime patterns [51, 52]
Listening activities [37]
Cumulative reviews [50]

6.2.1 Scope and Sequence

A strong scope and sequence build from the simple to the complex in a way that takes advantage of previous learning. The sequence should allow for many words to be formed as early as possible and focuses on teaching high-utility skills. Although there is no “right” scope and sequence, programs that strive to connect concepts and move through a series of skills in a stair-step way offer the best chance at student success [26]. For example, some teachers might introduce letters and their sounds by following the alphabetical order. However, the letter order proposed by Carnine et al. [53], a research-based approach, is recommended to build grapheme-phoneme knowledge from simple to complex.

Carnine et al. [53] developed a specific sequence for introducing letter-sound correspondences (a, m, t, s, i, f, d, r, o, g, l, h, u, c, n, b, k, v, e, w, j, p, y, x, z, q) to significantly reduce student confusion and accelerate reading mastery. The sequence begins with letters that appear most frequently in simple words (high utility or high frequency letters) so as to allow students to begin reading words as quickly as possible. The deliberate separation of visually similar letters (like ‘b’ and ‘d’, ‘p’ and ‘q’) or auditorily similar letters (like /d/ and /t/) also serves to prevent “interference” in a child’s memory [53].

Apart from using Carnine et al.’s Letter-Sound Sequence [53], another approach to be considered is the introduction of consonant letters first followed by vowel letters, as vowel phonemes are more complex [20]. For consonant letters, those that have a similar sound to the letter name should also be taught first while those that differ should be taught later after confidence has built up, and more instructional time should be allocated too. Pre-empting potential pitfalls would help to increase success in phonological processing.

6.2.2 Readiness Skills

Alphabet recognition and phonemic awareness have been found to be strong predictors of early reading success. Alphabet recognition involves learning the names, shapes and sounds of the letters of the alphabet with fluency. Phonemic awareness is the understanding that words are made up of a series of discrete sounds called phonemes [18]. Phonemic awareness also refers to the ability to focus on, distinguish, separate, and manipulate phonemes within pronunciations of words [22].

It is important to teach phonemic awareness explicitly, especially to emerging readers, as children started communicating and learning with the spoken language. They are accustomed to paying attention to the meanings of the words they speak or hear instead of their phonemes [20]. Furthermore,

segmenting a word into its phonemes is neither easy nor natural for them, as speech is continuous with the phonemes blended together seamlessly. To learn how to read words, phonemic awareness is required by the learners to form connections between the speech sounds they hear (phonemes) and the letters that represent them (graphemes). Once these connections have been established, the learner will be able to decode and read words [20]. Table 11 shows the various strategies that can be used to develop phonemic awareness in children systematically.

Table 11. Various tasks to teach phonemic awareness [54]

Type of task	Example
Phoneme isolation • Children recognize individual sounds in a word.	Teacher: What is the first sound in ***van?*** Children: The first sound in ***van*** is /v/.
Phoneme identity • Children recognize the same sounds in different words.	Teacher: What sound is the same in ***fix, fall,*** and ***fun?*** Children: The first sound, /f/, is the same.
Phoneme categorization • Children recognize the word in a set of three or four words that has the "odd" sound.	Teacher: Which word doesn't belong? ***bus, bun, rug.*** Children: ***Rug*** does not belong. It doesn't begin with /b/.
Phoneme blending • Children listen to a sequence of separately spoken phonemes, and then combine the phonemes to form a word. Then they write and read the word.	Teacher: What word is /b/ /i/ /g/? Children: /b/ /i/ /g/ is ***big.*** Teacher: Now let's write the sounds in ***big:*** /b/, write ***b;*** /i/, write ***i;*** /g/, write ***g.*** Teacher: (Writes ***big*** on the board.) Now we're going to read the word ***big.***
Phoneme segmentation • Children break a word into its separate sounds, saying each sound as they tap out or count it. Then they write and read the word.	Teacher: How many sounds are in ***grab?*** Children: /g/ /r/ /a/ /b/. Four sounds. Teacher: Now let's write the sounds in ***grab:*** /g/, write ***g;*** /r/, write ***r;*** /a/, write ***a;*** /b/, write ***b.*** Teacher: (Writes ***grab*** on the board.) Now we're going to read the word ***grab.***
Phoneme deletion • Children recognize the word that remains when a phoneme is removed from another word.	Teacher: What is ***smile*** without the /s/? Children: ***Smile*** without the /s/ is ***mile.***
Phoneme addition • Children make a new word by adding a phoneme to an existing word.	Teacher: What word do you have if you add /s/ to the beginning of ***park?*** Children: ***Spark.***
Phoneme substitution • Children substitute one phoneme for another to make a new word.	Teacher: The word is ***bug***. Change /g/ to /n/. What's the new word? Children: ***Bun.***

In teaching students to manipulate the phonemes in spoken words, it is important to help students distinguish the differences between a letter, a syllable and a phoneme, and also establish the fact that the number of letters do not necessarily determine the number of phonemes or syllables a word will have [20]. The easiest way to do that for emerging readers would be the use of examples (see Table 12).

Table 12. Differentiating letters, syllables and phonemes [20]

Word	Number of letters	Number of syllables	Number of phonemes
Fix	3	1	4 : /f/ + /i/ + /k/ + /s/
Stop	4	1	4 : (/s/ + /t/ + /ɑː/ + /p/
Check	5	1	3 : (/ch/ + /e/ + /ck/

6.2.3 Blending

This is the main strategy for teaching students how to sound out words and must be frequently modelled and applied. It is the focus of early phonics instruction and plays a role when transitioning students from reading monosyllabic to multisyllabic words [26]. In the initial stage, knowledge of continuant and stop consonants would enable teachers to plan the lessons such that the children will start by blending words

that start with continuant consonants. This will make it easier for the children since they can drag the first consonant phoneme and blend with the next phoneme without stopping [55]. For example, it is actually easier to blend the phonemes for the word ‘mop’ than the word ‘dog’, as /m/ is a continuant consonant and /d/ is a stop consonant. Table 13 shows the most common sounds of each alphabetic letter, classified into continuous sounds and stop sounds [56].

Table 13. Most common sounds of the alphabetic letters [56]

Most common sounds of each alphabetic letter	
Continuous sounds	Stop sounds
‘a’ as in ‘mat’	‘b’ as in ‘ball’
‘e’ as in ‘set’	‘c’ as in ‘cat’
‘f’ as in ‘fish’	‘d’ as in ‘dog’
‘i’ as in ‘big’	‘g’ as in ‘get’
‘l’ as in ‘lot’	‘h’ as in ‘hot’
‘m’ as in ‘map’	‘j’ as in ‘jet’
‘n’ as in ‘net’	‘k’ as in ‘kit’
‘o’ as in ‘hot’	‘p’ as in ‘pet’
‘r’ as in ‘rat’	‘q’ as in ‘queen’
‘s’ as in ‘sun’	‘t’ as in ‘tub’
‘u’ as in ‘cup’	‘x’ as in ‘box’
‘v’ as in ‘van’	
‘w’ as in ‘wag’	
‘y’ as in ‘yes’	
‘z’ as in ‘zoo’	

A fun activity that motivates children to practise blending is “Robot Talk” [57], where the children will listen to the phonemes produced by a “robot” and they need to say out the word made up of those phonemes. The “robot” can be a digital avatar with pre-recorded phonemes; it can also be the teacher or therapist saying the phonemes to the children in a robot-like tone.

6.2.4 Dictation

As the students’ phonics skills become more developed, it is critical to transfer these skills to writing, and one critical tool would be dictation. Dictation should start early from the preschool years and is an effective tool because it reinforces word recognition by reversing the decoding process [26]. Table 14 shows how a dictation routine can be carried out by using the segmentation and analogical approaches [17].

Table 14. Dictation Routines [17]

Dictation routine	**Description**
“Hear me out”	Teacher: I get a map. [Show a picture of a girl holding a map.] Teacher: Now, let’s write the word ‘map’. Listen to the sounds that make up this word ‘map’. Teacher: /m/ /a/ /p/ [Teacher can repeat if students need to listen to the sounds again.]
“Swap me out”	Teacher: Let’s write the word ‘map’ using the ‘Hear me out’ method. Teacher: /m/ /a/ /p/ Teacher: Now, change the first letter to form the word ‘tap’. Teacher: Remove the first letter again and form the word ‘trap’. Teacher: Remove the first two letters this time and form the word ‘snap’.

The “Hear me out” dictation routine above helps to reinforce the students’ grapheme-phoneme knowledge, and the “Swap me out” dictation routine enables the students to understand common English spelling patterns and rimes. By embedding word-construction activities and structured writing tasks in phonics lessons, students would have expanded opportunities to reinforce and consolidate their phonological knowledge.

6.2.5 Word Awareness

To boost students’ word awareness during lessons or intervention sessions, they can sort out words or construct words using cards containing individual alphabetic letters or magnetic letters. They can place the letters in a specific sequence or complete a word with missing letter [26]. Another variant of this activity is to write each letter on bottle caps, and students have to search for the letter they want in the ‘alphabet sea’. This slight variation integrates cognitive abilities like visual discrimination and executive functions such as organisation into a phonics activity [16]. For example, the teacher can start the lesson by placing the bottle caps in a scattered manner on the table. As the students spend a considerable amount of time searching through them, the teacher can suggest classifying the letters into smaller groups so that they can find the letters faster. There can even be a discussion on how they could classify (by letter shapes or by consonants and vowels for example). These engaging tactile activities help students to manipulate letter-sound relationships more fluidly while fully breaking down words into their individual sounds and spellings.

Through word-sorting activities, students identify shared spelling patterns, discuss about what they have observed about the structure of words or detect recurring spelling rules. This ability to notice larger chunks in words is an important skill as students transition from monosyllabic to multisyllabic words [26]. Appendix C shows an example of word sorting activity [58] that can be incorporated into a phonics lesson after the students have read a short literary text.

6.2.6 High Frequency Words

High-frequency vocabulary comprises the most frequently occurring terms in the English language. Some are phonetically irregular and cannot be sounded out using typical decoding rules. Most are phonetically regular and can be sounded out using the phonics skills learnt. The top 300 words are generally taught from kindergarten to grade 2 [26] Appendix D presents the first 300 high-frequency words from Fry's established word list, recommended for early readers [59]. Before commencing instruction, it would be useful for the teacher to sort these high frequency words into decodable words, irregular words that can be decoded partially by sounding out some letters, and totally irregular words that have to be taught as ‘Heart words’. The teacher can then decide on the sequence of introducing these words, as well as the curriculum time allocated for each type. The decodable high frequency words could be taught first; ‘Heart words’ that need higher frequency of revision to map them orthographically through lexical instead of phonological processes could come later in the sequence. More explicit attention could also be directed to seemingly easy high frequency words that can potentially confuse the struggling readers. Examples of such words include reversals like *no / on* and *was / saw*, *of / for / from*, and words that begin with *wh* or *th*) [26].

Beyond targeted reading-specific strategies, an effective literacy intervention must also integrate executive functioning (EF) skills that support early word recognition [16]. Table 15 shows how domain-general EF skills like working memory, inhibitory control, planning, and attentional control play a key role in supporting learners in word recognition.

Appendix E demonstrates how high-frequency word instruction and EF skills can be seamlessly integrated [12,16] into connected classroom experiences rather than being delivered as isolated, ad

hoc phonics drills. This can be done through designing learning materials such as those shown in the appendix.

Table 15. How Executive Functioning (EF) Skills Support Recognition of High Frequency Words [16]

Executive functioning skills	Example of how it supports word recognition
Working memory	Needed to hold grapheme–phoneme sequences active while blending sounds into recognisable words
Inhibitory control	Helps to suppress impulsive word-guessing or competing phonological distractors.
Planning	Enables the learner to think of how to segment a word to read it accurately
Attentional control	Enables the learner to direct attention to particular aspects of words (such as 'on' and 'no') or letters (such as 'b' and 'd') to discriminate them

In Sample Learning Sheet D1, a learner is introduced to the target high frequency word 'that' in various ways. Exposure to the same word is achieved repeatedly using various formats such as tracing, writing, filling in of missing letters, and discriminating visually similar letters to identify the correct spelling (thot, tnat, thaf, that). Apart from introducing 'that' as an isolated word, the teaching can progress to the sentence level where the way 'that' can be used is shown in three different contexts (statement, question and exclamation). The deliberate choice of incorporating different sentence types provides the opportunity to teach intonation and expression. The learners can also be invited to dramatize how each sentence could be read differently to convey the tone appropriately. This makes the learning sheet more versatile, and teachers can use the same resource to implement differentiated instruction and enhance inclusivity.

Sample Learning Sheet D2 illustrates a progression to the text level, and once again, the three sentence types have been embedded for repeated practice and in order not to distract the learners from the target word 'that', other vocabulary words like 'rabbit', 'dog' and 'monkey' are replaced with visual cues to reduce cognitive load [60], which could help learners with dyslexia. The learner is also encouraged to read to not just the teacher, but also to peers and family members, as indicated by the box in the top right corner. Sample Learning Sheet D3 incorporates the element of multisensory learning approach [17] by getting students to sound out the beginning sound and matching it to the correct letter using letter tiles. By weaving various elements into the design of teaching or intervention resources, more objectives can be met while reducing the amount of paper drills.

6.2.7 Reading Connected Text

To develop students into skilled readers, early phonics instruction can be carried out using controlled, decodable texts. Decodable texts are specially written to give children plenty of practice with particular sounds or patterns [26, 61]. For example: "Mig sees a pig. The pig is big. It likes to dig. Mig calls the pig 'Tig'. Mig puts a wig on Tig. Mig and Tig dance a jig." Appendix F shows an example developed by the author to illustrate how teachers or educational therapists can develop such tailored books as learning tools to build confidence in beginning readers and give them a sense of mastery as their reading skills grow.

Besides practising decoding skills, teachers can also make further use of decodable texts to fulfil other literacy components. For example, the decodable text can be presented to the students not as a mini story book, but a set of six sentence cards and six picture cards. They will decode the sentence on each card by reading aloud and then match it to the correct picture card (see Appendix F). This allows the students to demonstrate semantic understanding of the sentence they read [62]. Other possible extensions can be a development of vocabulary words based on the picture cards.

To build a foundation in early reading faster, phonics lessons should be closely matched with corresponding reading materials. This alignment is critical in helping students transit smoothly to less-controlled levelled readers in small group instruction.

7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

A critical ecological limitation of the existing empirical base on systematic phonics instruction stems from the prevailing reliance on tightly controlled experimental trials [63]. Most of the published intervention studies reviewed here are conducted under research conditions, with trained interventionists conducting the study with screened sample subjects. Published or researcher-developed resources are used during interventions of varying durations and frequencies, and finally, discrete outcome metrics such as pseudoword decoding [64] or Rapid Automatised Naming (RAN) [65] are used for evaluation. Consequently, the high effect sizes demonstrated in these efficacy trials may fail to fully replicate when translated into real-world, Tier 1 classroom environments. In practice, instructional outcomes are heavily moderated by systemic, real-world variables, including variations in teacher pedagogical competency and linguistic metacognition, highly heterogeneous student profiles within a single classroom, diverse socioeconomic backgrounds, and severe resource constraints typical of low- and middle-income country (LMIC) contexts [66]. Recognizing this gap between efficacy in laboratory-like settings and effectiveness in naturalistic classrooms is essential for establishing realistic implementation frameworks and avoiding the over-generalization of clinical intervention results to under-resourced, large-scale educational systems.

Future research can focus on psychometrically validating brief, teacher-administered diagnostic screeners aligned with the micro-level sub-skills of the CFF. Validating scalable screening instruments at the preschool-to-primary transition threshold allows practitioners to detect specific cognitive bottlenecks prior to formal reading failure, shifting the Multi-Tiered System of Supports (MTSS) paradigm from reactive Tier 2/3 remediation to proactive Tier 1 prevention [67]. Furthermore, translating reading science into sustained classroom practice requires initial teacher education and professional development programs to conscientiously integrate explicit, evidence-based coursework and targeted coaching in systematic phonics instruction. Institutional barriers, particularly the misalignment between core curricular resources and empirical research, must simultaneously be reconciled to provide trained educators with curricular materials anchored in evidence-based practice [66]. Lastly, as the strategies synthesized in this review pertain primarily to early reading acquisition, future research should explore advanced instructional frameworks that support ongoing reading efficiency and comprehension across intermediate and upper elementary developmental stages, thereby sustaining the learners' literacy trajectories across the developmental continuum.

8. CONCLUSION

The reading models presented in this article, coupled with the research findings of effective instructional interventions to help struggling readers, are evident that the inclusion of a phonics-based component in the literacy curriculum is key to helping children who struggle with reading. The brief introduction of the English language system also points to an obvious fact: since words are essentially codes for spoken sounds, reading instruction should logically start with the sounds of speech.

Apart from the research in the SoR, research in the field of neuroscience has also produced promising findings. A study carried out by the University of Washington [68] made use of MRI measurements of the brain's neural connections to show that the neural circuitry strengthened after a group of struggling readers went through eight weeks of intensive intervention. Two out of three specialized cortical zones that manage how we process speech and sight showed structural changes in terms of greater density of white matter and more organised "wiring" [68]. In another study led by Yeatman et al. in 2025 [69], it was found that the visual word form area (VWFA), which is a specialized cortical region critical for

efficient word identification, exhibits reduced volume or structural absence in children with persistent reading struggles. After going through intensive, evidence-based reading intervention, the VWFA in these children were found to have grown larger [69]. These findings demonstrate the plasticity of the brain, and once again affirms that targeted evidence-based reading interventions can significantly boost a child's reading skills. These gains naturally extend to other critical areas of literacy, enhancing their spelling, writing, vocabulary, and text comprehension.

This article is not a teacher's manual, but it hopes to provide teachers and other professionals working with struggling early readers with some background knowledge and evidence-based practices as they plan their classroom instruction or early literacy intervention programme. As aptly described by Yeatman et al. [68], "teachers are brain engineers who help kids build new brain circuits for important academic skills like reading". To enable teachers to become confident and effective brain engineers, there is a need to translate research into instructional practice for them.

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13. DATA AVAILABILITY STATEMENT

Not applicable. No primary data were generated or analysed in this study.

14. ETHICS APPROVAL

Not applicable. This study did not require ethics approval.

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Appendix A: Glossary of common terms in reading science and linguistics [11,21]

Term	Description
Phoneme	A phoneme is the smallest part of spoken language that makes a difference in the meaning of words.
Consonant phoneme	Sounds where there is a degree of constriction of the air as it flows out of the mouth or nose
Vowel phoneme	Sounds where the air flows out of the mouth without any constriction
Grapheme	A letter or a combination of letters that represents a sound (phoneme) in a word.
Grapheme-phoneme correspondence (GPC)	Refers to the relationship between the written letters or letter combinations in a language (graphemes) and the individual speech sounds they represent (phonemes). It is the code that allows readers to translate print into spoken sound (decoding) and speech sounds into writing (encoding or spelling).
Phonics	Phonics is the understanding that there is a predictable relationship between phonemes (the sounds of spoken language) and graphemes (the letters and spellings that represent those sounds in written language).
Phonemic awareness	Phonemic awareness is the ability to hear, identify, and manipulate the individual sounds (phonemes) in spoken words.
Phonological awareness	Phonological awareness is a broad term that includes phonemic awareness. In addition to phonemes, phonological awareness activities can involve work with rhymes, words, syllables, and onsets and rimes.
Phonological System	The system of language that uses sounds as its units and these sounds are combined to produce individual words.
Vowels	Refer to the letters ‘A’, ‘E’, ‘I’, ‘O’ and ‘U’ and frequently Y when it functions to represent a vowel phoneme (e.g., in cry or baby).
Consonants	Encompassing the 21 letters other than the basic vowels (B, C, D, F, G, H, J, K, L, M, N, P, Q, R, S, T, V, W, X, Y, Z), noting that Y is dual-purpose depending on its phonetic context.
Morpheme	The smallest grammatical unit of language that has meaning. Each morpheme constitutes a word, or a meaningful part of a word.
Morphograph	A spelling unit that represents a meaningful part of a word (a morpheme), such as a base word, prefix, or suffix.
Digraph	A combination of two letters that represent a single speech sound (phoneme). The two letters together make a sound that is different from the sounds they make individually.
Onset	The initial consonant or consonant cluster of a syllable that precedes the vowel nucleus.
Coda	Refers to the consonant or consonant cluster that follows the nucleus (the vowel) at the end of a syllable.
Nucleus	The central, most prominent vowel sound that forms the core of a syllable. It can stand alone (as in the word “I” or “oh”) or be flanked by an onset (as in the word “top”) and a coda (as in the word “eat”).
Rime	The vowel part and any following consonants of a syllable. Together, the onset and the rime make up a single syllable (Onset + Rime = Syllable).
Syllable	A syllable is a word part that contains a vowel or, in spoken language, a vowel sound (e-vent; news-pa-per; ver-y).
Morphograph	A spelling unit that represents a meaningful part of a word (a morpheme), such as a base word, prefix, or suffix.
Orthography	Refers to the conventional spelling system of a language. It encompasses the rules, patterns, and structures governing how spoken language is translated into written symbols (graphemes), including letter-sound correspondences, spelling rules, and silent markers.
IPA	International Phonetic Alphabet. Allows each phoneme to be unambiguously represented with a specific symbol.

Appendix B: List of 44 phonemes in the English language system

Consonant phonemes [16,17,70]:

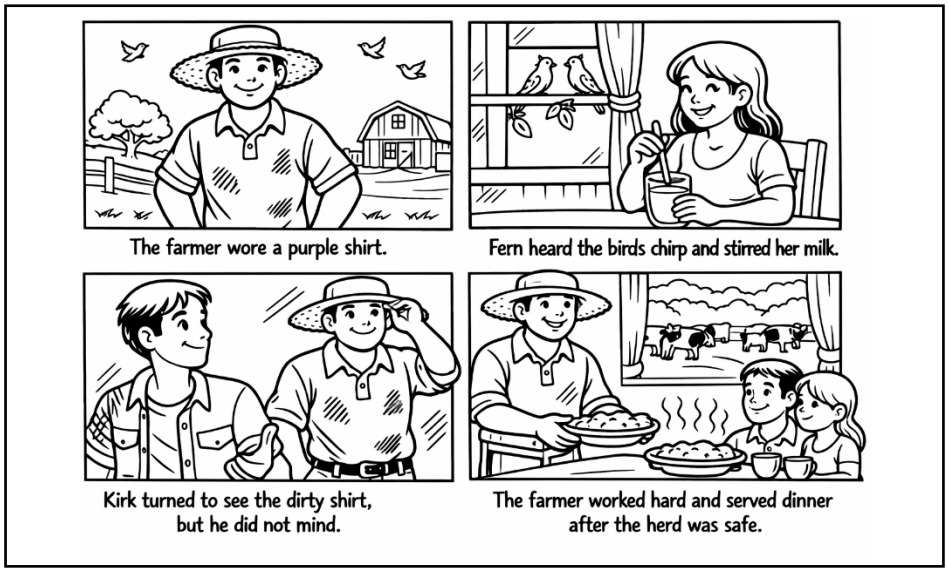
Phoneme [18]	IPA Symbol [70]	Graphemes [18]	Examples
1	b	b, bb	bug, bubble
2	d	d, dd, ed	dad, add, milled
3	f	f, ff, ph, gh, lf, ft	fat, cliff, phone, enough, half, often
4	g	g, gg, gh,gu,gue	gun, egg, ghost, guest, prologue
5	h	h, wh	hop, who
6	dʒ	j, ge, g, dge, di, gg	jam, wage, giraffe, edge, soldier, exaggerate
7	k	k, c, ch, cc, lk, qu ,q(u), ck, x	kit, cat, chris, accent, folk, bouquet, queen, rack, box
8	l	l, ll	live, well
9	m	m, mm, mb, mn, lm	man, summer, comb, column, palm
10	n	n, nn,kn, gn, pn, mn	net, funny, know, gnat, pneumonic, mnemonic
11	p	p, pp	pin, dippy
12	r	r, rr, wr, rh	run, carrot, wrench, rhyme
13	s	s, ss, c, sc, ps, st, ce, se	sit, less, circle, scene, psycho, listen, pace, course
14	t	t, tt, th, ed	tip, matter, thomas, ripped
15	v	v, f, ph, ve	vine, of, stephen, five
16	w	w, wh, u, o	wit, why, quick, choir
17	z	z, zz, s, ss, x, ze, se	zed, buzz, his, scissors, xylophone, craze
18	ʒ	s, si, z	treasure, division, azure
19	tʃ	ch, tch, tu, te	chip, watch, future, righteous
20	ʃ	sh, ce, s, ci, si, ch, sci, ti	sham, ocean, sure, special, pension, machine, conscience, station
21	θ	th	thongs
22	ð	th	leather
23	ŋ	ng, n, ngue	ring, pink, tongue
24	j	y, i, j	you, onion, hallelujah

Vowel phonemes [16,17,70]:

Phoneme [18]	IPA Symbol [70]	Graphemes [18]	**Examples**
25	æ	a, ai, au	cat, plaid, laugh
26	eɪ	a, ai, eigh, aigh, ay, er, et, ei, au, a_e, ea, ey	bay, maid, weigh, straight, pay, foyer, filet, eight, gauge, mate, break, they
27	ɛ	e, ea, u, ie, ai, a, eo, ei, ae	end, bread, bury, friend, said, many, leopard, heifer, aesthetic
28	i:	e, ee, ea, y, ey, oe, ie, i, ei, eo, ay	be, bee, meat, lady, key, phoenix, grief, ski, deceive, people, quay
29	ɪ	i, e, o, u, ui, y, ie	it, england, women, busy, guild, gym, sieve
30	aɪ	i, y, igh, ie, uy, ye, ai, is, eigh, i_e	spider, sky, night, pie, guy, stye, aisle, island, height, kite
31	ɒ	a, ho, au, aw, ough	swan, honest, maul, slaw, fought
32	oʊ	o, oa, o_e, oe, ow, ough, eau, oo, ew	open, moat, bone, toe, sow, dough, beau, brooch, sew
33	ʊ	o, oo, u,ou	wolf, look, bush, would
34	ʌ	u, o, oo, ou	lug, monkey, blood, double
35	u:	o, oo, ew, ue, u_e, oe, ough, ui, oew, ou	who, loon, dew, blue, flute, shoe, through, fruit, manoeuvre, group
36	ɔɪ	oi, oy, uoy	join, boy, buoy
37	aʊ	ow, ou, ough	now, shout, bough
38	ə	a, er, i, ar, our, ur	about, ladder, pencil, dollar, honour, augur
39	eəʳ	air, are, ear, ere, eir, ayer	chair, dare, pear, where, their, prayer
40	ɑ:	a	arm
41	ɜ:ʳ	ir, er, ur, ear, or, our, yr	bird, term, burn, pearl, word, journey, myrtle
42	ɔ:	aw, a, or, oor, ore, oar, our, augh, ar, ough, au	paw, ball, fork, poor, fore, board, four, taught, war, bought, sauce
43	ɪəʳ	ear, eer, ere, ier	ear, steer, here, tier
44	ʊəʳ	ure, our	cure, tourist

Appendix C: Short literary text to show how one phoneme can be represented by different graphemes [26,58]

Sample of a short literary text showing how multiple graphemes 'ir', 'er' and 'ur' correspond to the phoneme /ɜːr/ (refer to Type 3 GPC in Table 7):



Word sorting cards based on the decodable text:

farmer	purple	shirt	chirp	stirred
her	dirty	turned	served	herd

Sorting Chart [58]:

er	ir	ur
farmer	dirty	purple
her	shirt	turned
herd	chirp	
served	stirred	

Extensions to writing task:

- Choose a word from each column of the chart and make a sentence. (Example: The farm**er** loves his p**ur**ple sh**ir**t.)
- Choose 2 words from each column and create your own mini story.

Review using a phonics game:

- Teacher shows a card showing a digraph (*er*, *ir*, or *ur*), and students must shout out the word from the story that matches this digraph. This can be modified into a team game.

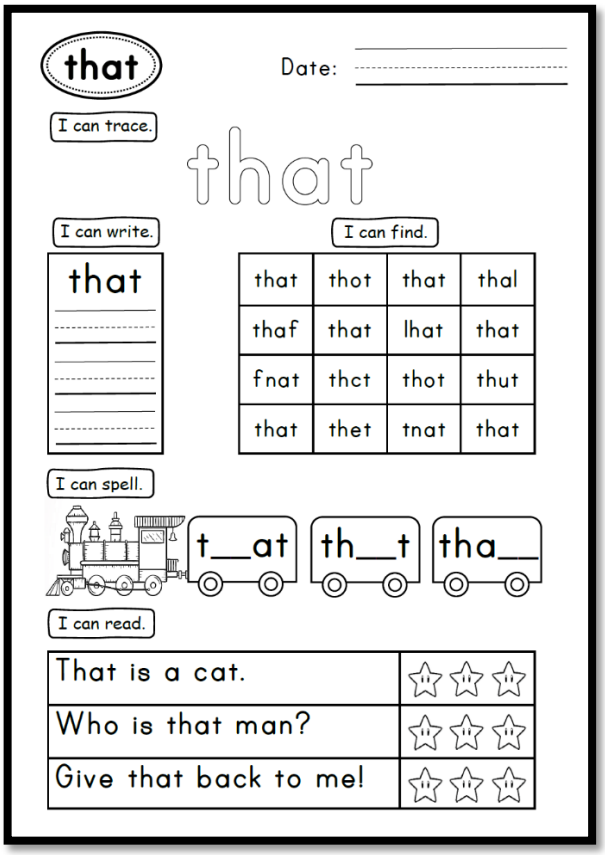
Appendix D: First 300 high frequency words in Fry's List [59]

Words 1 - 25	Words 26 - 50	Words 51 - 75	Words 76 - 100
the	or	will	number
of	one	up	no
and	had	other	way
a	by	about	could
to	word	out	people
in	but	many	my
is	not	then	than
you	what	them	first
that	all	these	water
it	were	so	been
he	we	some	call
was	when	her	who
for	your	would	oil
on	can	make	its
are	said	like	now
as	there	him	find
with	use	into	long
his	an	time	down
they	each	has	day
i	which	look	did
at	she	two	get
be	do	more	come
this	how	write	made
have	their	go	may
from	if	see	part
Words 101 - 125	**Words 126 - 150**	**Words 151 - 175**	**Words 176 - 200**
over	say	set	try
new	great	put	kind
sound	where	end	hand
take	help	does	picture
only	through	another	again
little	much	well	change
work	before	large	off
know	line	must	play
place	right	big	spell
year	too	even	air
live	mean	such	away
me	old	because	animal
back	any	turn	house
give	same	here	point
most	tell	why	page
very	boy	ask	letter
after	follow	went	mother
thing	came	men	answer
our	want	read	found
just	show	need	study
name	also	land	still
good	around	different	learn
sentence	form	home	should
man	three	us	america
think	small	move	world
Words 201 - 225	**Words 226 - 250**	**Words 251 - 275**	**Words 276 - 300**
high	saw	important	miss
every	left	until	idea
near	don't	children	enough
add	few	side	eat
food	while	feet	facet
between	along	car	watch
own	might	mile	far
below	close	night	indian
country	something	walk	really
plant	seem	white	almost
last	next	sea	let
school	hard	began	above

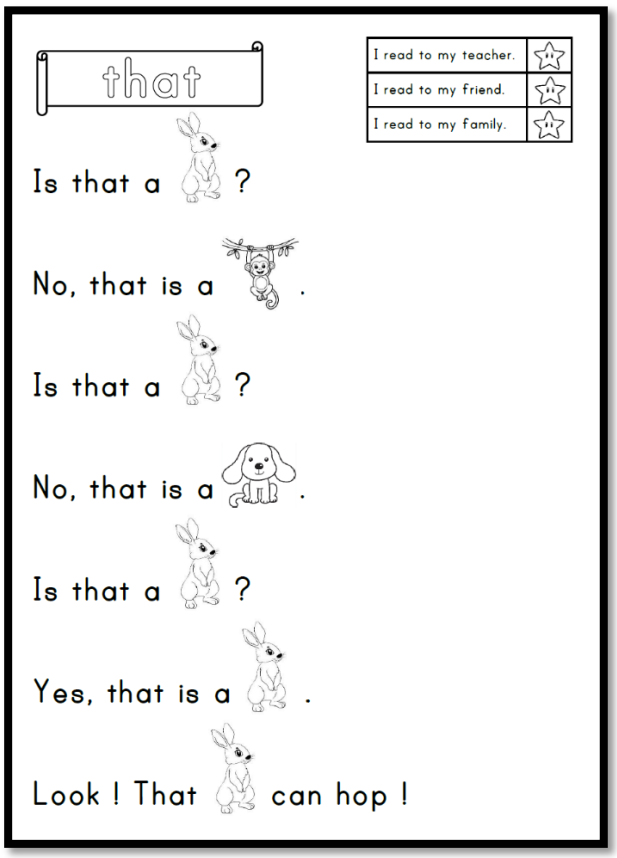
father	open	grow	girl
keep	example	took	sometimes
tree	begin	river	mountain
never	life	four	cut
start	always	carry	young
city	those	state	talk
earth	both	once	soon
eye	paper	book	list
light	together	hear	song
thought	got	stop	being
head	group	without	leave
under	often	second	family
story	run	later	it’s

Appendix E: Integration of learning tasks based on a target high frequency word [12,16,17,60]

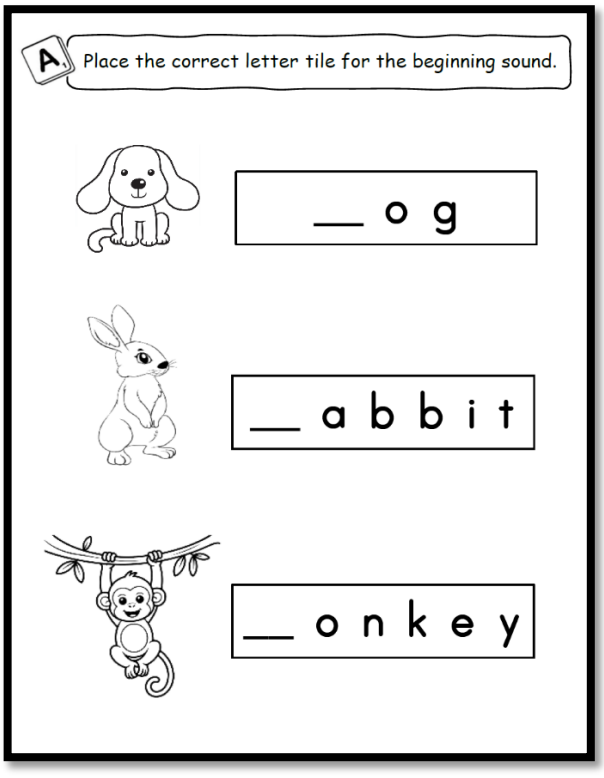
Sample Learning Sheet E1
Weaving of other literacy skills and EF [12,16]



Sample Learning Sheet E2
Rebus Technique [60]



Sample Learning Sheet E3
Multisensory approach to teaching phonics [17]



Appendix F: Use of decodable text for explicit phonics instruction [26,62]

Sample decodable text for the teaching of the short vowel /i/ sound [26]:

Mig sees a pig.

The pig is big.

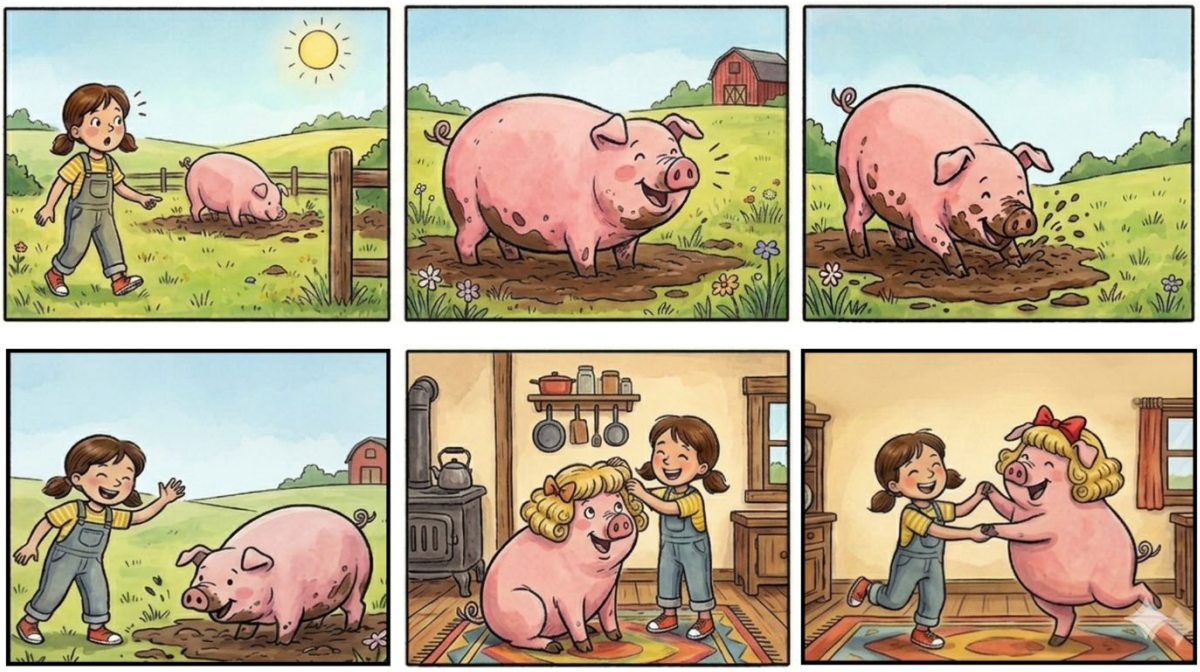
It likes to dig.

Mig calls the pig 'Tig'.

Mig puts a wig on Tig.

Mig and Tig dance a jig.

Picture-Sentence matching for decoding with semantic understanding [62]:



Sentence cards that can be used to match to each picture after students read the sentences.

Mig sees a pig.	The pig is big.	It likes to dig.
Mig calls the pig 'Tig'.	Mig puts a wig on Tig.	Mig and Tig dance a jig.