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WHY LEARNING TO READ ENGLISH IS SO HARD AND HOW TO MAKE IT EASIER

CHRIS STEPHEN & ANN FITTS

Readable English

Why learning to read English is so hard and how to make it easier

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This book is dedicated with love and thanks to Chris's sister, Alexandra Mackay, and Ann's brothers, Andrew, Paul, Danny and Martin Fitts, for inspiring our shared vision.

Introduction

A solution for literacy

This is a short book about the big topic of literacy and why learning to read English is so hard. It's also about Readable English: a new way of presenting the language and teaching reading that has the potential to help everyone learn to read, write and speak English more easily.

In monetary terms, the cost of illiteracy is staggering. Annual estimates are US$18 billion for Australia, US$300 billion for the United States and over US$1 trillion for the world as a whole [1].

In personal terms, the cost is much greater. People who live with illiteracy can experience poorer health and fewer job opportunities [2]. Their children can also find it harder to enjoy healthy, rewarding, prosperous lives [1]. Studies have even revealed a link between illiteracy and higher rates of imprisonment [3].

Our own research led us to conclude that a major barrier to English literacy is the erratic

spelling of the English language. Some words follow spelling rules, but many words don't. Some letters represent a single sound, but many letters represent several different sounds. The result is thousands of exceptions in English spelling and pronunciation. Only once these inconsistencies and exceptions have been learnt can readers decode written English words, and that's a huge barrier to reading and writing for many people.

Compounding this real challenge is a perception that intelligence is predetermined: we are either born smart or born dumb. Of course this isn't true, but people who struggle with reading and writing can become convinced there's something wrong with them and they will never be able to read fluently. They often resign themselves to this limited vision and won't try to read unless their belief is challenged.

Our research confirms that a way of making it easy to decode the sound of written English words is needed to improve English literacy, so that emerging readers can start to practise reading confidently as soon as possible. We found that the most effective method to achieve this is to embed a pronunciation guide into

written English words that doesn't change the way they're spelt. We call our embedded pronunciation guide 'Readable English'.

Readable English creates a direct relationship between the way a word is written and the way it's pronounced. It essentially converts written English into a phonetic writing system—in which each letter or pair of letters represents a single sound—allowing readers to sound out words without having to learn complex spelling and pronunciation rules first. Readable English fasttracks an association between the spelling and sound of each word, which is the pathway to reading fluency.

Our goal is to make it easier and faster for everyone to attain English language proficiency, from emerging first-language readers, with and without reading difficulties, to second-language learners. We also want to make teaching reading a simpler, clearer exercise for everyone, from schoolteachers and professional English-language educators to parents and carers. Inspiring confidence and motivation in students and teachers is the fundamental, guiding principle behind Readable English.

Throughout this book, we refer to anyone who is learning to read as a 'student' and anyone who helps another person learn to read as a 'teacher'.

***

Embedding a phonetic pronunciation guide into written English might sound straightforward. It was in fact a monumental task, taking years to complete.

First we developed a simple and intuitive way of marking up words to represent their pronunciation, and refined this mark-up more than 10 times. Then we developed new technologies to mark up an entire dictionary, or more than 100,000 words, in Readable English.

Readable English now makes 99.9% of written English words completely phonetic, without changing the spelling. It's the only phonetic version of written English with a comprehensive learning program and publishing system that includes:

- games and playful, interactive exercises that enable students to learn the sounds of letters and develop other important literacy skills

such as phonemic awareness and sight–word recognition

- a teaching guide with scripted lesson plans, plus online lessons for students learning independently as well as those taking part in teacher-led programs
- a completely phonetic version of the Macquarie Dictionary (the standard reference for Australian English, recognised internationally)
- an eReader that allows students to import and convert documents into Readable English, control the way words are displayed, look up the meaning of words and hear the way any word is pronounced
- an online store with electronic versions of popular books formatted in Readable English, plus hard-copy books printed on demand in Readable English.

Readable English™ was created by Ann Fitts and Chris Stephen. This book outlines the research and development project they led, and how Readable English has the potential to revolutionise the way we learn to read.

Chris Stephen—*It was my middle sister, Alexandra, who taught me how to read. She was herself an avid bookworm. Literacy was considered extremely important in our*

***family as we had a strong literary heritage, including such people as Henry John Stephen, who wrote* Stephen's Commentaries on the Laws of England, *which became the leading legal textbook for over 150 years, and Sir Leslie Stephen, who founded the* Dictionary of National Biography. *Sir Leslie's daughter, Virginia Woolf, needs no introduction. In Australia, my cousin Martha Campbell was a major contributor to the* Australian Dictionary of Biography.**

My interest in literacy turned into an obsession when Alexandra developed multiple sclerosis. As my sister's illness developed, she lost the ability to read sentences easily and could only manage individual words. I was determined to work out why Alexandra couldn't read easily anymore, and after much research discovered she had an eye-tracking problem. This meant she had to use a huge amount of mental energy to keep the words she read in the correct order, and didn't have enough energy left over to

decipher the meaning of those words and phrases.

It became my mission to help Alexandra read fluently by reducing the mental effort needed, eventually creating a large print format that enabled her to pursue again one of the few activities she loved. Seeing the positive impact on Alexandra made me understand how important reading is to a person's quality of life and to never take that ability for granted. I was deeply motivated to try helping others to read as well, and established a business in Sydney in 1998 called ReadHowYouWant.

Initially the business focused on developing accessible publishing technology that could quickly and accurately convert PDF books into a large number of accessible formats, including braille, DAISY (digital talking books), different text sizes and other reader-designed preferences. This technology has enabled Alexandra and thousands of others to read with ease. To date ReadHowYouWant has converted around 30,000 publications into accessible formats for readers in Australia, Canada,

New Zealand, the United Kingdom and the United States.

Early into that other project, fate intervened. I went to a meditation retreat and met a reading specialist working in San Francisco. Ann and I shared a passion for helping people who were struggling to read, and in 2009 we started exploring the Readable English idea together. Our unlikely meeting turned into a creative collaboration, and then into a personal relationship.

Ann Fitts—*I got interested in reading just out of university, when I was hired as a summer tutor to teach reading using a specialised multi-sensory program. We worked one-on-one with students with learning disorders like dyslexia, and I fell in love with the process.*

It wasn't until later that I made the obvious personal connection: I watched three of my older brothers struggle with reading while we were growing up

together. One brother had severe dyslexia, and went on to face difficulties his entire life because of his learning disorder. Looking back, I'm sure that witnessing first-hand what it's like to live with reading difficulties helped me to recognise my niche in life and guided me toward my life's work.

I only wish my brothers had been able to get the help they needed. There is nothing more satisfying than helping someone who's struggling to develop the crucial life skill of reading.

There's that moment when you see a student 'get it', and then see their life changed forever: a seemingly inherent limitation, an assumed personal failing, is lifted and they're freed to explore their potential. This profound satisfaction led me to co-found The Reading Clinic in San Francisco in 1997.

At The Reading Clinic, we specialised in one-on-one programs designed around the specific reading errors experienced by each student. Our intensive, tailored programs

stimulated visual, auditory and physical (kinaesthetic) pathways, requiring a commitment of up to 120 hours. Our approach was transformational. Within a couple of months, the average student's reading level vastly improved and they flourished within the education system. We worked with thousands of students during my 12 years as program director.

Despite these achievements, I was often frustrated that so many people couldn't access our programs due to the expense of individual sessions and the heavy time commitment. Meeting Chris, who was creating different book formats for people with visual problems, gave me the inspiration to try an entirely new way of teaching reading. I thought we might be able to adapt his technology to help people who were struggling with learning to read.

I had worked tirelessly to meet the varied needs of individual students, using many different existing reading programs. I realised it might be more effective to address the common denominator for every struggling reader: the English language.

So Chris and I decided to tackle English and its erratic spelling instead. It was the beginning of a fruitful collaboration, both at work and in our personal lives.

Part 1

Literacy and learning

I think that most thinking Australians are concerned about the poor literacy levels in society at large and the high burden of cost associated with the social consequences of illiteracy. As Fitts and Stephen point out, literacy is a survival skill and poor literacy too often equates with misery. Clearly the current teaching methods are not working for every Australian. The intuitive skilled reader often does not appreciate the complexity of the process of learning to read. There is no one centre of the brain for reading, as there is for speech, and reading involves many different parts of the brain working together in a fast and cohesive network. A new cross-discipline approach is needed, taking into account advances in neuroscience, cognitive psychology and other disciplines. There is the need to develop a simple and consistent system that makes it easier to learn to read.

Dr John H O'Neill, MD FRACP
Consultant Neurologist
Sydney, Australia

Chapter 1

Why literacy matters

Literacy is a fundamental right. It impacts the health outcomes and economic prosperity of individuals as well as nations. It improves equality for women, who gain greater reproductive freedom, the capacity to reduce infant mortality and the opportunity to be more active participants in their communities [4].

The Organisation for Economic Cooperation and Development (OECD) defines literacy as:

> *The ability to understand and use information from written texts in a variety of contexts to achieve goals and develop knowledge and potential* [5].

Being able to read English is an essential survival skill in technology-driven English-speaking countries. Literacy is necessary for basic tasks, as well as success at school, university and in the workplace. Office jobs, manual jobs, service jobs—all jobs—involve the ability to read and write.

The United Nations Educational Scientific and Cultural Organisation (UNESCO) has calculated that the economic impact of illiteracy is greatest in developed countries at 2% of gross domestic product (GDP). This equates to around US$18 billion in Australia and US$300 billion in the United States [1]. *Poor literacy is thought to put a 1.2% dent in the GDP of emerging economies and 0.5% in developing countries* [6].

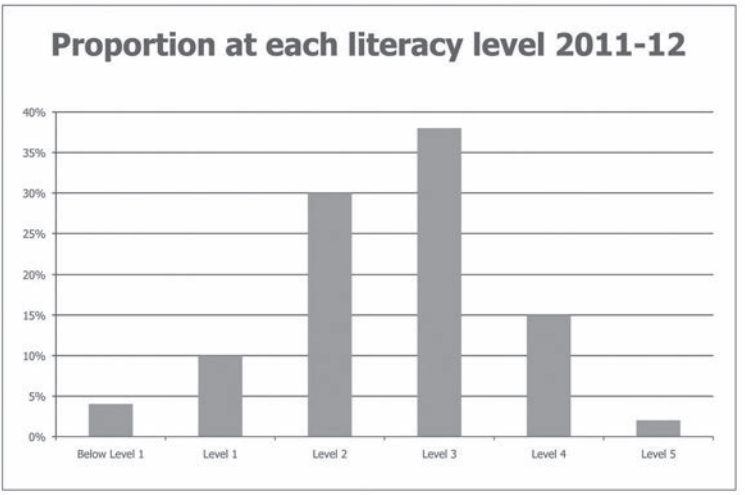
Many people are aware of the high rates of illiteracy in developing countries, partly due to lack of infrastructure, limited resources and civil unrest. But many are unaware of widespread *functional illiteracy* in developed English-speaking countries. The OECD defines a person as functionally illiterate if they:

> *cannot engage in all those activities in which literacy is required for effective functioning of his group and community and also for enabling him to continue to use reading, writing and calculation for his own and the community's development* [7].

People with functional illiteracy may have basic reading, writing and numeracy skills, but these

skills are not enough for everyday tasks such as reading a nutritional label on a food product, filling out a job application, reading and responding to communication in the workplace, and comparing the cost of two items to work out which one offers the best value [1].

In 2011–12, OECD countries took part in a study into prose, document and quantitative literacy. The results were shocking. Almost half of Australians surveyed (see chart below) were classified as having insufficient literacy for 'coping with the demands of modern life and work', comprising 620,000 people (3.7%) with minimal word-recognition skills (below level 1), 1.7 million (10%) with basic understanding of sentences only (level 1) and 5 million (30%) with more developed skills that were still considered insufficient (level 2). Only a slight majority (56%) had sufficient levels of English to handle the demands of everyday transactions and life (level 3 and above) [8].



Literacy levels of Australians (adapted from the Australian Bureau of Statistics/OECD, 2013)

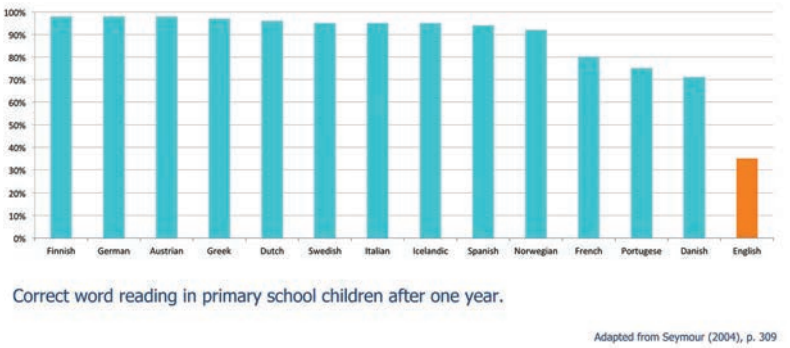
Although functional illiteracy is more common among older Australians, young people are still at risk. The Gonski review panel reported recently that one in seven 15-year-old Australians are at risk of leaving school without gaining basic literacy skills [9].

There has been a great deal of research into reading and literacy over the last 20 years, with hundreds of papers published each year. Despite recent advances in research technology such as brain imaging during reading, functional literacy

rates are still woefully low and the cost of illiteracy is significant.

The American Literacy Council identifies one of the main causes of illiteracy as the highly erratic spelling system of the English language [10]. English is difficult to learn because a large proportion of words aren't spelt phonetically, making their pronunciation unpredictable.

A European study in 2003 revealed that English children could only read around a third (30–40%) of words correctly after their first year of reading instruction, compared with a clear majority (70–100%) for all other languages tested [11].



Correct word reading in European primary school children (adapted from Seymour, 2004)

The true cost of illiteracy

Illiteracy can have a major impact on many aspects of a person's life, not least their health. The stigma of illiteracy often inhibits patients with reading and writing difficulties from revealing this fact to health care professionals [12], who then don't provide essential information in an appropriate way. It can lead people who can't read and write confidently to avoid health care services that involve paperwork [13]. Functional illiteracy can also make it difficult to understand medical instructions and health-related information.

Given all these factors, it's not surprising that patients without functional literacy are up to three times more likely to experience poor health outcomes [2].

> *An Australian Bureau of Statistics study in 2006 revealed that the majority (60%) of respondents didn't have adequate health literacy to understand the instructions on a bottle of medicine* [14].

Among all areas of literacy, health literacy is particularly challenging because it involves a

combination of skills. These skills include the ability to read passages of text with unfamiliar vocabulary, as well as numeracy and even problem-solving. As a result, people with functional illiteracy may not respond well to health education, may be less able to manage chronic illnesses such as diabetes and asthma, and consequently may even end up spending more on health care [15].

Illiteracy may increase the risk of developing Alzheimer's disease. Studies have shown that people who receive less education develop Alzheimer's more often and earlier, and there's evidence that encouraging people to read at every age delays the onset of Alzheimer's in later life [16]. *It has been estimated that if the average onset of Alzheimer's could be delayed by just three years, the number of people with the disease could be reduced by half (50%)* [17]. *Effective literacy policy could offer a powerful tool for combating the anticipated Alzheimer's epidemic in our ageing population by delaying onset of the disease.*

In the workplace, functional illiteracy can have a significant impact on a company's ability to maintain productivity and competitive edge.

In 2013, three-quarters (75%) of major employers in the Australian Industry Group (AIG) said their productivity was affected by low levels of literacy and numeracy in their workforces [18]. *In the United States, a study of manufacturing businesses in 2003 highlighted that a significant proportion (40%) couldn't implement productivity improvements because their workforce had insufficient literacy* [19].

Likewise, functional illiteracy limits a person's job prospects, which can lead to dependence on welfare [1]. Jobs with minimal literacy requirements are often comparatively poorly paid, and this can trap people with functional illiteracy in a cycle of financial struggle. It's perhaps understandable that people who leave school early, before they have developed full functional literacy, are three times more likely to receive welfare benefits than those who stay on and graduate [1].

Negative impacts extend to the law. Local and international research has shown that young people under community service orders are more likely to have difficulty expressing themselves verbally. In an Australian study carried out in 2011, approximately half (46%) of young male offenders completing custodial sentences were found to have a clinically significant language impairment that hadn't been picked up previously [20].

Children with the reading disorder dyslexia (which often goes undetected) can get caught up in this damaging cycle too: they are less likely to complete secondary school and are also overrepresented among juvenile offenders [21].

The financial impact of imprisonment is enormous: in New South Wales it costs over A$75,000 (or the equivalent of more than US$51,000) to keep a person in prison for a year [22] *and in California over US$47,000 (A$62,000) a year* [23], *which is more than it would cost to spend the same time studying at Harvard University in the United States* [24].

In families with parents with functional illiteracy, a child's literacy is often affected too. When parents can't read bedtime stories, their children grow up without developing a love of reading and are more likely to have reduced vocabularies when they start school.

> *In the United States, children from families with low incomes hear around 32 million fewer words than the average middle-class child in their first four years of life* [25].

This form intergenerational illiteracy is called *word poverty* by researcher and author Dr Louisa C Moats, EdD. Children who grow up with word poverty experience a significant disadvantage at school, making it harder for them to engage with the learning experience. They're also more likely to display behavioural problems, perform poorly in their studies, repeat school years and leave school early [26].

Chapter 2

The reading brain

Reading isn't something we do naturally, like speaking, but a human creation that must be learnt. A millennium ago, silent reading was very rare. Over time changes were made to the way words were presented and documents were formatted. As grammar was gradually simplified too, reading became more accessible to the general public and today silent reading is the norm.

Although in the modern world we're often focused on knowledge gained at school, a great deal of what we know is learnt organically and has an important evolutionary function. *Biologically primary learning* covers a wide range of knowledge and abilities such as language recognition, speech production, spatial awareness and group dynamics [27].

Academic learning, on the other hand, is *biologically secondary learning.* It modifies primary knowledge and abilities to develop culturally specific skills and understanding, including being able to decode written symbols—or read.

Learning to read brings together these two very different types of learning.

Put simply, reading a word involves three steps: 1) see a word; 2) convert the word into sounds in our heads; 3) recognise the sounds and understand the meaning of the word.

A writing system is a code that allows a reader to see words and retrieve their meaning. Although, from an evolutionary point of view, reading is a relatively new skill, it benefits from an ancient one. We use our brain's natural pattern-matching skills coupled with information contained in conceptual frameworks, or *schemas* [28], to enable us to recognise variations of the same object. So, a schema for hair might allow us to recognise long, short, curly and straight hair. We can also recognise objects from partial views of them. For example, seeing a flash of snakeskin in long grass is usually enough visual information for us to know that a snake is present.

These skills allow us to recognise letters of the alphabet and words whatever way they're presented—typed, written by hand on scrunched up paper, printed on glass or produced in ***any***

number **of** different *styles* – even if we just glance at them quickly. We can also recognise characters (letters with additional marks) even if they have unfamiliar features. For example, we can see the Roman letter 'o' in the German character 'ö' and the letter 'e' in the French character 'é'.

Once all letters of the alphabet and the standard sounds they represent have been learnt, it's possible to start sounding out words (steps one and two above). Students initially learn to read by sounding out individual letters in words such as 'cat', 'sit' and 'pot' (phonetic words), which is also known as *segmenting.* They then combine these sounds to pronounce the whole word, which is known as *blending.* Students practise reading and saying these phonetic words a number of times, until they automatically recognise the words from their overall shapes and letter patterns (step three).

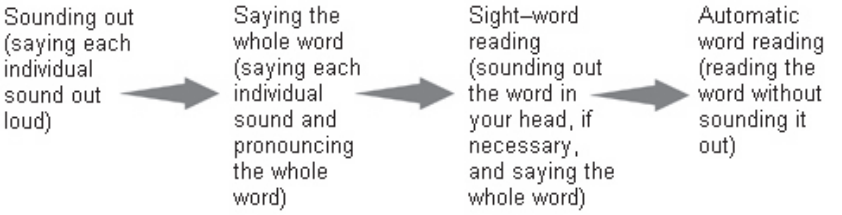
This skill of automatically recognising words is called *sight–word recognition.* It enables a much faster reading process than sounding out individual letters every time we read a word and is essential for reading fluency [26]. Sight–word recognition is especially important for

words such as ‘sure’, ‘friend’ and ‘cough’, containing letters that don’t represent their standard sounds (nonphonetic words). In these instances, sounding out individual letters is of little use.

For typical readers, between five and 16 exposures to a written word are needed to learn to read it [29].

The brain’s ability to recognise shapes of words and patterns of letters is highly sophisticated. Also known as the brain’s feature encoding system, this ability allows a reader to use sight–word recognition to quickly tell the difference between words with very similar shapes and letter patterns, but very different pronunciations, such as ‘eight’ and ‘sight’ or ‘EIGHT’ and ‘SIGHT’.

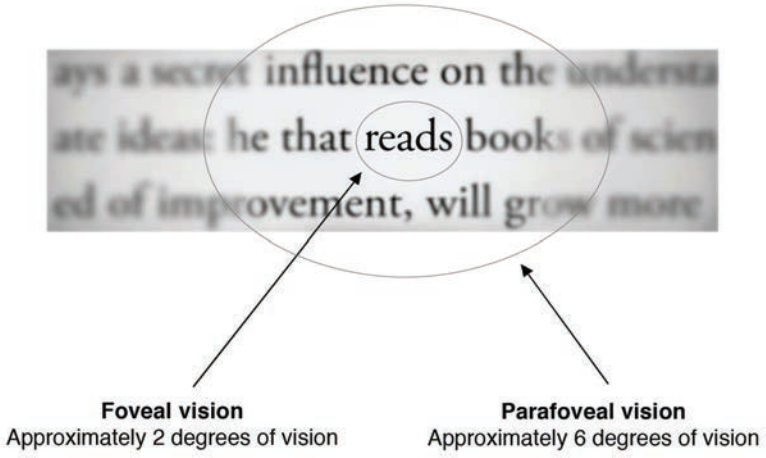
Progression of regular word reading (adapted from University of Oregon Center on Teaching and Learning) [30]



More on the biology reading

When we read, we primarily use a tiny area at the back of the eye called the fovea, which provides our sharpest vision. Because this area is so small, it can only detect a limited number of letters at a time. When reading lines of text, the eye typically looks at seven to nine letters in a block, and then moves to the next block of letters. This is the slowest part of the reading process [31].

The fovea covers about two degrees of the visual field and is assisted by the parafovea, an area that provides less sharpness but covers a further 12 degrees. The remainder of the visual field is provided by the perifovea, which can detect movement but not detail.



Degrees of vision (adapted from Reading in the Brain, *Dehaene, 2009)* [31]

Recent developments in brain scanning technology have allowed researchers to investigate how the brain functions when reading, and we now know that many regions of the brain are used.

Predictably the brain regions responsible for vocabulary (parietal lobe) and sight (occipital lobe) are used extensively. Understanding the link between written words and the sounds they represent involves coordination between the region responsible for long-term memory (hippocampus) and the region that controls movement (cerebellum).

People who have more active brain cells, or neurons, in particular areas of the brain are better at the reading tasks that use those areas. For example, people who have more neurons in the parietal lobe, which manages vocabulary, are better at connecting words to meaning.

With any activity, the more times we perform it, the more the brain's function improves and the better we get at it: practice makes perfect. Studies have shown that children with reading difficulties can learn to activate parts of the brain that aren't functioning effectively with reading interventions [32]. Research has also shown that children with dyslexia have fewer connections between brain regions that need to coordinate with each other to enable reading, and this connectivity can be improved and the volume of neurons increased with targeted reading practice [33].

Adults can also achieve these changes. In a recent university study, participants were asked to read 30 pages of an engaging novel for several evenings. Brain imaging captured the following mornings and for several days afterwards showed improved connectivity in the

language region of the brain as a result of the reading intervention [34].

This enhanced capability after the actual activity has been performed is called shadow activity—a little like retaining strength in our muscles after exercising them at the gym. Any reading intervention needs to encourage lots of practice, ideally without external help, to produce lasting results.

Brian had difficulty communicating from an early age. His speech was tested at three, and he went on to receive speech therapy through the public school system. Standard school assessments revealed that he was bright, but his development around reading and writing was delayed. Brian's parents were concerned that he couldn't apply himself to learning tasks without one-on-one support, and they went looking outside the school system for help. That's how we started working together.

When we introduced Brian to Readable English, he knew the different sounds that letters make and how words can be broken into segments of sound, but he was

struggling to understand how to sound out whole words effectively. After just a couple of months of Readable English teaching, Brian was able to automatically chunk words while he read and was developing a good feel for the structure of the language. He even caught up and was assessed with an average reading level for his age. Brian's reading is still slow, and he doesn't always get it, but he isn't overwhelmed by reading anymore and has the confidence to work independently.

Readable English won't turn everyone into a proficient reader, but it does offer a way to make reading accessible for most people. Where words on a page were previously impenetrable for Brian, he now sees them as a code that can be cracked to reveal meaning. He's now set up to read on his own and exercise his reading muscle.

–Ann, Readable English co-founder

Note actual names of Readable English students have not been used anywhere in this book.

Chapter 3

The learning brain

Memory is essential to learning a language. We process new information in our short-term memory, or *working memory,* and encode that information in our long-term memory after sustained practice over time.

Our long-term memory is thought to have no volume limits: once information is stored there we can bring it into our working memory whenever we need it (although information in long-term memory that's not used for a long time can fade).

Unlike long-term memory, there are definite limits to how much information can be held in the working memory. In the 1950s, information processing theory first described how seven new items (plus or minus two) can be processed at any one time and pieces of information can be grouped, or chunked, to make better use of this capacity [35].

More recent research has investigated individual differences in working memory, revealing that

some people have greater storage capacities while others use them more effectively [36]. Deficits in working memory have been found in many people, including those with dyslexia, attention deficit hyperactivity disorder (ADHD), Down syndrome and hypertension [37].

Working memory capacity increases from early childhood to adolescence, and children of the same age can have very different capacities. Research has shown that limits in working memory correlate with performance in English and maths assessments in 11-year-olds [37].

Memory loads and limits

According to cognitive load theory, using working memory beyond its limit impedes the learning process. The amount of working memory capacity needed to perform a task is called its *cognitive load,* and the maximum amount of information we can process at a given moment is our *cognitive limit* [38]. It's important that the cognitive load of a learning task doesn't exceed our cognitive limit for positive learning outcomes. In addition, the way that information is stored in long-term memory affects the way it's retrieved into working memory. Our long-term

memory is structured in schemas that contain all the information about everything we know, and well-structured schemas help us make sense of what we've learnt and provide a scaffold for adding new information.

Our long-term memory will have a schema for cars, for example, containing all the information we have learnt about them. Depending on our experience, our schema might contain information such as spellings and sounds for the word 'car' in one or more languages; sensory information about how cars look, smell and feel; details about the component parts of cars (steering wheels, fanbelts and so on); knowledge about different models and prices, how to drive and road rules; and memories of our own experiences with cars (Sunday drives, racing events). People with basic car schemas might struggle to understand information given to them by a mechanic, as technical information about cars is likely to exceed their cognitive limit.

The more developed our schemas, the better we're able to analyse and understand new information, and the more proficient we get.

When we're a novice at something, like playing the piano, we have basic schemas for it. Few aspects of the task are automatic. This makes the cognitive load very high and, to continue the piano playing example, leads to stilted playing with constant errors. As a person develops into an expert pianist, their schemas develop to include information about musical notes, finger placement, key signatures, tempo and dynamics. Well-developed schemas reduce the cognitive load of the task and allow the pianist to read and perform music fluently [38].

English speakers have several interrelated language schemas in their long-term memory, including schemas for vocabulary, word pronunciation and grammar. The more these schemas are structured using clear patterns and relationships, the better we're able to encode new information and retrieve existing information.

Because a huge number of English words don't follow consistent spelling and pronunciation rules, our schemas for language contain thousands of items that don't fit into any logical structure. It's more laborious to load these non-phonetic words into schemas because they aren't encoded

using the logic of spelling rules or similarities with other words. Each non-phonetic word needs to be spoken and written many times before it's permanently encoded in a schema. This slows the learning process for everyone, especially when our cognitive limits are lower and if we have difficulties processing information.

Stress and the fight-or-flight response

The body uses many instinctive mechanisms designed to keep us alive. One of the most impressive is the ability to quickly become supercharged in times of extreme danger. Our ancestors would have regularly dealt with life-threatening situations, like being attacked by a large animal, and would have benefited greatly from this survival mechanism.

When our brain detects danger, it floods the body with a hormone called cortisol. This generally prompts the body to respond in one of three ways: we attack (fight), we run away (flight) or we remain completely still (freeze). These days we don't come across life-threatening situations all that often, but the brain isn't good at differentiating between sensations linked to

an extreme physical threat and sensations linked to an extreme emotional threat. When we experience stress, shame, fear, anger and other negative emotions, our brain can interpret this as extreme danger.

Everyone knows that strong emotional reactions can pop up in any situation, including the learning setting. A student might feel intimidated and afraid if a task is too difficult, embarrassed if a mistake is made in front of the class or frustrated if a new concept is hard to understand. They might even become enraged if they put effort into a learning task and still can't grasp it.

Any of these experiences can trigger a flood of cortisol throughout the body. While this mechanism enables fast, effective action when there's no time to stop and think, it produces an utterly ineffective response when the exact opposite is needed. In this state, taking the time to stop and think clearly is very hard to do. Research shows that high levels of cortisol can impede our ability to learn [39].

When a student finds it difficult to read, they're likely to experience emotional distress. This can

produce a stress reaction before a class has even started, further hindering the capacity to learn, and a vicious cycle forms that stops some students from learning to read. They fall further behind their peers and catching up can seem an impossible task. It's crucial to structure learning experiences in a way that avoids triggering this unhelpful cortisol reaction. Given the inconsistencies and complexities of the English language, and given struggling readers might have low self-esteem around their reading ability, it's no simple task to support students toward becoming fluent readers without activating a stressful response.

Chapter 4

Reading struggles

For so many readers, decoding words to understand the meaning of texts is strenuous. Several auditory and visual processes are activated in the brain at the same time, notably those that allow us to hear the language accurately and those that allow us to encode this information for future use [40].

A fundamental auditory process, *auditory discrimination,* is the ability to identify clearly all units of sound (phonemes) and to distinguish the sounds of similar phonemes. A table of all 42 phonemes heard in the English language is included in Appendix 1.

Phonemic awareness involves mentally segmenting a word into its component phonemes (such as /s/, /i/ and /t/ in 'sit'), and then blending those sounds together to say the whole word accurately. It also allows us to detect the difference between words that sound very similar (such as 'steam' and 'stream'). Phonemic awareness allows us to 'hear' a word when reading, which in turn helps us to retrieve its

meaning. Applying this ability to words we've never seen before, and making sense of the new words in context, is a vital reading skill called *word attack.*

Note slashes around letters indicate the standard or most common sound represented by that letter, as with /s/ in 'sit' above.

Auditory discrimination and phonemic awareness are closely linked and usually learnt together. Some typical errors made by readers with auditory processing difficulties, and in turn less developed word attack skills, include leaving out, adding, switching around and even substituting sounds in words.

A student who struggles with phonemic awareness may miss a letter when reading a word (like missing the 'r' in 'stream'). Even though they're usually able to identify the letter (as in, name the third letter in 'stream'), when asked to repeat the word the student will probably say 'steam' again because, when reading the word as a whole, they can't hear their omission of the /r/ sound.

Without word attack skills, the reading process slows drastically, leaving readers to resort to guessing the sound and meaning of words, which ultimately affects their comprehension.

No matter how well developed a reader's auditory processing, it won't help them decode nonphonetic words, which make up around half the English language. To attain sight–word recognition (described in Chapter 2), all readers rely on memory. The more exposure to written words, the greater the sight–word vocabulary stored in a reader's long-term memory and the better their reading fluency.

Problems arise if readers can't remember the shape of a word and the pattern of letters it contains, or can't associate the word shape and letter pattern with a sound. Readers with visual processing difficulties usually have minimal or even no sight–word recognition ability. Even if they see a word many times, they still might not be able to recognise it. Main indicators of visual processing difficulties are slow reading and frequent misspelling.

Struggles for second language learners

Just as decoding words to understand the meaning of texts can be strenuous for readers, decoding the sound of spoken words can be strenuous for second language learners. Listening to a person speak requires being able to clearly hear, in fact *accurately discriminate,* the individual phonemes of the language. When a person is still in the early stages of learning, most of their working memory is devoted to discriminating the sounds and words being heard, rather than devoted to understanding the meaning of what is being said.

Why Italians do it better

Many rules have been devised to help us decode the sounds of written English words, but these rules can't be applied consistently. For every rule, we must build up a catalogue of spelling and pronunciation exceptions. This challenge increases the cognitive load of learning the English language for everyone.

As an example, when a word contains a vowel–consonant–e pattern, we usually pronounce

*the vowel by its name. Some readers know this as the magic 'e' rule. So, the 'o' in 'rove' is pronounced /oh/ (as in 'g**o**') rather than the /o/ sound (as in 'g**o**t'). This rule works for some words (such as 'drove', 'wove' and 'cove') but not for others ('move', 'love' and 'glove').*

Often students are taught to memorise non-phonetic words through repetition, or rote learning, developing sight–word recognition through multiple exposures to the written word and its complete sound. This rote learning method is labour intensive, for the student and the teacher, and takes much more effort than learning all words by sight, through simply sounding them out letter by letter [31].

In languages with phonetic spelling such as Italian, each letter or pair of letters represents a single sound. Once students have learnt those sounds, they can sound out words letter by letter with minimal help [31]. With reading practice, emerging Italian readers can quickly attain sight–word recognition.

Researcher and psychologist Professor Philip HK Seymour has conducted the most extensive

cross-national study of reading abilities, involving children in 14 European countries. Seymour and his team found that children learning languages with simple spelling systems, or shallow *orthographies,* such as Finnish, Italian and Spanish (phonetic languages) progressed faster than those learning languages with complex or deep orthographies such as English (a non-phonetic language). Seymour concluded:

> *the acquisition of elementary word recognition and decoding occurs more slowly in some languages (Portuguese, French, Danish) than in the majority, and the delay is greatly exaggerated in English* [11].

Children learning languages other than English master the basic elements of literacy within a year, while children learning to read English take two and a half years to reach the same point.

Other researchers have found that the effects of dyslexia are not as limiting for readers of languages with phonetic spelling such as Italian [41]. In phonetic languages, even students with reading disorders can learn to read by sounding out words and gain functional literacy.

Dyslexia disadvantage

A leading expert in dyslexia, Dr Sally E Shaywitz, MD, has identified a clear relationship between the nature of dyslexia and the biology of the reading brain. Her research demonstrates that in typical readers intelligence and reading are dynamically linked, while readers with dyslexia can have high intelligence yet read at a comparatively much lower level [42].

I now know that my brother Andrew was a classic dyslexic: he wasn't a conventional thinker, he thought outside the box. But because he couldn't read he was called stupid his whole life. He became boxed in, and he had low self-esteem.

Being unable to read is* the *most ridiculed learning difficulty. You don't get teased for being bad at maths or science or art. Reading is fundamental and the common misconception is that you're fundamentally dumb if you can't read.

Andrew was held back two years at school, and graduated from high school through continuing education at the age of 21. He

was functionally illiterate, though, and found it hard to get odd jobs. The personal struggles he experienced through his school years as a result of his reading disorder continued into adulthood.

What is so sad about my brother's story, and for so many who struggle with reading, is the lack of fulfilled potential. In our modern written culture and now technologically driven world, reading is a crucial life skill. Without it, we aren't heard and can't communicate fully, and our capacity to learn is diminished. Literacy unleashes the power of our individual potential and helps us pursue our interests. Without it, our lives can become very limited.

–Ann, Readable English co-founder

People who struggle with reading and those who experience dyslexia usually learn in a different way from people who pick up reading easily, and often have particularly well-developed creative and analytic skills [43]. However, they can also have frustrating school experiences,

especially if their difficulties are misinterpreted as laziness. Children with dyslexia often experience frustration and anger at school [44], and have a higher risk of mental illness [45], especially depression [46]. Tragically, adolescents with dyslexia are at higher risk of suicide than those with standard reading skills [47].

We know that English is an incredibly difficult language to learn to read and even the best-equipped students take years to become proficient. We also know that to reach proficiency, students must undertake focused practice at home to supplement what they learn in class.

When struggling readers feel ashamed or frustrated by their difficulties, they often avoid reading, fall behind and never catch up. And despite the amount of research there is on the topic of reading, far too many people still struggle or don't read at all. Shaywitz writes:

> *In dyslexia, there is an abundance of high quality scientific knowledge so that we have not a knowledge gap, but an action gap* [42].

We believe this is true for all struggling readers and literacy in general.

Existing methods for teaching reading focus on the issues around the student learning to read, attempting to 'fix' the personal causes of their struggle. As each student and situation is different, no single reading program can help everyone. That's why we decided to focus instead on making the English language easier to read: Readable English is an attempt to fill the 'action gap' and take a step toward breaking the cycle of illiteracy.

Many researchers have investigated why the English language presents such unique challenges. The history and structure of the language provides insight.

Part 2

A short history of English

Learning to read English is an exceptionally difficult task. The written language is only partially phonetic, with very few clear and consistent rules. Individual letters can be pronounced in multiple ways, depending on the word in which they are found. The consequence is that a speaker who knows the pronunciation of a word will not necessarily know how to spell it, and a reader who encounters a novel word can, at best, only guess at its pronunciation. Given this lamentable state of affairs, ideally, we should develop a completely new phonetic English spelling system and forget the old one. Of course, realistically, such a radical transformation is not going to happen. Many of us assumed the situation was irretrievable and we had no choice but to condemn English readers and writers to their difficult task. I was in that camp until I was introduced to Readable English. It is ingenious.

Emeritus Professor John Sweller
School of Education, University of NSW
Sydney, Australia

Chapter 5

The alphabet

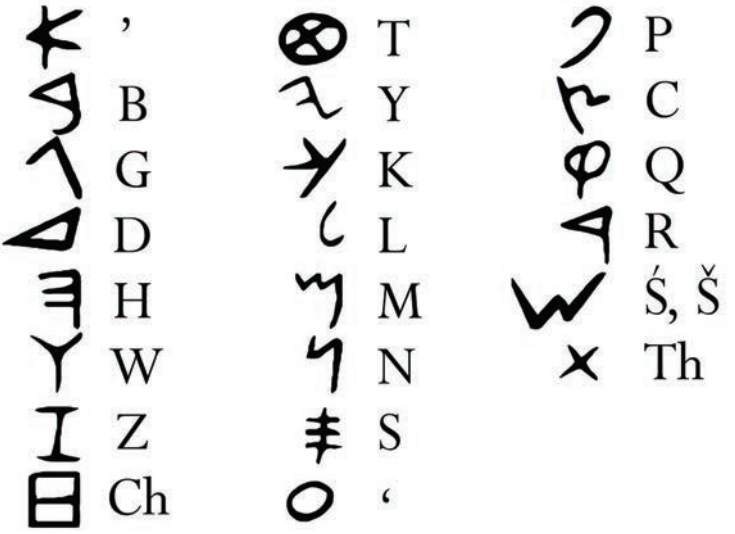
Writing, and in turn reading, were invented several thousand years ago and have been evolving ever since. Language is never static, as this part of the book will show, and continues to change today. We believe Readable English has a role to play in this ongoing evolution.

Early alphabets

One of the earliest writing systems, the Phoenician alphabet, had symbols for consonants only and none for vowels. The Semites are thought to have created the Phoenician alphabet in around the eleventh century BCE (before the Common Era), inspired by Egyptian hieroglyphs, which had been in use for the previous 2,000 years. Phoenician traders spread the alphabet throughout the Mediterranean, and it's considered the source of all modern western alphabets.

The Phoenician alphabet contains 22 characters. Each character is named after the Phoenician

object it represents. For example, the character that eventually became the Roman letter 'y' is called 'yód', the Phoenician word for hand [48].



Phoenician alphabet (from The Phoenician Alphabet and Language, *2014)*

Around 200 years later, in the ninth century BCE, Greeks changed the pronunciation of several adopted Phoenician letters to suit the phonemes in their own language, and added letters to represent other sounds that were missing. The Greek alphabet was the first fully phonetic alphabet, with one unique sound per character, and the pronunciation of each word represented

by the sounds of its characters in the order they were spelt.

The Eastern Greek language was originally used in western Turkey, where a large Greek population lived, and this alphabet is still used across the entire Greek-speaking world today. Western Greek was initially used west of Athens, and eventually evolved into the Roman alphabet.

Western Greek alphabet

In central Italy, Etruscans spoke a language that has never been deciphered and is thought to be unrelated to any other. Around the eighth century BCE, Etruscans adopted the Western Greek alphabet, and later introduced changes to suit their needs [49]. As their language didn't include consonant sounds such as 'z' that vibrate the vocal chords (voiced consonants) and those such as 's' that don't vibrate (unvoiced consonants), different consonants were sometimes used to represent the same sound. (Place your fingers against your throat and say 'z' and 's' to feel the difference.).

It's believed Etruscans also pronounced 'c', 'k' and 'q' the same way, as /k/, possibly with slight variations. And they experimented with ways of writing the sigma letter 'Σ', creating variations with three to six lines, compared with four in the original Greek version. The alphabet they developed contained many ambiguous writing conventions still found in English today.

The Roman alphabet

The Latin founders of Rome, known as the Romans, adopted letters from the Western Greek and Etruscan alphabets in around the fifth century BCE. They dropped letters representing sounds they didn't need (such as 'Θ', 'Φ' and 'Ψ') and created new ones they did (such as 'f').

Although the Romans changed several pronunciation rules—the letter 'c' was initially used to represent the hard /k/ sound (as in '**c**at') as well as the /g/ sound (as in '**g**arden'), until the letter 'g' was developed—they maintained the Etruscan practice of pronouncing different letters the same way, including pronouncing 'c', 'k' and 'q' as /k/.

In the third century BCE, Alexander the Great, ruler of the Ancient Greek kingdom of Macedon, conquered the Eastern Mediterranean and introduced the Eastern Greek alphabet to the region. Romans absorbed many Eastern Greek words into their language and created pairs of Roman letters to represent single sounds, known as *digraphs,* as substitutes for some Eastern Greek letters, including 'ph' for 'Φ' and 'th' for 'Θ'. Eventually they also borrowed the letters 'y' and 'z' from Eastern Greek, which were placed at the end of the Roman alphabet.

After several attempts, the Romans invaded Britain successfully in the year 46, taking the Roman alphabet and writing tradition with them. By the year 70, Rome had control of Britain (excluding northern Scotland) and ruled for almost 400 years [50].

In the 600 years leading up to the Roman invasion, there had been a strong oral tradition in Britain, using two Celtic languages, Brittonic and Goidelic [51]. The introduction of a writing system was revolutionary.

For the next 1,000 years, text was written as continuous script, with no spaces between words

and no punctuation of any kind. Readers had to scan lines back and forth to determine where each word started and ended. Because the process was so laborious, even the most proficient readers had to read aloud, engaging auditory memory to help decipher the meaning of the sentences [52].

During this period, spoken language was often constructed using rhyme and rhythm (metre), often in verse, to help the majority of people who couldn't write to memorise and share such things as folklore. Initially written documents used the same poetic sentence structures.

Old English and the Anglo-Saxons

Celtic languages were still spoken in England up to the fifth century. But this ended abruptly when Anglo-Saxon invaders arrived, speaking Germanic languages with links to Dutch, Frisian (from the northern Netherlands), German and Scandinavian. Although there's almost no trace of those earlier Celtic languages in today's English language, except for a handful of placenames and obscure words such as 'brock' (badger), some have speculated that Modern

English did inherit grammatical structures from the Celts [53].

Because there are no written records of Germanic languages used in this period, there's little detail available about the nature of the spoken language at the time. However, Old English writings from the seventh to ninth centuries reveal a lot of regional variation, which continued evolving for several hundred years.

In the eighth and ninth centuries, England was invaded again, this time by the Norsemen of Scandinavia who set up camp in the north and east. Their Northern Germanic language had similarities to the Old English being spoken in England at the time, sometimes referred to as Anglo-Saxon. Some introduced words were absorbed, or hybridised, in this period, and because the languages were similar the origin of these new words is not always clear.

Whatever their origin, Anglo-Saxon words clearly form the basis of Modern English, as shown in the following passage composed entirely from Anglo-Saxon words used all the time today:

> *A man 'loves his mother, father, brother, sister, wife, son and daughter ... kisses his*

kin and buries his dead; draws his breath, eats his bread, drinks his water, stands his watch...' [54].

The centuries that followed brought tremendous change to the English language, setting the structural and grammatical foundations for how we speak today.

Chapter 6

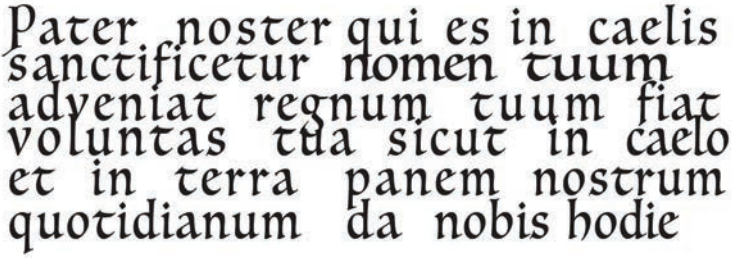
Middle English

In 1066, England was invaded and occupied once more, this time by the Norman army under William the Conqueror. The Norman ruling elite spoke French and wrote in Latin [55], and these became the official languages. A tidal wave of words entered into common English use from these languages, and speaking a combination of English, French and Latin became the norm in business and professions.

Back in the ninth century, a series of reforms had been developed in the Carolingian Empire (France and Germany today). Known as the Carolingian reforms, they included a move to simplify and standardise the way Latin was written. These changes reached England after the Norman conquest and were adopted over the following centuries, making it much easier to read written texts.

Initially spaces were introduced between words, which made individual words easier to identify. But all letters remained the same height (for example, the letters ‘p’ and ‘d’ were the same

height as ‘e’ and ‘n’) and that meant many different words appeared very similar. Readers had to look carefully at individual letters to differentiate a word from others with a similar shape.



Excerpt of Latin text [56]

In the next development, some letters were extended above the central line (such as ‘b’, ‘d’, ‘h’, ‘k’, ‘l’ and ‘t’) and some below the central line (such as ‘g’, ‘p’ and ‘q’), which gave each word a distinctive shape, known today as its *Bouma shape* (after vision researcher Herman Bouma). This enabled readers to use a cognitive short cut, or sight–word recognition, to identify words immediately by their appearance. This new written format allowed much faster reading and eliminated the need to read aloud to stimulate auditory memory of words. Once silent reading became possible,

there was a sharp increase in personal communication and even in seditious movements against public figures, including the Pope and the King.

Other Carolingian reforms involved standardising grammatical rules and sentence structure, including introducing the basic subject–verb–object word order in sentences, which in turn made silent reading even easier.

The official language again

A number of factors contributed to making English the official language of England again. First, the Norman occupiers became anglicised following the loss of international territories. Norman nobles started thinking of themselves as English and began paying more attention to their local interests, and Norman French slowly fell out of use.

While some people in England spoke French and some spoke Latin, by this time only a few people spoke both languages and everyone spoke English. It gradually became the most widely used language of the nation again.

English became even more popular during the Hundred Years War against France (1337–1453), when French became the language of the enemy. Early in this period, the bubonic plague killed a third of the English population and a disproportionate number of the Latin-speaking clergy in just over a year. An extreme labour shortage followed this catastrophic event, which saw the English-speaking working class gain a more powerful position in society and in the economy. Soon there was little difference in the language used by commoners and nobility.

In 1362, English was made the official language of the courts and parliament. In that same year, Edward III became the first king to address parliament in English. By 1385, English had become the language of instruction in schools [57].

Because court clerks generally had experience writing in Latin and French, some spellings were retained in error from those languages (such as 'table' and 'double' from French). Spellings of many other words were deliberately changed to reflect their anglicised pronunciation (such as 'beef' and 'mountain' from the French 'boeuf' and 'montagne'). Other spellings were changed

with questionable logic (such as ‘people’ from the French ‘peuple’) [58].

During this period, numerous regional dialects of written and spoken English started to be overshadowed by the London dialect. Elites in class and profession had adopted London English, giving it an air of superiority; other dialects became stigmatised and the London dialect gradually became widely adopted.

In turn, an organic change to vowel pronunciation, or vowel shift, occurred at the time, which would have made many foreign words unrecognisable in their countries of origin. No corresponding change to spelling accompanied this shift, creating many of the inconsistencies in pronunciation found in the English we speak today.

The end of the Middle English period is marked by the introduction of the printing press, developed by Johannes Gutenberg in Germany in the 1450s. An English merchant, William Caxton, spent several years studying printing technology in Belgium before taking it to England in 1476 [57].

Caxton also introduced Flemish typesetters to England. These Flemish speakers made spelling errors that were then absorbed into regular English, including ‘any’ (originally spelt ‘eny’) and ‘busy’ (‘bisy’). Typesetters are also thought to have lengthened some words to make margins neater and, because they were paid by the line, to increase the number of lines. They are attributed with adding the ‘i’ to ‘friend’ and the ‘a’ to ‘head’ [58].

The printing press allowed multiple, identical copies of books to be printed very quickly for the first time and created a large market for books on many different subjects [59]. It became economically important for books to be easy to read and, despite any hindrances imposed by Flemish typesetters, efforts were made at this time to establish consistent spelling and standard punctuation [60].

Chapter 7

Modern English

In 1525, after years in exile, English scholar William Tyndale published the first English language Bible and coined many new words in the process.

Tyndale believed people should be able to read the Bible in a language they could understand, rather than only hearing it read aloud in Latin during sermons. His translation empowered Christians to access and interpret scriptures by themselves, and this development threatened to diminish the power of the Church. English Bibles were soon made illegal and regularly burned outside St Paul's Cathedral in London, creating a black market for copies that were produced by Flemish and German typesetters overseas.

As each new edition of the Bible required manual typesetting, numerous spelling errors were introduced over time. Spelling inconsistencies were so prevalent that it was not uncommon to see several spellings of the same word on a single page [58]. With the Bible often the only book that a family owned,

some of these spelling errors slipped into common use.

In response, English schoolmaster Edmund Coote published the first edition of *The English Schoole-maister* in 1596. This was the first substantial English-only guide to reading and writing the language, helping to standardise spellings based on the most common use. Coote removed unnecessary letters in many words (for example, 'hadde' became 'had'), but unfortunately was not consistent in applying this rule.

The first formal English dictionary, *Table Alphabeticall,* was published in 1604, providing authority on use of new words introduced to the spoken language.

Around 150 years later, in 1755, a group of booksellers published a new English dictionary compiled by Samuel Johnson. It had taken more than eight years to develop and was a far more comprehensive dictionary than had ever existed before, containing 40,000 words with detailed definitions and quotes illustrating variations of word use.

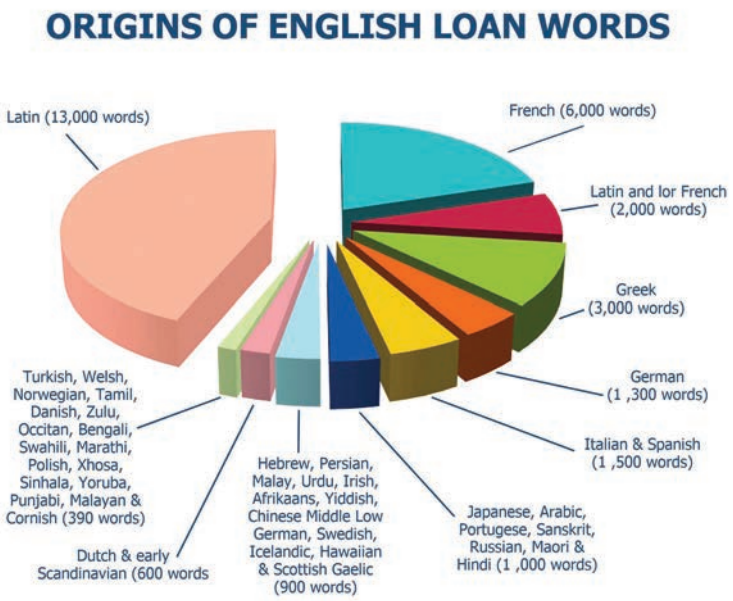
Johnson was commissioned to standardise rules governing the English language in the process,

but found this task impossible and instead recorded the language of the time [61]. He created different spellings for different words pronounced the same way (such as 'there' and 'their'), making it easier for readers to understand intended meanings.

From the early seventeenth century, British exploration vastly expanded the influence of English around the world. When the British took English to new countries such as Australia and North America, local versions of the language evolved away from British English. Today Australian English includes words such as 'hotel' for pub and 'larrikin' for a mischievous usually younger person, while American English includes 'trash' for rubbish and 'faucet' for tap, none commonly used in Britain anymore.

Colonisation and international trade also led to words being adopted into English from other languages (loan words). For example, English now contains Aboriginal words (such as 'koala', kangaroo', 'dingo' and 'bunyip', to name a few) as well as many Indian ('bungalow', 'shampoo', 'pyjamas', 'chutney'), Spanish ('barbecue', 'hurricane', 'poncho', 'chocolate') and West African words ('chimpanzee', 'banjo', 'safari', 'jumbo').

Oxford English Dictionary etymologist, Dr Philip Durkin, conducted a study on the national origins of English loan words. The vast majority are from Latin, French, Greek and German [62]. There are words from all over the globe and surprisingly few from languages local to Britain such as Welsh, Gaelic and Cornish.



Origins of English loan words

English vocabulary exploded during the rise of the British Empire, which covered about a quarter of the globe at its height, and throughout the industrial revolution [63]. Most

innovations at this time were of British origin in fields as diverse as steam power, manufacturing and transportation. English also dominated the fields of science and technology between 1750 and 1900 [64]. It's estimated 27,000 new words were added to the English language in this period [62].

Today English is the primary international language used in communications, science, business, aviation and many other fields. It also dominates around the world as the common language, or lingua franca, spoken by people whose first languages are different [65].

Erratic English spelling

English is a patchwork language, full of words adopted from people who conquered Britain and people who Britain conquered. It's heavily influenced by Greek and Latin vocabulary, embraces new words coined all the time and includes a multitude of words absorbed from myriad sources. As the language expanded, new phonemes were added that had to be represented using the 26 letters of the Roman alphabet.

*In the English language, 14 letters of the alphabet represent one sound only. The other 12 letters can represent up to seven different sounds each. Take the letter 'u': it's used to represent the sounds /uh/ (as in 'up'), /yoo/ (as in '**u**se'), /oo/ (as in 'p**u**t'), /oo/ (as in 'fr**ui**t'), /ih/ (as in 'b**u**sy'), /w/ (as in 'q**u**ick') and /eh/ (as in 'b**u**ry').*

Traditional Latin languages such as Italian and Spanish are phonetic: they have a corresponding number of phonemes and letters. A reader can look at a word written in Italian or Spanish and know how to say it.

English isn't phonetic. It has almost twice as many phonemes (between 42 and 45) as letters (26), depending on the definition of a phoneme (for example, some people consider the long 'a' sound, /ay/, a singular phoneme, while others consider it comprises two existing phonemes, /eh/ and /ih/). In English, there's little correspondence between how words are spelt and how they're spoken.

English spelling contains two-way ambiguity. First, many phonemes can be spelt in multiple ways. For example, the long /ee/ sound in 'm**e**' can be spelt 'e', 'ey', 'ee', 'ei', 'ea', 'i', 'ie' or 'y'. This kind of ambiguity results in words that are spelt differently but sound exactly the same (homophones). For example, 'steel' and 'steal', 'ate' and 'eight', 'night' and 'knight'.

Second, many letters and letter combinations can represent multiple phonemes. For example, the letter 'a' represents its standard phoneme /a/ (as in '**a**t') plus at least four other phonemes (as in '**a**te', 'w**a**sh', '**a**ny' and '**a**bout'). This ambiguity results in different words that are spelt the same way but pronounced differently (homographs). For example, 'bow' represents three words, two rhyming with 'cow' and the other with 'show'.

Homographic ambiguity is common in English and particularly challenging for emerging readers. It means there's more than one way to decode a word, which can lead to all kinds of errors when reading.

Pairs of letters, or digraphs, such as 'ou' and 'th' are also used to represent some of the

extra phonemes in speech. Again, there are multiple ways to pronounce digraphs, which adds further complexity to written English. Although some spelling patterns help with learning pronunciation, there are many more exceptions.

Different pronunciations of the digraph 'ou'.

And that's not all. English applies segments of sound or speech (syllables) inconsistently as well, reflecting patterns that have evolved over time. Anyone who has studied Shakespeare might guess correctly that the word 'converged' was once pronounced with three syllables, and only uses two in Modern English. But how would an emerging reader know that 'converged' has two syllables while 'converted' has three?

The English language is also full of letters that are silent in some words but spoken in similar contexts, like the letter ‘g’ in ‘sign’ (silent) and ‘signature’ (spoken). It would be impossible for an emerging reader to predict how ‘chasm’, ‘know’, ‘debt’ and ‘thought’ are pronounced without guidance.

Conventional methods of learning English involve students memorising multiple rules and thousands of exceptions just to be able to read everyday words. For those who struggle with reading for any reason, these inherent complexities cause great difficulties.

Chapter 8

Spelling reform

Several noble attempts have been made over the last 400 years to reform erratic English spelling, none of which have been successful. Several contributors to the cause made it their life's work and some made a huge financial investment.

The first call for spelling reform came in 1568, from Sir Thomas Smith, Secretary of State to Edward VI and Elizabeth I [66]. Sir Thomas attempted to align spelling with the pronunciation of Southern English spoken in court. He proposed significant reforms such removing redundant letters like 'c' and 'q', and reintroducing several Greek letters. His reforms were far too drastic to be adopted—and it didn't help that he wrote his recommendations in Latin [67].

In 1768, the great American polymath, Benjamin Franklin, analysed the English language, prioritising sounds based on the vocal effort required to produce them. He developed reforms to make English phonetic via several changes:

removing the letters ‘c’, ‘j’, ‘q’, ‘w’, ‘x’ and ‘y’; using double vowels when a long sound was needed; and adding six new letters for sounds such as /sh/, /ng/ and the soft /o/ (as in ‘b**a**ll’).

Franklin’s alphabet wasn’t popular. It was only published in 1789, when a fellow spellingreformer, Noah Webster, championed and included the proposed reforms in his *Dissertations on the English Language* [68]. Webster later developed a less drastic version without additional characters, but his efforts were also unpopular, even ridiculed by critics as an ‘unsightly corruption’ of English.

There were many others in favour of spelling reform. In 1906, American president Theodore Roosevelt introduced simplified spelling to government offices. This lasted just a couple of months before congress lobbied him to revert to Standard English.

From 1934 to 1955, the publisher of the *Chicago Tribune,* Colonel Robert McCormick, waged his own war on English spelling by adopting a simplified system. Upon McCormick’s death in 1955, the newspaper maintained many of his

changes and only reverted to Standard English in 1975, when they accepted that the changes hadn't been widely accepted by the reading public [69].

A number of other respected and influential people have been active supporters of spelling reform, including naturalist Charles Darwin, industrialist Andrew Carnegie, English teacher Isaac Pitman, who developed the most widely used system of shorthand [70], and Sir Robert Baden-Powell, founder of the Boy Scout movement and one-time vice-president of the Simplified Spelling Society [71]. A number of famous authors, including George Bernard Shaw, Mark Twain and Upton Sinclair, also campaigned for spelling reform.

Barriers to spelling reform

All attempts to reform English spelling fall into two categories: those that operate within the existing Roman alphabet and those that introduce new letters and characters, or variants of existing letters. No proposed system has ever been widely adopted.

The main drawback with systems operating within the existing alphabet is that they're not

able to reduce the ambiguities of written English without changing the spelling of words. For example, pronunciation guides used in dictionaries spell out words according to their pronunciation ('geography' as 'jeeogruhfee'). Systems that introduce new letters and characters, such as the International Phonetic Alphabet, also change the shape and spelling of words ('clothes' as 'kloðz'). Neither approach benefits students learning to read and write Standard English.

Although English spelling is complicated, many of the spelling patterns represent the roots of words and are important to keep in the language to convey meaning. The English writing system is called *morphophonemic* because it represents units of meaning (morphemes) as well as units of sound (phonemes) in its spelling.

Linguists Noam Chomsky and Carol Chomsky use words like 'sign' to teach the way English words carry meaning within them. The silent 'g' in 'sign' may seem unnecessary (and bewildering to new readers), but in fact visibly connects the word to its origin, the Latin root 'signum', from which there are related words like 'signal' and 'signature'. The silent 'g' in 'sign' visually

represents the morphemic aspect of English. In the latter words, the 'g' is pronounced and represents the phonemic aspect of the alphabet.

There's another reason why existing spelling is important to retain. If a person were to learn to read phonetically using a system that changes the spelling of words, there would be little benefit when they switched to reading Standard English text. These readers would never develop sight–word recognition (described in Chapter 2), which is fundamental for achieving reading fluency.

Learning to read the words 'through', 'vision' or 'knead' with the International Phonetic Alphabet ('θru', 'vɪʒən' and 'nid' respectively) would not help a reader when they then encountered the words in Standard English.

A further barrier to spelling reform is that, unlike many other languages, the English language isn't regulated. In France, for example, the French Academy established in 1635 is the official authority providing advice on the French language. No central authority exists to compel

or even recommend change to English spelling. Even if legislated changes were introduced in one country, they might not be adopted in others. Any change would have to be adopted voluntarily around the world.

Changing English spelling is also unlikely to be popular. Those who want to retain the cultural heritage of the English language are likely to oppose English spelling reform. And changing the spelling of words would make everyone have to learn a new system, not just those who struggle with reading the language. People are likely to question why the majority was being disadvantaged to benefit the minority with reading difficulties.

Yet another barrier is the sheer volume of existing texts that have already been published in Standard English. If people still needed to learn Standard English spelling to access previously published information, they would essentially be forced to learn two systems.

Only a completely fresh approach to addressing erratic English spelling could overcome these many real barriers to change.

Part 3

Making English readable

It really works! We saw improvements in reading after only one term. The whole cohort of students improved—the program doesn't just target the upper and lower ends of the class.

Peter Johnson
Principal, Bourke Street Public School
Sydney, Australia

Chapter 9

A new solution

Unlike previous attempts to overcome the difficulties that arise from erratic English spelling, Readable English has been designed to address the heart of the problem: the only viable solution is to make existing spelling phonetic.

We considered many possible ways of helping readers understand how to pronounce words more efficiently. Our process was rigorous and involved a great deal of research. It was also experimental, enjoyable and highly collaborative, involving many experts, researchers, students, teachers and readers over several years.

All we knew at the outset was that we didn't want to change the spelling of words. Any new way of presenting written English that we came up with would have to retain the existing Roman alphabet and existing English spellings. But we weren't purists: ease of use was the overarching priority, and this is reflected in our final mark-up design.

During our long process of discovery, we came to realise that Readable English also had to deliver a complete package of easy-to-use tools and services to be fully effective. Today our goals for Readable English have been fulfilled in the following ways:

- The new format is intuitive and easy to learn. It enables emerging readers to sound out words, letter by letter, without having to memorise complex spelling rules and exceptions first, helping them progress directly to sight–word recognition.
- It's comprehensive. If a significant proportion of words couldn't be represented in the new format a student would still need to learn rules for those exceptions, defeating its purpose.
- Simple, intuitive software has been developed to enable students to read what they want to read by being able to convert Standard English documents into the new format. Readers can turn the new format on and off in electronic documents as their reading ability develops, and they transition to reading standard text.
- A complete dictionary is marked up in the new format so that readers can easily identify the pronunciation of any word when they're accessing unformatted reading material.

- A publishing system with an online store is provided to allow publishers to sell books and readers to buy books or any other documents in the new format. Electronic and print versions of books are also available, and publishers can submit books for sale in any form (such as PDF for print and ePub for ebook applications).

It took more than six years of research, development, trials and tests for all aspects of the project to be identified and fulfilled. We kicked off the whole process by analysing the spelling and sounds contained in the 10,000 most common words in the English language.

We started marking up by hand a database of 10,000 words so that we could see patterns in the words. We thought once we understood the patterns in the marked-up Readable English words, we would be able to develop algorithms to help us to mark up words. So we reworked the 10,000 words 11 times in the hope we would eventually see some patterns that were regular enough to develop useful algorithms. However, this approach did not work because too many English words are non-phonetic and the spelling is simply too

erratic. And we couldn't use machine learning—that is, a computer program that could look for patterns in marked-up sample words to predict appropriate mark-up for new words—until we had a big enough training set. So we developed tools for marking up words which enabled us to get to 60,000 words more efficiently. This gave us a big enough training set to later engage machine learning for continuing to mark up words.

Once the first set of parameters for applying our prototype mark-up had been established, we assessed how easy the mark-up was to read in print and on different computer screens, including tablet and smart phone screens. We also tested how user friendly our marked-up text was to read for a range of students.

–Chris, Readable English co-founder

Fast forward, and we have now applied our final mark-up design to 100,000 words in the Macquarie Dictionary, providing a Readable English pronunciation guide in Australian English

and American English accents, with British English in development. The number of marked-up words continues to grow as the project rolls on.

Readable English evolved in four phases, and each phase is described in detail on the following pages.

Phase one: Concept and development

We drew on our experience in publishing accessible print formats, and in teaching children and adults to learn to read, and asked ourselves what a new way of presenting the language that addressed non-phonetic English spelling might look like.

This involved research in linguistics, neuroscience, cognitive psychology and cognitive load theory (described in Part 1 of this book). It became clear that the most efficient way to learn to read occurs in phonetic languages like Italian, in which readers can sound out words letter by letter. Students of those languages progress to sight–word recognition far more easily than students learning non-phonetic languages such as English.

The most obvious way to start the project was to break words into syllables, as long words are pronounced syllable by syllable.

Syllable breaks

While studying the way words are formed from syllables (syllabification), we found that different dictionaries applied different syllabification rules based on spelling patterns. So Ann drew on her teaching experience at The Reading Clinic and began breaking up words the way students are taught to do when learning to read, which is also the way words are actually pronounced. She did this by inserting a dash between syllables in the initial 10,000 words.

Take the word 'imaginary'. This multi-syllable word was broken into spoken segments, 'i·ma·gi·na·ry', in Readable English mark-up rather than the conventional pattern, 'im·ag·i·nar·y'.

i·ma·gi·nā·rȳ

Silent letters

During phase one, the presence of silent letters also became evident. We needed a way to signpost these letters that would be clear in

different applications (in print and on screen, in colour or black-and-white), without interfering with the overall shape of the word.

Whereas other phonetic systems usually remove silent letters, we wanted them to remain visible to keep the spelling intact, allowing readers to see the shape of a word and in turn associate it with the sound of the word.

Two examples of words with silent letters are:

limb nīght

We experimented with different approaches and finally determined that fading out silent letters was a good solution, providing a simple cue for readers that still retained the integrity of the complete word.

We experimented with reverse video format, in which the colours of the letter and background are swapped. When tested, some users found this presentation affected the shape of the word and actually drew more attention to the silent character.

Although our final solution was technically hard to implement across print and electronic formats, with different devices offering significantly different screen display capabilities, we found a way to consistently fade out silent letters in Readable English.

–Chris, Readable English co-founder

Ambiguous sounds

Having broken words into spoken syllables and having faded out silent letters, it became easier for us to identify and mark up different sound patterns. Given 12 of the 26 letters in the English alphabet represent multiple sounds, we realised additional visual information would be needed to indicate correct pronunciation.

When I was working with students at The Reading Clinic, I would use flashcards to teach sight–word recognition. In pencil, I would draw a small symbol on a letter to help the student remember that the letter was going to make a sound other than its usual sound. As the student became more

proficient with a word, I would erase the pencil marking.

This was how we came up with the concept of adding visual cues to non-phonetic letters in Readable English.

–Ann, Readable English co-founder

We started marking up obvious variations such as long vowel sounds (as in '**a**te', 'm**e**' and '**u**se'), compared with short vowel sounds (as in '**a**t', 'm**e**t' and '**u**s'). Then we moved on to other sound patterns we already knew such as the unstressed vowel sound (the schwa) in unstressed syllables (as in '**a**bout', 'env**e**lope', 'g**i**raffe', 'el**o**quent', 's**u**pply' and 'sib**y**l').

Computer programmers advised us to use standard computer code symbols (Unicode) to mark up these irregular phonemes because Unicode symbols, or *glyphs,* were already in common use. We chose a selection that had a logical visual link to the sounds they represented.

*The schwa glyph that represents the unstressed /uh/ sound (as in 'sof**a**') looks like a little 'u',*

*and we use a little 'o' glyph for the /o/ sound (as in 'w**a**tch'). We also use glyphs that are already in common use such as the French cedilla on the letter 'c' in 'i**c**e'.*

sô·fă īçe

We ended up with 16 glyphs that covered the irregular phonemes in almost all of our initial 10,000 words. Words that couldn't be marked up with glyphs were called exceptions. In these instances we presented a phonetic version of the word in brackets afterwards.

The word 'tough', for example, was written phonetically as [tuff] and 'said' as [sed].

Phase two: Informal testing

Once our initial database of the 10,000 most common English words had been marked up, we decided to informally test the logic and usability of our glyphs. We developed videos and online lessons to teach the glyphs to students, and help them progress from interpreting individual sounds and syllables to reading words, sentences and paragraphs.

We recruited a small group of English-speaking secondary school students who were struggling with reading and a group of adult English language learners (24 participants in total), and provided them with nine hours of teaching in Readable English, and then got their feedback.

Overall results were promising: several of the secondary school teachers reported that Readable English had helped to break down barriers to reading, and students who were previously disengaged started taking part in class. One participant was reported to have gone up a full grade level in their reading comprehension after this brief intervention. Another used Readable English to create subtitles for a movie he was watching, and a couple of participants even started teaching their grandparents to read English. One parent was thrilled to report that their child had started asking for books and magazines instead of just music.

The feedback clearly showed that Readable English maintained the integrity of individual words because participants had no difficulty recognising Standard English words they already knew when these were marked up. Similarly, students who gained sight–word recognition of

new words using Readable English were then able to recognise the words in Standard English.

Although this result was not unexpected—people are good at identifying known letters in the presence of distractors (for example, we can easily recognise the letter 'o' in the character 'ö')—it was still an important result. It showed that students could use Readable English to learn to read a word by sight, and then read that same word in Standard English. There was little if any transitioning between the two formats.

Other feedback included parents reporting that their children were now automatically breaking words into syllables when reading Standard English text, even though they hadn't specifically been taught word attack skills (described in Chapter 4). Again, this wasn't unexpected as it aligns with information processing theory [35] and cognitive load theory [38]: by breaking up words into syllables, the number of pieces of information a reader is required to process is greatly reduced (described in Chapter 3).

Take the word 'information'. Decoding the sound of all 11 characters in the word as separate

pieces of information is likely to cause a significant overload on working memory. But when the word is shown with syllable breaks (as in 'in·for·ma·tion'), the student has to decode the sound of each of the four syllables only, and then blend the sounds of those four syllables together to read the whole word. Teaching a student the sounds of the most common syllables aids this process.

in·fŏr·má·t͡iŏn

In the Readable English dictionary database, at least 13,802 words (and counting) are made up of combinations of the 500 most common syllables. Students mastering those 500 syllables early in the learning process gain an extra boost from Readable English, progressing even more readily to decoding the sound of more than 13,000 words.

Focus group interviews with the English language learners—participants whose first languages weren't English—revealed that they often avoided saying words they weren't confident they could pronounce correctly, even if they felt comfortable using the same words in writing. They described

how they would try to find other words to express themselves and this often caused communication problems.

These participants reported that Readable English allowed them to decode the sounds in new words with greater confidence, and our learning tools allowed them to hear the sounds and practise their pronunciation independently. English language learners in our informal testing group said overwhelmingly that they wanted a Readable English dictionary delivered as a mobile app.

While all participants said our glyphs were generally easy to learn, a handful of the glyphs weren't clear or intuitive, including the single glyph used to represent all long vowel sounds (as in '**a**te', 'm**e**' and '**u**se'). This glyph would represent different sounds depending on which letter it was placed over, whereas other glyphs represented the same sound regardless of the letter. This was confusing, so we set about analysing vowel sounds again.

Chapter 10

Developing the glyphs

A couple of goals framed the next phase of development. We needed to expand the range of glyphs used in Readable English so that each glyph represented a single sound, and as many mark-up exceptions as possible were eliminated. And we wanted to redesign the glyphs so that they were easier to identify, easier to remember and generally more intuitive for readers to use.

Phase three: Further development

As we began refining the glyph system, it quickly became apparent that we had exhausted all suitable Unicode symbols. We needed to create new glyphs, and we needed a printable typeface that incorporated all our glyphs and could be scaled to any size.

Eventually another six glyphs were added to our mark-up, bringing the total to 21. A Readable English typeface was created too. These developments provided more comprehensive coverage of English sounds, without inconsistencies, as well as the capacity to

reproduce Readable English easily to serve any application.

The new glyphs made 99.9% of English words phonetic. Words such as 'tough' and 'said', which we presented previously as exceptions, could now be marked up.

tou ̄gh sa ́id

We also made sure each glyph had a memorable corresponding name, incorporating the sound it represented, to help students retain the sound (known as a mnemonic). The glyph named Aussie Oswald, for example, represents the /o/ sound (as in '**o**ff') that 'Aussie' and 'Oswald' both start with. We also created a short, fun video for each glyph, to reinforce the visual and auditory association between the glyph and the sound it represents.

A lot of effort went into naming and explaining the Readable English glyphs, using sound, vision, action and a splash of humour to provide a few different options for remembering each glyph and its sound. Our approach was deliberately open and playful, to liberate and inspire students to

find their own ways of memorising the glyphs. Every new user of Readable English connects with the glyphs differently, and this was highlighted when we were working with a young student called Louise on the glyph known as Dome.

Dome makes the sound /oh/ (as in 'open') and is shaped like a dome (ô)***. 'No,' said Louise. 'That's not how I remember that glyph. I think of it as a rainb/oh/!'***

Of course, why didn't we think of that? Readable English glyph names are important if you have trouble remembering the sounds they represent, but recalling the actual sounds is the most important thing. If Louise calls a glyph Rainbow and we call it Dome, that's just fine.

–Anna Tuyl, Readable English researcher

The next step was to develop an efficient mark-up system that could apply our glyphs to all English words. As new words were being marked up during phase one, we noticed that the number of new syllables we encountered rose slowly, because many of the new words

were comprised of existing marked-up syllables. This observation enabled us to optimise our manual approach: it was possible for Ann to quickly select appropriate marked-up syllables from a list of identified syllables while marking up new words.

Once Ann had marked up the next 50,000 most common English words, we had a large enough collection of examples (60,000 in total) to train a machine learning system to predict the mark-up of new words.

We used our training set of marked-up examples to teach the system to predict which Readable English character should be applied to a letter, given the letter's context within a word (with 'character' referring to a letter–glyph combination or silent letter). We noticed that mark-up mistakes generated by the system often occurred in unknown syllables (ones we hadn't identified and marked-up yet), so we were able to dramatically improve the system's performance by limiting search results to known, or allowed, syllables.

However, there were still thousands, sometimes millions, of possible ways to break up an English word into spoken syllables. As the time to perform a single word mark-up was around a minute, the process needed further improvement.

Through mathematical (combinatorial) search techniques, coupled with our machine learning system, we were able to intelligently search all possible syllable combinations for the most probable options, reducing the search space from millions to around 10,000 or fewer.

In 92% of cases, the highest priority option generated by the system was correct, and in about 99% of cases, the top six results contained the accurate mark-up. Now only around one in every 100 words needed to be marked up manually.

–Chris, Readable English co-founder

Over a six-month period, Ann marked up tens of thousands more words, using a combination

of machine learning and expert human knowledge.

Our initial Readable English dictionary database was created using American (Californian) English. We next turned our attention to Australian English and discovered that an extra glyph was needed to fully represent the local accent, which included the /ar/ and /or/ sounds (as in 'b**a**th' and 'th**o**ught'). We named the new glyph 'Fast R'.

Anyone who enjoys doing crosswords or playing Scrabble will understand what a pleasure it was to create Readable English.

Exploring the first 60,000 words to devise an effective mark-up system became an irresistible puzzle. We started to see patterns, and then responded to those findings, but until we saw the patterns we didn't know what to do or what kind of technology needed to be developed.

Then, through experimentation and collaboration, we arrived creatively at Readable English. It has been a fun process.

–Ann, Readable English co-founder

More about our mark-up

In Readable English, each letter of the alphabet represents a standard or most common sound (such as /a/ for ‘a’, as in ‘s**a**t’). These letters remain unmarked. Letters are only marked with a glyph when they represent a non-standard sound (such as /ay/ for ‘a’, as in ‘**a**te’).

áte

Readable English also contains 12 digraphs: ‘ar’, ‘or’, ‘ur’, ‘oi’, ‘oy’, ‘ou’, ‘ow’, ‘ch’, ‘ng’, ‘ph’, ‘sh’ and ‘th’. To keep our mark-up as simple as possible, and maintain the original integrity of words as much as possible, digraphs are left unmarked when they represent their standard sounds (such as /ou/ for ‘ou’, as in ‘h**ou**se’). As with individual letters, digraphs are only marked with a glyph when they represent a non-standard sound (such as /oo/ for ‘ou’, as in ‘s**ou**p’).

söup coũld th̲ôugh

The aim of Readable English mark-up is to enable readers to sound out a word well enough to pronounce it, recognise it and retrieve its meaning. The glyphs represent an accurate approximation of speech sounds so that readers can arrive easily at the correct pronunciation of each word. When a word is pronounced more than one way (that is, words with one meaning but more than one pronunciation), the most common pronunciation is marked up.

To minimise the number of glyphs a student needs to remember, one of the glyphs has been used to serve two purposes. Upper Cup was designed to represent the /uh/ sound (as in 's**o**n'). As this vowel sound is a close approximation of the schwa sound in unstressed syllables (such as the second syllable in 'sof**a**'), Upper Cup is also used to represent this other very similar sound.

sŏn sô·fă

Special mention also needs to be made about the letter 'r', which often changes the sound of vowels placed immediately before it, including vowels in the digraphs 'ar', 'or' and 'ur' listed above.

When ‘a’, ‘e’, ‘i’, ‘o’ and ‘y’ are followed by the letter ‘r’, they sometimes make the digraph sound /ur/ (as in ‘forw**ar**d’, ‘h**er**’, ‘b**ir**d’, ‘w**or**d’ and ‘m**yr**tle’). And when ‘a’ is followed by the letter ‘r’, it can make the digraph sound /or/ (as in ‘w**ar**m’). In Readable English, the Upper Cup glyph (representing the /uh/ sound) and the Aussie Oswald glyph (/o/ sound) are used to standardise these pronunciation exceptions.

Whenever students see Upper Cup applied to a letter immediately before the letter ‘r’, they know that the letter pair make the standard digraph sound /ur/. Likewise, Aussie Oswald applied to the letter ‘a’ immediately before ‘r’ indicates the standard digraph sound /or/.

for·wărd wårm

A table of all 22 glyphs used in the Australian English version of Readable English appears in Appendix 2, including sample words with each glyph in place.

A breakthrough

The first three phases of development had achieved a real breakthrough: we had created

a simple mark-up design that made written English phonetic, without changing the spelling of any words.

And because spellings were unchanged, readers would also be able to learn to spell a word and recognise its Bouma shape while using our mark-up to sound out the word accurately. Being able to recognise the shape of a word and its letter pattern is important for developing sight–word recognition and fundamental for achieving reading fluency.

As our mark-up system made every written word unique, difficulties presented by confusing homographs (such as 'wind') were also eliminated. This benefit extended to homographs arising from shifts in emphasis, or stress, on syllables within words (such as 'contract').

In the homographs 'wind', the natural movement of the air, and 'wind', move in or take a twisting or spiral course, Readable English mark-up clearly specifies the sound represented by 'i' in both words.

wind wīnd

To distinguish 'contract', an agreement that is intended to be enforceable by law, and 'contract', to decrease in size, number or range, Readable English leaves the first word unmarked and in the latter word marks the unstressed syllable with the Upper Cup glyph, as shown below. This indicates to the reader that the first 'contract' is pronounced with the standard /o/ sound for 'o', and the second 'contract' is pronounced with an unstressed /uh/ syllable sound.

con·tract cŏn·tract

Readers could now sound out English words without having to memorise complicated rules and exceptions first, just as readers of phonetic languages around the world have been doing for centuries.

Chapter 11

Testing Readable English

The hardest work was done. Next we needed to make sure all our research and development really had produced an effective literacy tool.

Phase four: Extensive testing

Before formal testing was carried out with students in schools, we trialled our final Readable English mark-up on proficient readers whose first language was English. We asked more than 30 Australian adults to decode unfamiliar non-phonetic words to find out how easily they learnt and applied the new glyphs.

Participants were shown 20 non-phonetic English placenames they were unlikely to have come across before—names like Godmanchester, Tintwistle and Hawarden—and were asked to say the names aloud. (Don't look down the page if you want to try this now yourself.) Spoken responses were recorded, with most participants pronouncing less than a quarter of the names correctly. Some participants reported

that the only words they pronounced correctly were the ones they happened to know.

Participants then received 10 minutes of teaching in Readable English, focusing on the glyphs that appeared in the placenames. Following this quick lesson, they were shown the same placenames presented in Readable English.

Godmanche·stĕr
Tintwi·stle
Hawar·den

After this very brief introduction to Readable English, most participants were able to pronounce three-quarters of the placenames correctly. This quick activity confirmed the effectiveness of our mark-up, and reminded participants what it's like to attempt decoding unfamiliar non-phonetic English words as an emerging reader.

The pilot study

Now the formal testing began. We gained permission from the Department of Education in New South Wales to trial Readable English in primary schools in Sydney, and three schools chose to join our pilot study. In total, 27 students across years 4, 5 and 6 took part.

Each participant first completed a standardised test of reading accuracy and speed (the Gray Oral Reading Test), as well as a survey about their attitude to reading. They then received eight hours of classroom-based teaching in Readable English (two half-hour classes per week for eight weeks). During this period they could also access from home the Readable English website and all the resources on it. At the end of the eight weeks, reading ability in Readable English and attitude to reading was tested again.

Results revealed a significant improvement in oral reading fluency: all participants were able to read aloud faster and with fewer errors than before. Over half the participants (19 out of 27) were reading at a higher grade, and a quarter of these (5 out of 19) were reading two grades higher. Even the eight participants who stayed within the same reading grade made fewer errors in the post-study test than in the pre-study test.

There was also a significant improvement in self-reported attitude to reading among participants, a result that was validated by teachers. When we asked teachers if they had noticed any changes in their students, most

teachers (20 out of 26 respondents) reported observing an overall improvement in reading ability and around two-thirds (17 out of 26) noticed an improvement in attitude to reading.

My previous teaching experience at The Reading Clinic involved one-on-one work. We were always looking at individual students: we would pay close attention to the mistakes they made, which served as clues to the specific reading processes they needed to develop, and would then create unique programs for each of them. There's no one reading program that fits all struggling readers. But tailored programs and one-on-one teaching take time. They're also expensive.

While tailored programs are the only effective way to teach reading using existing teaching methods, the one thing every reading teacher and reading program does that's the same is to help students overcome erratic English spelling. Everyone is trying to eliminate that challenge so they can hone in on the activity of reading.

One of the unexpected benefits of the solution we've developed is that it also makes effective classroom teaching viable. Readable English focuses on the common denominator for all emerging readers—the English language, not the processes needed to read it—and keeps Standard English accessible to proficient readers learning alongside struggling readers. It even makes teaching reading accessible to non-professional teachers. Everyone benefits.

–Ann, Readable English co-founder

The full study

A second, more comprehensive study was designed to compare reading outcomes in children taught by a Readable English teacher with children in a control group receiving their usual reading lessons. The sample was larger (60 participants, compared with 27 in the pilot study) and slightly longer (12 hours over 12 weeks, compared with eight hours over eight weeks previously). Additional assessments were also undertaken, including a comprehension

component, and examining improvements in reading when reading in Standard English as well as Readable English.

Two classes totalling 37 students received teaching in Readable English. One class of 23 students acted as the control group. As before, students in the Readable English group took part in two half-hour classes per week and could access the Readable English website from home. Students in the control group took part in their usual reading lessons during the study period. Seven participants across both groups were excluded from the study due to incomplete data from them (they left the school during the study or were absent for parts of it).

All participants were assessed before and after the study using several measures. Different reading material was also used before and after the study (tests A and B in the table below) to avoid unintended practice with familiar material skewing results.

Gray Oral Reading Test (GORT): *assessing reading fluency and error rates, using selected passages.*

Neale Analysis of Reading Ability (NARA): *measuring reading accuracy, reading comprehension and reading rate (words read per minute), with each score converted to a reading age.*

The Readable English group used Standard English for both GORT assessments and the initial NARA assessment, and Readable English for the follow-up NARA assessment only. The control group undertook all assessments (before and after the study) using Standard English. The study design is summarised in the following table.

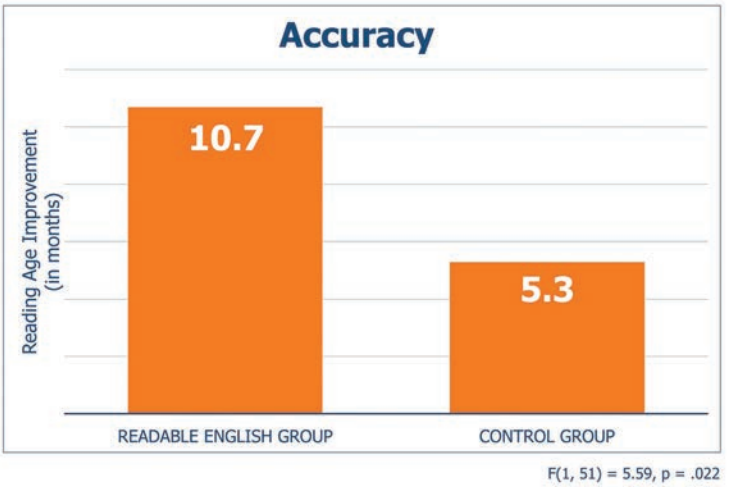
Assessment	Readable English group		Control group	
	Before(Test A)	After(Test B)	Before(Test A)	After(Test B)
GORT	Standard English	Standard English	Standard English	Standard English
NARA	Standard English	Readable English	Standard English	Standard English

Structuring the study this way allowed us to assess how reading ability changed when using Readable English compared with Standard English, and results demonstrated conclusively that

Readable English had improved the reading ability of participants who learnt it.

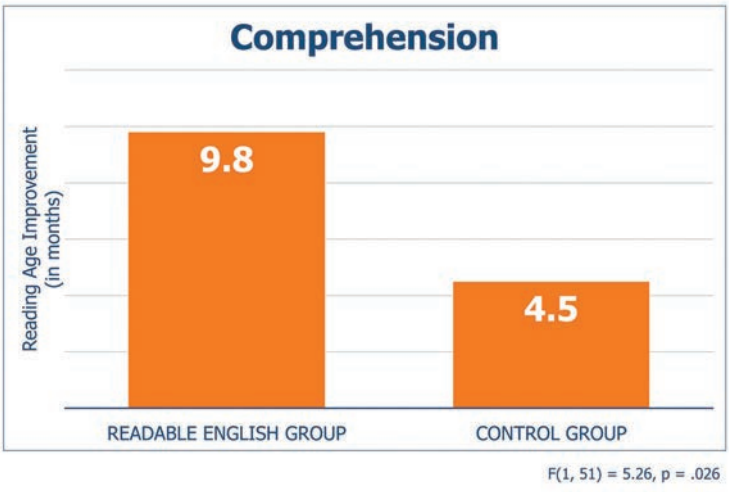
Over the course of the study (four months, including holidays), the control group's accuracy reading age (measured via the NARA assessment) increased by 5.3 months on average, as would be expected.

The Readable English group were initially assessed using Standard English, and then used Readable English in the follow-up assessment. Their accuracy reading age increased by 10.7 months on average in the same period: *twice the rate of the control group.* The difference between these figures was statistically significant.



Readable English study results for accuracy

Improvements in comprehension followed a similar pattern: the control group improved their comprehension reading age by 4.5 months on average, while the Readable English group *more than doubled this result,* at 9.8 months. The difference between these figures was statistically significant.



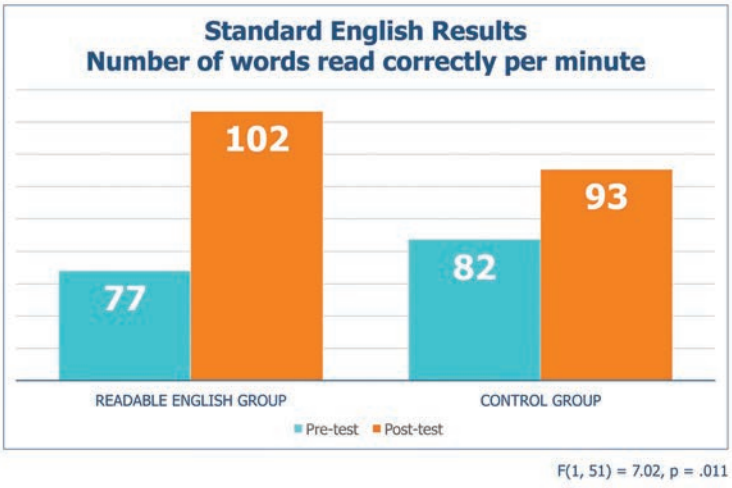
Readable English study results for comprehension

No significant difference was recorded between the groups for changes in reading rates.

To find out whether teaching with Readable English improves Standard English reading, we assessed both groups using Standard English

text from the GORT. Again, both groups showed improvement in fluency, with the Readable English group improving at *more than twice the rate of the control group.*

In follow-up assessments, the Readable English group read 25 additional words correctly per minute than before they received teaching with Readable English, compared with an improvement of 11 additional correct words per minute in the control group. The difference between these figures was also statistically significant.



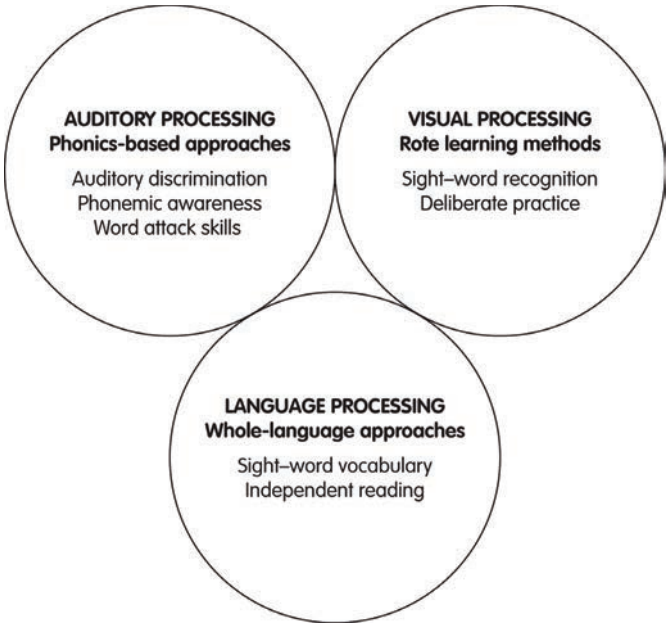
Readable English study results for accuracy reading rate

Assured by these results, we were ready to apply Readable English mark-up to real learning situations. It was time to draw together our experience in teaching reading and in developing reading technology to create a learning program for Readable English.

Chapter 12

A step-by-step approach

Successful learning programs usually combine different approaches to teaching reading, which together stimulate the critical processes needed for reading fluency.



Auditory processing refers primarily to phonemic awareness, or the ability to segment a word into its component sounds and then blend those sounds together to read the whole word. Phonemic awareness helps us to develop word attack skills, which we need to be able to read new words we've never seen before. If a person

struggles with auditory processing, they omit sounds (read 'steam' instead of 'stream'), add sounds (read 'sand' for 'sad'), switch sounds around (read 'gril' for 'girl') and even substitute sounds (read 'drag' for 'brag').

Helping students to develop their auditory processing skills is the basis of phonics-based approaches to teaching reading. But these approaches will only get a student so far. Around half the words in the English language are non-phonetic, and it isn't possible to sound them out by simply following the spelling.

That's where visual processing comes into play, usually developed through rote learning methods. We learn non-phonetic words by memorising them: after we've read a word several times, its shape, letter pattern and spelling become embedded in our long-term memory and we gain sight–word recognition. The next time we see the word, we have a memory to compare it with. We recognise the word, and retrieve its sound and meaning.

We experience visual processing when we write down a word, see straight away that it's not quite right, and then correct the misspelling. If

a person struggles with visual processing, they find it hard to memorise words, take longer to gain sight–word recognition and might never notice misspellings.

Language processing and the whole-language approach to teaching reading help students use context to understand what they're reading. Context enables us to identify words that have been misread and to self-correct, building our sight–word vocabulary and in turn helping us learn to read independently.

Say we accidentally read 'a foal is a baby house', our knowledge of the words around 'house' alerts us to the fact that the statement didn't make sense. We quickly realise the word 'house' should be 'horse' and self-correct. If a person struggles with language processing, they find it hard to comprehend passages of text and might have to reread sentences several times.

All three of these processing skills—auditory, visual and language processing—need to be functioning together effectively at the same time for readers to attain fluency. If any one process isn't well developed, it hinders the others and

makes reading difficult. The most effective reading programs are usually implemented step by step, with lots of repetition and steady advancement through increasingly complex exercises, allowing students plenty of time to integrate new skills as the course progresses.

Developing accurate auditory discrimination and phonemic awareness of English phonemes, words and sounds early will enable second language learners to free up their working memory from the task of trying to figure out what words were spoken to them, and instead, concentrate on understanding the meaning of the spoken words. It is important that these skills are taught to students through a systematic approach designed using the latest discoveries in neuroscience to make the process as efficient and reliable as possible.

First steps

The Readable English program embraces these tried-and-tested principles. It was designed to be flexible or structured to meet the needs of different students and teachers. It allows students to learn by themselves in an organic way or through a planned online program. It

can also be integrated into a classroom setting and used as a reading practice tool, allowing teachers to monitor individual progress. Whatever their pathway, students complete playful, stimulating exercises designed to build their confidence and maintain their motivation.

Our learning program kicks off with videos of Standard English letter–sound associations, which teach students the standard or most common sound that each letter of the alphabet represents. These videos help students to correct their pronunciation by mirroring mouth shape and tongue position. Games are also provided to help improve auditory discrimination and phonemic awareness, which flow into quizzes about consonant, vowel and digraph sounds.

Once these fundamental language skills have been mastered, students are gradually introduced to the most common single syllable words, and then to the three elements of Readable English mark-up: syllable breaks, silent letters and glyphs.

Readable English reveals pronunciation with three simple steps:

1. Words are broken into spoken syllables

2. Silent letters are faded out

3. Glyphs are used to show exactly what sound each character represents.

By displaying spoken syllable breaks in words, Readable English eliminates the need to learn syllabification, reducing the cognitive load for students during this early stage of the learning process. Signposting silent letters achieves a similar reduction.

Likewise, needing to remember just one sound per letter and glyph reduces the cognitive load further. Each glyph is also introduced with a playful video that reinforces the glyph's name, sound and shape to maximise memory retention.

Mia was a lively nine-year-old girl who had been diagnosed with dyslexia. She was what is called a 'spit and grunt' reader: she had to sound out every phoneme in every word. Her reading was halting and laboured, she seemed beaten down by the effort, but she was a trooper. Perhaps because Mia's parents valued reading and

were giving so much encouragement—her mother was literally a brain surgeon—she was still trying hard.

When I sat down with Mia and showed her the elements of Readable English—first the syllable breaks and silent letters, and then a few of the glyphs—I could feel her interest. She sat up, her eyes lit up. She even squealed with delight and said: 'I can do that!'

–Ann, Readable English co-founder

As well as the videos that introduce each glyph, there are other resources that can be used to teach and reinforce the glyphs. These aim to stimulate auditory, kinaesthetic (physical) and musical pathways. For each glyph there is an associated song, or jingle, as well as a body movement and yoga activity.

When students have mastered letter–sound association, they go on to learn the sounds of common syllables and words containing more than one syllable, at the same time further developing phonemic awareness and sight–word recognition.

This ongoing, step-by-step approach continually minimises cognitive load, and we've observed that many students pick up accurate word attack skills readily using Readable English. Once a student has achieved sight–word recognition, syllable breaks don't need to be highlighted and can be hidden when using Readable English learning tools.

As students gain proficiency in reading multi-syllable words, they move on to phrases, sentences and paragraphs. Progression through these stages happens only once a student has mastered the previous stage. This ensures the cognitive load of each step is manageable and the student can focus instead on comprehension.

A Kurdish refugee contacted us, wanting to learn the basics of reading and writing English as a new Australian resident. Daryan spoke English well, but had left school at the age of 10 and was illiterate in his first language as well. He had clear and achievable expectations. He told us he just wanted to start over completely and learn English like a kindergarten kid.

Daryan got anxiety when it came to reading long words, and he found the Readable English syllable breaks particularly helpful. The glyphs made it much easier for him to anticipate the sound of more complex words, as they were designed to do. In just a few hours of work together, Daryan's attitude toward reading in English completely transformed.

–Ann, Readable English co-founder

Building on foundations

Many people believe that intelligence is genetically determined. This belief is a *fixed mindset* perception that people hold about themselves and others, assuming individual intelligence and talent are things each of us are born with—and that's just the way things are. These people may not fulfil their potential because they avoid challenges, give up easily, see making an effort as a waste of time and reject useful, critical feedback.

People who do well academically and in other aspects of their lives are people who aren't

afraid of making mistakes. These people have a *growth mindset.* They understand that intelligence is developed, that the brain grows when it's learning, making us smarter. People with a growth mindset embrace challenges, persist despite setbacks and see effort as the path to mastery, learning from errors and feedback. They don't see mistakes as failures but simply as signs that there is more to be learnt.

A leading researcher in the field of motivation, Dr Carol S Dweck, PhD, recommends avoiding encouragement like, 'That's right! You're so smart.' If a teacher is always telling a student that they're right or wrong, the student comes to rely on the teacher's feedback. But if a teacher engages a student by asking how they arrived at an answer, the student develops awareness and interest in their processing skills. They develop a growth mindset. Dweck, who first defined fixed and growth mindsets, writes:

> *Yes, children love praise. And they especially love to be praised for their intelligence and talent. It really does give them a boost, a special glow—but only for the moment. The minute they hit a snag, their confidence goes*

> *out the window and their motivation hits rock bottom. If success means they're smart, then failure means they're dumb. That's the fixed mindset* [72].

People with a growth mindset embrace learning and practise what they're learning to get better at it. As a result they reach higher and higher levels of attainment. As they improve, a positive feedback loop is created that encourages them to keep learning and improving [72]. In one study, researchers found that students who understood the growth mindset put in more effort and were more engaged [73].

Rosa was a Mexican woman raising two young girls in the United States. While Rosa's spoken English served her well enough, she couldn't read or write English at all. When we started working together, she couldn't read the notes that teachers sent home with her daughters and she was too intimidated to go to parent–teacher meetings. She wanted her kids to do well at school and her children's welfare was a big motivator in learning to read English.

We kicked off with the standard sounds for each letter of the alphabet, and then looked at syllable breaks. Rosa was soon blending words and recognising words—developing phonemic awareness and sight–word recognition. She commented at one point that it was easier to know what sound a letter was going to make when there was a glyph above it than when there wasn't.

A breakthrough occurred one day when one of her daughters was really struggling with her homework, and Rosa was confident enough to write a note to the teacher about the situation. After that Rosa was no longer afraid to attend her teacher–parent conferences in person.

Relaying this story to me, it was plain to see that Rosa felt like a million bucks. She was no longer intimidated by the English language, and her whole family had benefited from her efforts. Needless to say, it was extremely satisfying to be a part of this breakthrough.

–Ann, Readable English co-founder

Science has shown time and time again that our brains can change, that is, they have *plasticity.* This means that intelligence can be shaped and the brain grows from experience. If we spend time learning, the brain reprograms itself to become better at learning, and intelligence and ability continually develop. Researchers have found that this is a biological process involving myelin, a substance that encases parts of certain nerve fibres and is essential for proper functioning of the nervous system. In scientific terms: 'Experience influences myelin formation and the resulting myelin supports learning and improvement of skills' [74].

Research also shows that the innate abilities we're born with don't determine our eventual skill sets; these are in fact determined by how consistently and deliberately we work to improve our performance. The key here is that the student engages in deliberate practice, which means engaging in programmed activity with the specific goal of improving performance.

Deliberate practice includes four essential components: tasks that have been designed for the current skill level, based on the student's

pre-existing knowledge; immediate feedback on performance for efficient learning; repetition of appropriate tasks; and motivation and the willingness to make an effort to improve performance [75].

Independent reading practice

Likewise, studies have shown that independent reading practice is the key to building vocabulary, fluency, comprehension, writing and higher-order thinking skills such as grasping concepts, critical analysis and drawing conclusions [76].

The OECD Programme for International Student Achievement did a study involving 174,000 students aged 15 across 32 countries and found that time spent reading books is the best single predictor of academic achievement, even more significant than socio-economic factors or ethnicity [77].

Cumulative benefits of extended reading practice become clear with some simple maths. Someone who does 20 minutes of reading practice a day will be exposed to 1,800,000 words over the course of primary school, versus someone

reading for five minutes a day, who will be exposed to just 282,000 words. This equates to having spent 60 whole school days reading, versus 12 school days for those who read only five minutes a day [78].

As with any other skill, reading develops through practice, and the Readable English program supports students to practise reading independently. It incorporates videos and games to help students hone their basic literacy skills, including letter–sound association, auditory discrimination and phonemic awareness. Skill-building games allow students to practise by themselves and only allow students to move onto harder tasks once they have mastered the foundation skills.

Students also receive immediate feedback on their performance via results to quizzes and comprehension questions, and so on. This helps them to stay motivated to do enough practice to develop and keep on developing reading fluency. Sufficient reading passages and comprehension tasks are provided at varying levels of difficulty, designed to enable students

to practise for a minimum of 20 minutes a day.

Our Readable English eReader facilitates ongoing reading practice. It allows students to control the way text is displayed (turning the three elements of Readable English mark-up—syllable breaks, silent letters and glyphs—on and off, as they wish), as well as hear the sound of any word or passage and access definitions easily, so that they can practise reading independently at their own pace. Students can also import material, allowing them to practise reading what they really want to read. Teachers are able to monitor how much time students are spending on practising.

Daily reading practice is ideal for the brain to reprogram itself to learn to read. When we can read independently, we're empowered to learn what we want to learn.

Personal motivation

English is a hard language to learn to read, even for those who excel at reading it. It takes a huge amount of effort, intentional practice and perseverance to master the thousands of

spelling and pronunciation exceptions in common English words.

Struggling readers usually avoid reading tasks. They often think that their reading difficulties are due to a personal failing, and feel humiliated and frustrated when they stumble awkwardly through passages. Some struggling readers believe they're stupid and many believe they will never read.

For this reason, the Readable English program starts by explaining the growth mindset and the importance of practice. It also explains why the English language is so hard for *everyone* to learn and how Readable English makes reading easier for us all. This introduction is designed to convince students that any difficulties they face with reading aren't their fault: the problems are the fault of the language, which Readable English 'fixes'. Once students understand this, their negative beliefs are challenged and they become empowered to make the effort to learn.

Jaden was the naughty kid in class, reluctant to participate and always testing boundaries. He was also struggling with reading. When we started delivering two

half hours of teaching a week during our pilot study, Jaden would stroll in late—well after all the other kids had come into the classroom—and would muck around throughout the lessons. His first challenge in the first lesson was to say, 'I hate the syllable breaks.' So we turned them off in the Readable English eReader. And that's the way we rolled for a while.

Little by little, Jaden engaged with Readable English and began making progress with his reading. Toward the end of the eight-week study, the change in Jaden was remarkable: he was the first one to arrive at our Readable English lessons. He even herded the other kids along. Jaden was grasping reading and feeling a sense of personal achievement in the classroom, and he was finally seen by others to be capable at something too. He thrived on that. His improvement in reading spilled over into other aspects of study and we saw his confidence blossom.

–Anna Tuyl, Readable English researcher

The Readable English program has been designed to provide students with lessons that challenge them appropriately, which means that if they make a reasonable effort they're likely to succeed. Games have long been recognised to improve learning outcomes [31], providing additional stimulation to help inspire engagement and maintain motivation, and each Readable English lesson also includes game components. Being able to consistently master and enjoy mastering new information helps to alleviate negative beliefs students might have about their abilities, helping them to relax. As students relax, their stress levels usually drop, which in turn increases their capacity to learn.

Our own research has shown that Readable English helps students to learn twice as fast—for all students, not just those who were struggling. Imagine not having to spend years learning the multitude of rules needed to decode words and the thousands of exceptions that go with them. Imagine how much more time would be available for students and teachers to get on with learning and teaching about the world around us.

We believe that we can make it easier for everyone to learn to read by ‘fixing’ the English language. Ultimately, our greatest ambition for Readable English is to end the damaging cycle of illiteracy and help everyone to read, to learn and to explore their true potential.

Appendix 1

English phonemes

All 42 units of sound, or phonemes, heard in the English language are detailed in the table below. A phoneme can be represented by a single letter and by a pair of letters, or *digraph.*

Phoneme	IPA	Standard spelling	Alternative spellings
/a/	æ	**a**pple	
/e/	ɛ	**e**gg	s**a**id, b**u**ry
/ih/	ɪ	**i**t	vill**a**ge, pr**e**tty, w**o**men, b**u**sy, g**y**m
/o/	ɑ or ɔ	**o**ff	w**a**tch, **e**ncore
/uh/	ʌ (stressed) and/or ə (unstressed)	**u**p	**a**lone, env**e**lope, g**i**raffe, s**o**n, s**y**ringe
/ay/	eɪ	**a**te	**e**ight
/ee/	i	t**e**a	tax**i,** happ**y**
/i/	aɪ	h**i**de	fl**y**
/oh/	oʊ	**o**at	s**e**w, plate**a**u
/yoo/	ju	**u**se	f**e**w
/oo/	u	t**o**	gr**e**w, fl**u**te
/*oo*/	ʊ	b**oo**k	p**u**t

Phoneme	IPA	Standard spelling	Alternative spellings
/ou/	aʊ	h**ou**se	n**ow**
/oy/	ɔɪ	b**oy**	c**oi**n
/ar/	ɑr	c**ar**	
/or/	ɔr	f**or**	w**ar**m
/ur/	ɜr	f**ur**	backw**ar**d, h**er**, s**ir**, w**or**d
/b/	b	**b**ob	
/k/	k	**k**ick	**c**at, anti**q**ue
/d/	d	**d**og	
/f/	f	**f**at	**ph**one, tou**g**h
/g/	g	**g**o	
/h/	h	**h**at	
/j/	dʒ	**j**ump	**g**el, sol**d**ier
/l/	l	**l**ove	
/m/	m	**m**oney	
/n/	n	**n**ine	
/p/	p	**p**ig	
/r/	r	**r**ose	
/s/	s	**s**ing	**c**ent
/t/	t	**t**en	skippe**d**
/v/	v	**v**an	
/w/	w	**w**e	q**u**een, **o**ne

Phoneme	IPA	Standard spelling	Alternative spellings
/x/	ks	si**x**	
/y/	j	**y**es	
/z/	z	**z**oo	no**s**e, **x**ylophone
/ch/	tʃ	**ch**eese	**c**ello, **q**uestion
/sh/	ʃ	**sh**e	o**c**ean, **s**ure, na**t**ion
/ng/	ŋ	lo**ng**	
/th/	θ	**th**ree	
/*th*/	ð	**th**en	
/zh/	ʒ	gara**g**e	vi**s**ion, sei**z**ure

Appendix 2

Readable English glyphs

All 21 glyphs used in the American English version of Readable English appear in the table below.

Glyph Name	Icon	RE Glyph	Sound	Letters	Example Word
Aussie Oswald		o	/o/	å ẻ	swån
Dome		∩	/oh/	â ê ô	rôad
Ed Says		<	/e/	ắ ứ	hắir
Fun Enough		=	/f/	ḡ	laugh
Happy Face		·/·	/ee/	ë́ ḯ ÿ́	tëa
Hey April		/	/ey/	á é	páint
Hook		~	/oo/	õ ũ	fõot
I Spy		-	/ahy/	ī ȳ	eȳe
Infinite		∞	/i/	ä̈ ë̈ ö̈ ü̈ ÿ̈	ban·däge
J Dot		•	/j/	ġ ḋ	bridge

Glyph Name	Icon	RE Glyph	Sound	Letters	Example Word
Noisy Tail		◟	/z/	ş	roşe
Say Cheese		⊳	/ch/	c̆ t̆	c̆el·lo
Sharp Hat		^	/sh/	ĉ ŝ t̂	lo·t̂ion
Silly C		◞	/s/	ç	façe
T Crossed D		‾	/t/	d̄	baked̄
That Noisy TH		t͟h	/*th*/	t͟h	fea·t͟her
Treasure Chest		⌐	/zh/	s̄ ḡ z̄	tel·e·vi·s̄ion
Two Moons		••	/oo/	ë ö ü	shöe
Unicorn		ˈ	/yoo/	e̛ ư	cưbe
Upper Cup		ᵕ	/uh/	ă ĕ ĭ ŏ ŭ	um·brel·lă
Wonder One		″	/w/	ű ő	sqűare

Appendix 3

Readable English sample text

Our mis·sîŏn iş ă sim·ple őne: tö im·pröve litĕrăçў bў inspīring ă löve of lĕarning. And bĕcåuşe rĕading iş thĕ májŏr foundátîŏnal skill for môst lĕarning, máking lĕarning tö rĕad bôth ĕaşў and enjoyăble iş thĕ kĕy tö ăccomplishing our gôal.

Wĕ bĕlĭĕve that lĕarning tö rĕad shoũld bĕ bôth intüitive and stress frĕe, and báseđ on sŏmething ŏthĕr than just memŏrīşátîŏn and rôte activitiĕş that forçe thĕ rĕaděr tö lĕarn and ădapt tö ă sĕriĕş of irregůlaritiĕş that cŏmprīşe thĕ Ĕnglish lángűåġe.

That's whў wĕ've dĕvelŏpeđ ă sўstĕm that rĕpláçeş hundredş of rüleş with 22 ĕaşў and memŏrăble viſůăl cůeş that can tĕach sŏmeőne tö bĕgin tö rĕad Ĕnglish in ă mattĕr of wĕeks vĕrsuş yĕarş.

Appendix 4

Readable English learning tools

Readable English offers a range of learning tools, including a website, an eReader and several apps, and additional resources such as offline teaching materials.

Lessons

The lessons section of the website is where students can quickly and easily learn Readable English. It includes:

- twelve 15-minute lessons for learning Readable English mark-up and the sounds of English with videos, skill-building activities, reading practice and quizzes
- lessons for extra practice and additional content
- fun, catchy videos to learn the Readable English glyphs
- interactive reference charts for review of letter and glyph sounds

- mouth-movement videos, demonstrating how to pronounce the individual phonemes in English and example words.

Skill builders

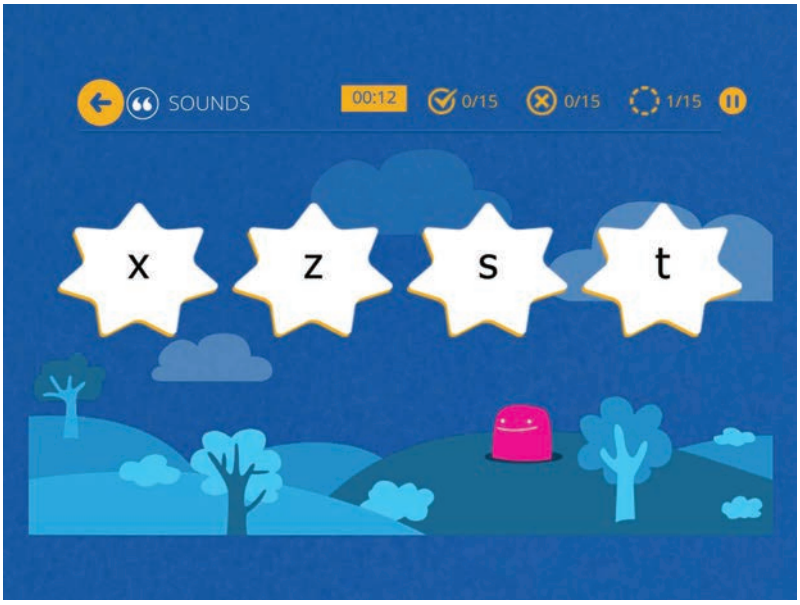
Interactive games in the skill builders section of the website have been designed to teach and develop specific reading and language skills. The Missing Word skill builder is available on the website, and Choose or Lose and What's Changed? are available as apps.

Choose or Lose

The goal of this game is for the student to choose the correct letter, syllable or word for the sound they hear. After hearing the sound,

students see four options floating down the screen and have to quickly identify the correct answer. The game develops:

- letter–sound association for all the sounds in English
- sound–symbol association for all the Readable English glyphs
- auditory discrimination of the sounds in English
- sight recognition of the 1,000 most common syllables and words in English



What's Changed?

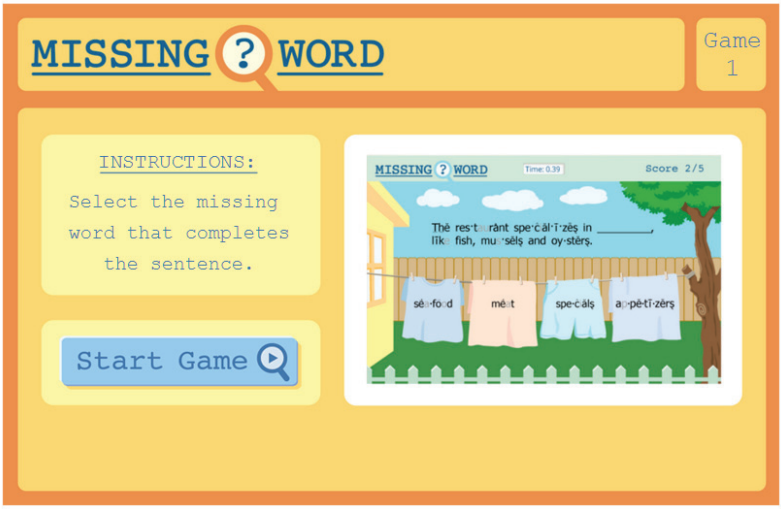
Students see the letters of a word on tiles and click to hear the sound of that word. They then click to hear the audio of a new word. The goal of the game is to identify what changed between the two words. The types of possible changes include: identifying the sound that changed, substituting a new letter for the sound that changed, specifying the letter for a sound that was added or omitted, or switching two letters for sounds that were switched. The game develops:

- auditory discrimination (ability to discern vowel sounds and blended sounds)
- phonemic awareness (ability to discern the sounds and sequence of sounds in a word)
- segmenting and blending (ability to combine sounds for whole-word reading)

Missing Word

Students read a sentence with a missing word and have to choose the correct word from four options to complete the sentence. The game develops:

- reading comprehension
- vocabulary
- word attack skills (ability to make sense of a new word in context)
- higher order thinking skills (ability to infer new information from a given context)
- knowledge of a multitude of topics by playing the various themed categories included in the game.



Reading practice

This section of the website is where students can begin to practise independent reading. Students can read prepared materials in the Reading Practice Module or convert their own documents into Readable English with the eReader.

Reading Practice Module

Reading passages with comprehension questions are offered in the Reading Practice Module, levelled by reading age.

- Level 1: reading age of 6
- Level 2: reading age of 7
- Level 3: reading age of 8–9
- Level 4: reading age of 10

- Level 5: reading age of 11–12
- Level 6: reading age of 13+

eReader and eBookstore

Students can buy books in the bookstore or convert their own documents to read in the eReader. The eReader offers a full range of features, including the ability to turn individual elements of Readable English mark-up on and off. Documents in the eReader can also be converted to PDF for printing and reading offline.

Customisable features include:

- font size
- word spacing

- line spacing
- line length (short lines)
- paragraph indents
- font colour.

Additional tools include:

- text-to-speech with synchronised highlighting
- word definition and translation
- audio of full words and by syllable
- star words to add to favourites list.

Readable English features include:

- showing words di·vi·ded in·to syl·la·bles
- fading out silent letters
- adding visual cues, or glyphs, to letters to indicate how they're pronounced when they don't represent their standard sounds
- being able to turn Readable English on and off for specific words and across entire documents.

Readers can:

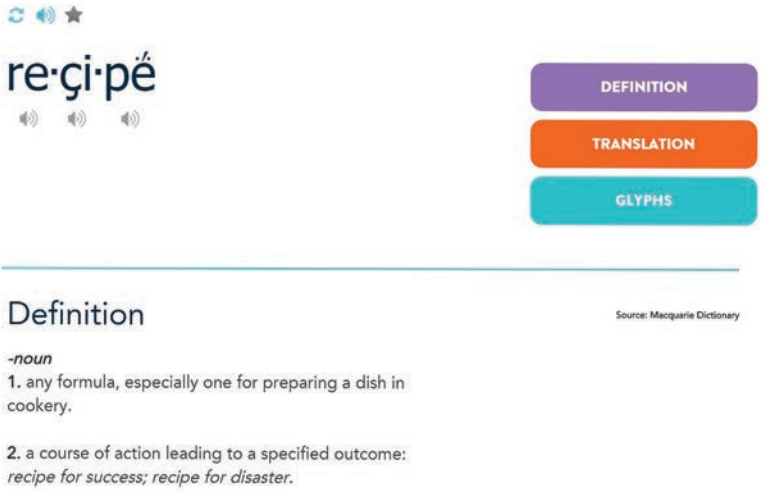
- upload, edit and save their own documents
- convert personal documents into Readable English
- save documents as a PDF to be printed out

- share documents with other readers
- read provided practice materials (word lists, sentences, practice passages)
- buy books in Readable English from the eBookstore.

Dictionary

The Readable English dictionary allows students to look up and learn words via the website or app. Users can look up words in Readable English and can learn new words with Word of the Day. For each word users can:

- see the definition
- see the translation in different languages
- hear audio of the whole word or by syllable
- practise pronouncing the word and compare their pronunciation to a standard recording
- toggle the word between Readable English and Standard English
- save to a star words list to practise later
- click on the glyph chart to hear the sound of a glyph, see the glyph video or watch the mouth movement video.



Printable teaching resources

The section of the website includes printable materials for teaching Readable English offline. Resources include:

- a teaching guide, which explains how to teach Readable English and includes scripted lesson plans
- recordings and musical scores for teaching the glyph songs
- a workbook
- phoneme flashcards
- quizzes
- a progress chart for tracking a student's progress through the lessons

- games and activities, including board games and Readable English versions of Naughts and Crosses, Bingo, Heads or Tails and so on.

Bulk conversion for integrating Readable English into existing courses

Readable English can be integrated into existing courses through the bulk conversion of course materials. Documents can be sent to Readable English administration for conversion into digital and/or portable document formats (PDF). The documents can be printed locally or loaded electronically into students' eReaders.

Once course materials have been converted into Readable English, students can practise independently, learn the course content more efficiently as well as improve their English skills while learning other subjects.

Glossary

auditory discrimination– ability to accurately discern the sounds (phonemes) of a language

biologically primary learning– organic learning that does not need to be specifically taught and serves an evolutionary function such as learning a first language

biologically secondary learning– academic learning that needs to be specifically taught

blending– combining phonemes to sound out a whole word

Bouma shape– overall outline or shape of a word created by its collection of letters

cognitive limit– maximum amount of information we can hold at a given moment in our working memory

cognitive load– amount of working memory capacity needed to perform a task

schema– highly linked conceptual framework of ideas, mental objects and experiences (for example, a person's schema for the word 'train'

may include information about a train's physical shape, the spelling of the word and so on)

digraph– pair of letters that represent a single phoneme

fixed mindset– belief that intelligence is genetically determined

functional illiteracy– insufficient reading and writing skills to complete everyday tasks

glyph– symbol or visual cue that indicates the pronunciation of a letter within a word

growth mindset– belief that intelligence grows through learning and practice

homograph– word spelt the same way as another but pronounced differently (such as 'wind' for a breeze and a movement)

homophone– word spelt differently from another but pronounced the same way (such as 'bow' and 'bough')

loan word– word adopted by a language from another language

morpheme– unit of meaning in a language (for example, 'ed' in 'wait***ed***' explains that this form of the word 'wait' is past tense)

morphophonemic– representing both units of meaning and units of sound

non-phonetic– spelling that does not correspond with pronunciation

orthography– manner of spelling in a language

phoneme– unit of sound usually associated with a letter or digraph

phonemic awareness– ability to discern the sounds and the sequence of sounds in a word

phonetic– spelling that corresponds with pronunciation

plasticity– capacity of the brain to change through experience, learning and practice

schwa– neutral vowel sound typically occurring in unstressed syllables in words

segmenting– breaking a word into its component phonemes

sight-word recognition– ability to instantly recognise a word from its Bouma shape and letter pattern

syllabification– the way words are broken into syllables and are formed from syllables

syllable– segment of sound or speech

unvoiced consonant– sound that doesn't vibrate the vocal chords

voiced consonant– sound that vibrates the vocal chords

word attack– ability to learn and apply the rules (such as syllabification) that enable a reader to decode the sound of a written word

word poverty– lack of exposure to spoken and written vocabulary during childhood

working memory– the part of short-term memory concerned with current contents of a person's consciousness

Support for Readable English

First, each word is spelt in its conventional manner so expert readers have no difficulty reading it. Second, letters that are not pronounced are visible but greyed out and each letter that has multiple pronunciations has a mark above it to indicate the particular pronunciation required for that word. The consequences are that written English becomes entirely phonetic but still allows readers to learn the current, non-phonetic English spelling.

Those familiar with cognitive load theory, with its emphasis on reducing working memory load during learning, will immediately see the benefits of the system. Preliminary data indicate that learning to read Readable English not only is easier and faster than learning conventional English, as might be expected, but also results in easier and faster learning of conventional English. Based on theory and data, I can recommend Readable English in the strongest possible terms. It has the potential to transform the teaching of English.

Emeritus Professor John Sweller
School of Education, University of NSW, Australia

I strongly support the scientific, evidence-based approach adopted by Fitts and Stephen, and commend this project to the education community.

Dr John H O'Neill, MD FRACP
Consultant Neurologist, Australia

When my son Dereck was introduced to Readable English [by Ann Fitts at The Reading Clinic], he was at a second grade reading level during the summer before fourth grade. When he started school in the fall, Dereck was assessed at a fourth grade reading level. Usually children regress during the summer months, but Dereck increased his reading skills in the summer from working with Readable English.

Now he is at the average school district level and understands instructions better. He has also improved in every subject at school. He went from needing someone helping him all the time to little amounts of help in his schoolwork. He does better when he uses Readable English compared to when he does not use it. I believe that Readable English and working with Ann has improved the opportunities and possibilities he will have in his life. Thank you.

Annette
Parent, United States

With the glyphs, I can improve my pronunciation and I'm visualising them in my head when I'm reading a text.

Baptiste
English language learner (18 years), Belgium

My son really struggled with English and subjects that involved having to read significant amounts. Readable English has made a world of difference: he is now confident to read aloud and understands the meanings of words as well.

Since he's been working [with Readable English], he's been happier to pick up books and read. He hasn't struggled as much doing his assessment tasks, and there's less aggression when my husband and I ask him to go and do his homework. He still has the usual teenage attitude about doing homework, but there's not as much anxiety involved with doing his homework as there was before.

I have caught my son reading books, which was something he wouldn't do before, and he's even started wanting to buy magazines that he can read.

Melita
Parent, Australia

As an American living in Asia, I have noticed that there is a huge demand for English language skills in Asia. I think that Readable English is a breakthrough in English language teaching, and has enormous potential in Asia, especially in the markets that I am familiar with: ESL teachers, English language colleges and private schools.

Lucinda
Special education teacher, Malaysia

My students really loved going on the computers to play the games and activities. Their reading accuracy and comprehension is better than before. They are more confident and willing to learn. I would recommend Readable English to parents of children who are struggling with reading.

Chris
Teacher, Australia

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