

Deregulation of the publishing of Accessible Editions will increase competition, reducing the cost of accessible editions, increasing the number and type of accessible formats available, and the availability of accessible editions.

1. Cost of illiteracy. Poor literacy significantly increases education and health costs, and significantly reduces national productivity. The cost of poor literacy to the Australian economy has been estimated to exceed AUD\$18 billion as well as high social and personal costs. Details and references about the costs of poor literacy are set out in detail in the attachments: "Redefining Reading" and "The Silent Epidemic".
2. Lack of access to accessible information is a major barrier to literacy. It is particularly important that all students, whether in primary, secondary or tertiary study, have access to text books in the format that they need at the same time as the original publication.
3. Copyright exemptions for accessible editions. There are special exemptions for the provision of accessible editions in the Copyright Act. With the Treaty of Marrakesh, the definition of impairment in the Copyright Act will be broadened to include 'perceptual disability', which includes dyslexia and similar causes of illiteracy. Estimates of people with significant visual impairments are around 2% of the population (depending on the severity of the visual impairment). Estimates of the number of people affected by dyslexia and related issues range from 10-15% and some recent reports suggest that this might be higher. See attachments for details.
4. Types of accessible formats include:
  - a. Large print – one in 7 people over 50 is likely to be afflicted by Macular Degeneration and will require large print (16 point) or super-large print (20+ point)
  - b. DAISY (Digital Audio Information System) – audio with navigation as in a book, allowing readers to go directly to passages without having to listen to the file. There are two main types of DAISY files:
    - i. Synthesized voice DAISY files that can be produced quickly and at low cost to produce with high navigation functionality, as well as speed to market (when produced through proprietary XML), which is critically important for students.
    - ii. Human narrated DAISY files that are expensive and slow to produce, and often with limited navigation. Human narration is preferred by some visually impaired people who listen to predominately fiction books for pleasure. Students generally require non-fiction books on their courses.
  - c. Braille
  - d. Readable English is a new accessible format initially designed for people with reading issues like dyslexia, but which appears to help all readers, including some people with difficulties that appear related to autism.
  - e. Design your own print format – readers can design formats that suit their particular reading style. One group of formats are intended for people with Macular Degeneration who need to read with their parafoveal vision.

5. Technological developments in the provision of accessible formats:
  - a. Technology has been developed to make accessible format publishing dramatically more efficient by allowing a book, or document, to be converted into proprietary XML, from which multiple accessible formats can be generated automatically.
  - b. Individually formatted books can now be economically printed on demand (POD) allowing users to determine the format that meets their individual need.
  - c. A new format for people with language based reading difficulties called Readable English has been developed which will cover probably over 90% of the people with reading difficulties like dyslexia and with a significant percentage of people with vision impairment, as the reader can adjust the font to any size and format
  - d. Accessibility eReaders are being developed to allow readers to read accessible editions on smart phones and tablets; this is designed to provide accessibility to many more people, who may not have the financial ability to purchase PCs
6. The current model (Charity Model) for the provision of accessible editions is via not-for-profits (NFPs). Usually, the NFP creates the accessible edition at their own cost – they are often funded by government – and provides it free to the person requiring the accessible edition. Relatively little information is available in accessible editions, and it can take weeks or even months to deliver a new accessible edition if human narration is required. Organizations such as Vision Australia focus on services for vision impairment, using human narration for the majority of recordings. There is often little support for people with reading issues like dyslexia.
7. In contrast, the commercial accessible publishing model works closely within the mainstream publishing industry – the conversion cost is redeemed from sales, and publishers receive a royalty for their authors from the nett proceeds of the sale.
8. The benefits of the commercial model are:
  - a. Students are able to have accessible editions at the same time as everyone else – there is little point in getting an accessible edition just before the exam
  - b. Publishers own the PDF book files – converting these files into XML reduces the costs for all accessible formats
  - c. Over time, some publishers may use accessible publishing systems to generate eBook editions, which will be a highly efficient system
  - d. Creation of a Publisher Archive for titles is now commercially feasible, and will allow a publisher to control their own electronic files, and to supply these files for conversion as the need arises in an efficient and cost effective process.
  - e. The commercial model will require the least amount of government funding.
9. APS submits that the Harper Review should support the commercial model of accessible publishing by
  - a. Making it easier for publishers to participate by removing, or simplifying, administrative hurdles for publishers. For publishers, the most significant cost, in both time and money, is the need to review contracts with authors and agents, and to negotiate the new definition of accessible rights. As many books will sell only a small number of accessible editions, we submit that this administration cost should be removed by creating a statutory licence to allow publishers to licence accessible rights without the need to refer to past contracts or to negotiate further rights from author or agent.
  - b. Providing statutory licences to schools, universities, and accessible format providers to create accessible editions by scanning print editions and creating new accessible

editions from the scanned images, with minimal administration costs where these files are not readily available from Australian publishers

- c. Allowing private companies to compete for government funding for the provision of accessible formats on the same terms as not-for-profits so that the most efficient can get the business and deliver to the consumer in a cost effective and timely manner
- d. Allowing the same copyright exemptions for profit companies as for not-for-profit companies

10. Parallel importing may restrict the number of books that can be printed in Australia. Low cost conversion to accessible formats is dependent on the provision of the PDF by the local Publisher/distributor. When a book is imported, publishers and distributors in Australia do not hold the print files. The consequence of any change to the parallel importation rules will be increased accessible publishing expense, because of the very high cost to capture the information of overseas publications by scanning it, and then converting the image to accessible formats. If the changes to the parallel import rules are not to impact negatively on the provision of accessible formats to people needing them, the government will need to increase funding, possibly under the NDIS, to cover the additional costs to scan a book and then convert the scanned image to an accessible edition. We submit this funding will have a high ROI (return on investment) given the large costs of poor literacy.

# Introducing READABLE ENGLISH™

(November 2014)





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## 1. A Solution for Illiteracy

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This short book is about illiteracy - its causes and costs, to the economy, society and individual lives. It is also about Readable English™, which we believe has a major contribution to make towards eradicating, or “curing”, illiteracy. In monetary terms, the cost of illiteracy is staggering. Estimates for Australia are \$18 billion per year; for the United States, \$300 billion; for the world as a whole, over \$1 trillion [1]. In personal terms, the cost is much greater. Those who live with illiteracy have poorer health, limited employment prospects and higher rates of incarceration. In short, they are much less likely to live long, happy, prosperous lives. Sadly, so are their children.

Our extensive research has concluded that one of the major causes of poor English literacy is its erratic spelling. Because of this, English words are very often not spelt as they are pronounced. Some words follow spelling rules, however many do not, leading to thousands of spelling exceptions that must be learned. Only once these inconsistencies and exceptions are learned can readers decode English words - this is a huge barrier for many people. We need a method to make it quick and easy to decode the sound of English words, so that readers can start practising reading as soon as possible.

We have found that the only way to achieve this is to embed a pronunciation guide into English words that does not change the spelling. We have called this pronunciation guide "Readable English" and it enables readers to easily sound out words, character by character. Readable English has effectively converted English into a phonetic language, allowing readers to sound out words without complex and inconsistent spelling rules. Readable English fast tracks the development of an association between the sound and shape of each word, which is the pathway to reading fluency.

Our goal is to speed up and improve English language proficiency for everyone - from emerging native speaking readers (with and without reading difficulties) to second language learners. Readable English can also help proficient readers by clarifying pronunciation of new words and those with individualised, unpredictable pronunciation (e.g. names).

Embedding a phonetic pronunciation guide into English words meant marking up an entire dictionary into Readable English. It was a monumental task, taking years to complete. We first developed a simple and intuitive way to represent sounds, then refined the scheme over 10 times. Following this, we developed new technologies to mark up large numbers of words. The Readable English system now makes over 99.9% of words completely phonetic, without changing the spelling. Readable English is the only phonetic version of English for which a comprehensive online educational and publishing system has been developed, involving:

- games and other exercises: these enable students to learn the sounds of characters, glyphs, syllables, words and other skills such as phonemic awareness.
- online lessons: assisting students learn Readable English and read English
- a completely phonetic English dictionary: using the Macquarie Dictionary, we have marked up almost every non phonetic word using Readable English, so that students can quickly and intuitively decode the sounds of all common words. For the tiny

proportion of words that can't be marked up, an alternative phonetic spelling is provided

- an eReader: this allows students to import and read documents into Readable English, controlling the way words are displayed. It also allows readers to look up the meaning and hear the pronunciation of any word.
- a bookstore: readers can buy popular books as eBooks in Readable English.
- print books: we have adapted the technology from ReadHowYouWant, a sister company, making it possible to create individual print on demand Readable English books using the reader's format preferences.

This book outlines the research and development behind Readable English and how it inevitably makes learning the language very much easier, and has the potential to revolutionise language acquisition. More information about the Readable English technology and tools is set out in the Appendix.

## The Co-Founders

### Chris Stephen

My obsession with literacy started when my older sister, Alexandra, developed Multiple Sclerosis. Alexandra had taught me how to read and was herself an avid bookworm. As her illness developed, she lost the ability to easily read sentences and could only manage individual words. I was determined to work out why she couldn't read easily, and eventually discovered she had an eye-tracking problem. Because of this, she had to use a huge amount of mental energy to keep words in the correct order and didn't have enough left for the meaning of words and phrases.

It became my mission to help her read, by reducing the mental effort, or *cognitive load*, required to keep words in the right order. We created a large print format that Alexandra could read, and she was once again able to do one of the very few activities she loved. Seeing the impact of this on Alexandra made me understand how important reading is and to not take it for granted. I was deeply motivated to try to help others to read as well. Early into this decade-long project, fate intervened. I went to a meditation retreat and met Ann Fitts, a Reading Specialist working in San Francisco. Ann and I shared a passion to help people who were struggling to read. This unlikely meeting turned into a collaboration and then a life partnership.

### Ann Fitts

I got interested in reading just out of university when I was hired as a summer tutor teaching reading using a specialised multi-sensory program. We worked one-to-one with students with learning disorders like dyslexia and I fell in love with the process. In fact, I felt I had found my niche in life. It wasn't until later that I made the connection that three out of four of my older brothers struggled with reading and one had difficulties his entire life because of his learning disorder. I only wish that my brothers had been able to get the help they needed. There is nothing as satisfying as helping others to develop this absolutely crucial life skill. There is that moment when you see students 'get it' - and their life is changed forever. This profound



satisfaction led me to co-found The Reading Clinic in San Francisco in 1997. We specialised in customised, one-to-one programs that assessed and addressed the needs of individuals with reading difficulties. Our intensive programs stimulated visual, auditory, and kinaesthetic pathways, requiring a commitment of up to 120 hours. The program 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 the Program Director.

Despite these reading gains, I was often frustrated that many people couldn't access the program, due to the expense of individual sessions and the heavy time commitment. Meeting Chris, who was creating different formats of books for people with visual problems, gave me the inspiration to try an entirely different approach to teaching reading. I thought that we could adapt Chris' technology to help people who were struggling with reading. I had worked tirelessly utilising the numerous reading programs available to meet the varied needs of individual students. However, I realised that it might be more effective to address the common denominator to all of my students' difficulties - the English language with its erratic spelling is particularly hard to learn. So, we decided to tackle English instead. It was the beginning of a fruitful collaboration both at work and in our personal lives.

## ReadHowYouWant

The result of a decade's research and development, ReadHowYouWant has developed accessible publishing technology that allows a book PDF to be quickly and accurately converted to a format called 'XML'. A large number of accessible formats can be automatically generated from XML files, including Braille, DAISY (audio with navigation), different font sizes, and reader designed formats. This technology has enabled Alexandra, and thousands of others, to read with ease. ReadHowYouWant provides around 30,000 publications, which are printed on demand after a book has been purchased.



## 2. Literacy

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The Organisation for Economic Co-operation 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 [2].*

Literacy is a right. It impacts on the economic prosperity and health outcomes of individuals as well as nations. It improves equality for women, who enjoy greater reproductive freedom, lower infant mortality, and are more active participants in their communities [3].

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. Even manual jobs require the ability to read and write.

Illiteracy affects at least one in five people worldwide and costs the global economy more than **USD \$1 trillion dollars** each year [4].

Research by UNESCO calculated that the economic impact of illiteracy is greatest in developed countries, at 2% of GDP. This equates to around USD \$18 billion in Australia and USD \$300 billion in the United States of America [4]. Poor literacy is thought to put a 1.2% dent in the GDP of emerging economies and 0.5% in developing countries [5].

Many people are aware of the high illiteracy rates in developing countries, which is partly due to lack of infrastructure, limited resources and civil unrest. However, many are unaware of the silent epidemic of *functional illiteracy* in English speaking countries.

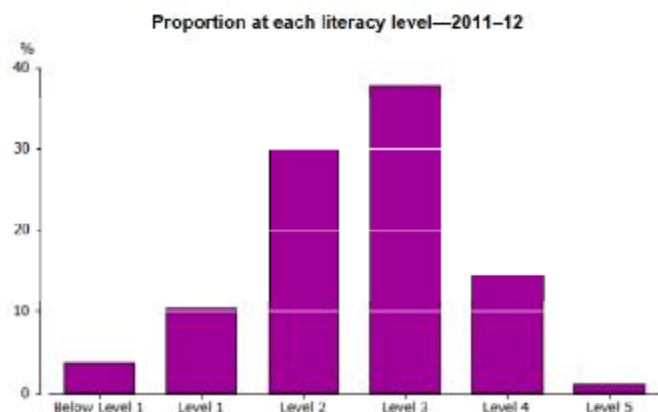
*A person is functionally illiterate who cannot engage in all those activities in which literacy is required for effective functioning of his group and community and also for enabling him to continue to use reading, writing and calculation for his own and the community's development [6].*

Those who with functional illiteracy may have basic reading, writing and numeracy skills, but these skills are insufficient for everyday tasks [4] such as:

- Reading a nutritional label on a food product
- Filling out a job application
- Reading and responding to correspondence in the workplace
- Filling out a home loan application
- Comparing the cost of two items to determine which offers the best value

In 2011/12, OECD countries participated in a coordinated study into prose, document and quantitative literacy. The results were shocking – almost half (44%) of Australians surveyed were classified as having insufficient literacy required for 'coping with the demands of modern life and work [7]. This figure includes 620,000 people, or 3.7%, with minimal word recognition skills (below Level 1), 1.7 million, or 10% who have only a basic understanding of sentences (Level 1) and 5 million (30%) with more developed skills that were still considered insufficient

for modern life (Level 2). Only those scoring at Level 3 and above had sufficient level of English to handle the demands of everyday transactions and life. See the chart below:

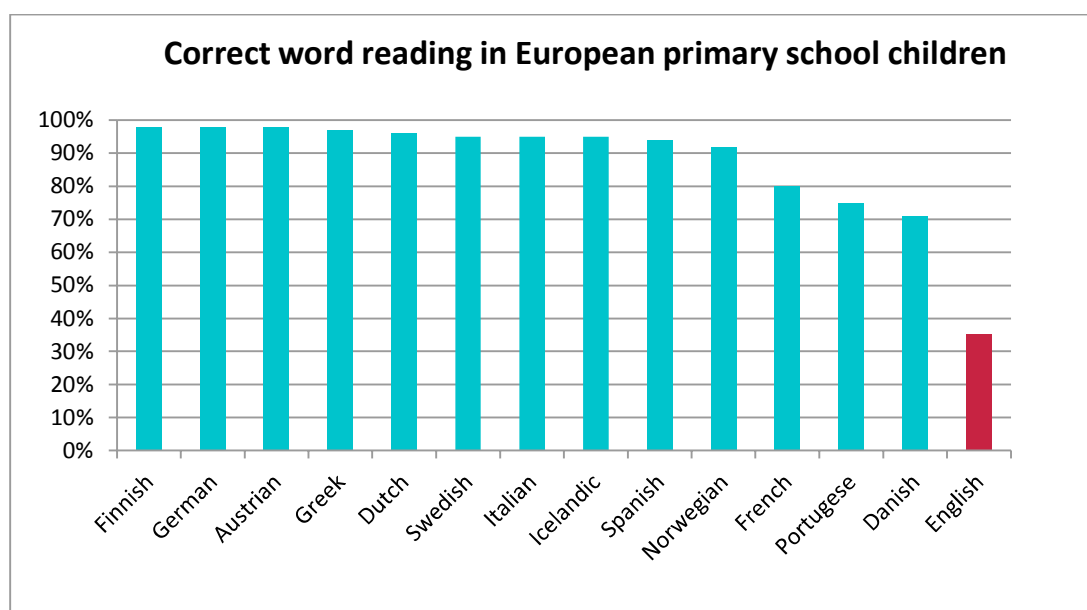


*Literacy levels of Australians*  
(ABS/OECD, 2013)

Although functional illiteracy is more common amongst older Australians, young people are still at risk. The recent Gonski Review in Australia reported that one in seven 15 year olds are currently at risk of leaving school without acquiring basic literacy skills [8].

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 for illiteracy as the highly erratic spelling system of the English language [9]. English is difficult to learn because a large proportion of words aren't spelt phonetically, so their spelling and pronunciation is unpredictable. A European study in 2003 found that after the first year of instruction, English children could only read 30-40% of words correctly - compared to 70%-100% for all other languages tested. The results of the study are reproduced below.



Adapted from Seymour (2004), p. 309 [10]

## 3. The Cost of Illiteracy

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### Health

Illiteracy can have a major negative impact on a person's health. The stigma of illiteracy often inhibits disclosure to health care professionals [11], and can lead to avoidance of health care services, where paperwork may be involved [12]. Poor literacy can make it difficult to read medical instructions and understand health promotion information. It is not surprising that patients with low literacy have been found to be 1.5 to 3 times more likely to experience a poor health outcome [13].

Health literacy is often particularly low, because of the combination of skills required. Health literacy involves complementary skills including prose and document literacy, numeracy, and problem solving skills. An ABS study in 2006 found that almost 60% of respondents didn't have adequate health literacy to understand the instructions on a bottle of medicine [14]. As a result, these people may respond poorly to health education, be less able to manage chronic illnesses and consequently spend more money on health care [15].

Illiteracy may increase the risk of developing Alzheimer's disease. Studies have shown that people with less education develop Alzheimer's more often and earlier. 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 50% [16].

### Business productivity

Low literacy in the workplace can have a significant impact on the ability of companies to maintain their competitive edge. In 2013, 75% of major employers in the Australian Industry Group (AIG) said their productivity was affected by low levels of literacy and numeracy [17]. In the US, a study of manufacturing businesses found that 40% couldn't implement productivity improvements because their work force had insufficient literacy [18].

### Employment

Illiteracy limits employment opportunities, which can lead to dependence on welfare [19]. Employment options with lower literacy requirements are often found in the 'blue collar', service industry, are comparatively poorly paid. This can potentially trap people in a cycle of poverty. It is not surprising that high school drop-outs are three times more likely to receive welfare benefits than high school graduates [19].

### Criminality

Local and international research has shown that young people under community service orders are more likely to have difficulties expressing themselves verbally. In a recent Australian study, 50% of young male offenders were found to have a clinically significant language impairment which hadn't been detected previously [20]. Children with dyslexia can



also get caught up in this cycle – they are less likely to complete high school, and are over represented among juvenile offenders [21]. the cost of incarceration is enormous: in NSW, it costs over \$75,000 to incarcerate a person for a year [22] - which is more than it would cost to spend the same period at Harvard [23].

## Intergenerational transmission

In low socio-economic families where parents have low literacy, children's literacy often suffers. When parents can't read bedtime stories, children are more likely to grow up without developing a love of reading. Children who are not read to may have reduced vocabularies before they start school. This *word poverty* also presents a significant disadvantage once at school. When parents are uninvolved in their children's education, young students are also more likely to display behavioural problems, perform poorly, repeat school years and drop out of school [24].

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

## 4. The History of Reading

Reading is not something we do naturally like speech. It is a human creation that must be learned. Reading has evolved over the last 2000 years. For example, a millennium ago, silent reading was very rare. Over the course of the next 500 years, changes were made to the way words were displayed, documents were formatted and with the simplification of grammar, reading has become more accessible to the general public, and silent reading is now the norm. Language is not static, and is continuing to evolve, as this chapter will demonstrate. We believe that Readable English is part of this ongoing evolution.

### The Phoenician alphabet – 11<sup>th</sup> Century BCE

The Phoenician alphabet is a writing system which only had symbols for consonants, none for vowels. It was developed from the North Semitic alphabet in around the 11th Century BCE. It is thought to have been created by the Semites, inspired by Egyptian hieroglyphs, which had been in use for the previous 2000 years. The Phoenician alphabet was spread throughout the Mediterranean by Phoenician traders and is considered the origin of all Western alphabets. It contains 22 characters with no vowels (see below). Each character is named after the Phoenician object it represents. For example, the character that eventually became the Roman Y is called 'yód', the Phoenician word for hand [25].

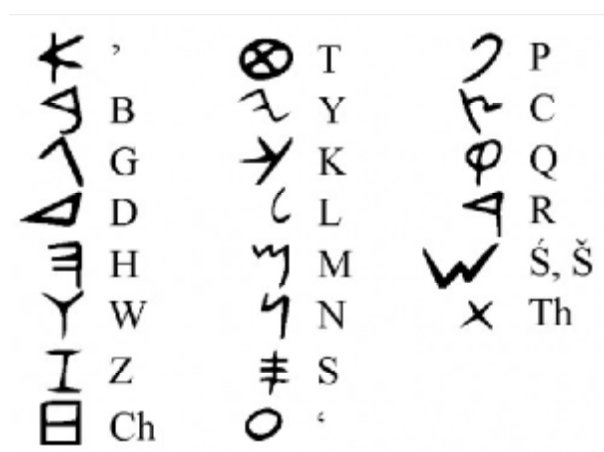


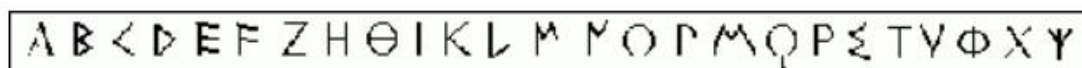
Image from The Phoenician Alphabet and Language (2014) [25]

### The Greek alphabet – 9<sup>th</sup> Century BCE

The Phoenician alphabet influenced three major alphabets: Hebrew, Arabic and Greek – English is derived in part from each [26]. The Western Greek alphabet was initially used west of Athens, and eventually evolved into the Roman alphabet. Eastern Greek was originally used in Western Turkey where there was a large Greek population. It is now the alphabet in the entire Greek-speaking world. The Greeks changed the pronunciation of several Phoenician characters to suit the phonemes in their language, and added others that were missing. The

Greek alphabet was the first fully phonetic alphabet, with one sound per character. Therefore, the sound of a word was made up of the sound of its component characters.

The resulting Western Greek alphabet resembles the Roman alphabet, as can be seen below.



## The Etruscan alphabet – 8<sup>th</sup> Century BCE

The Etruscans, from Central Italy, spoke a language that has never been deciphered and is thought to be unrelated to any other. Around the 8th Century BCE, the Etruscans adopted the Western Greek alphabet, with later changes to suit their needs [27]. Major changes included not distinguishing between voiced and unvoiced consonants, so 's' and 'z' made the same sound. It is believed they pronounced 'c', 'k' and 'g' as /k/, possibly with slight variations. They also experimented with the Sigma character Σ, which in the Greek had four lines - the Etruscans used several variations with three to six lines. The Etruscan alphabet contained many orthographic ambiguities that we see in English today.

## The Roman alphabet – 5<sup>th</sup> Century BCE

The Latin founders of Rome were known as the Romans. These Latin speakers adopted characters from both the Etruscan and Western Greek alphabets around the 5th century BC. They dropped characters they didn't need, e.g. Θ, Φ and Ψ and created new ones, such as 'f'. The Romans also changed several pronunciation rules. The character 'c' was initially used for the hard /k/ sound in 'cat' as well as the /g/ sound in 'garden', until the character 'g' was developed. The Romans maintained the Etruscan practice of pronouncing different letters the same way, as with 'c', 'k' and 'q' all pronounced /k/.

In the 3rd Century BCE, Alexander the Great conquered the Eastern Mediterranean, bringing with him the Eastern Greek alphabet. The Romans absorbed many words, creating digraphs such as 'ph' to represent the Greek character Φ and 'th' for Θ. Eventually, they also borrowed 'y' and 'z' from Eastern Greek, which were placed at the end of the alphabet.

## The Roman alphabet comes to Britain – 1<sup>st</sup> Century CE

In 46 CE, after several attempts, the Romans successfully invaded Britain, bringing the Roman alphabet and writing tradition. By the year 70, Rome had control of Britain (excluding northern Scotland), and they ruled until the year 450 [28].

The introduction of a writing system was revolutionary. In the 600 years preceding the Roman invasion, there had been a strong oral tradition in Britain, using the two key Celtic languages Brittonic and Goidelic [29]. For the following thousand years, text was written as continuous script, with no spaces between words or punctuation of any kind, called *scriptura continua*. Because of this format, readers had to scan text 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 the auditory memory to assist with sentence retention

[30]. During this period, language was constructed using rhyme and metre, often in verse, to assist with memorisation. Initially, documents used the same poetic sentence structure in prose.

## Old English – 5<sup>th</sup> Century

### The Anglo-Saxon invasion

Prior to the 5th century, Celtic languages were still spoken in Britain. This ended abruptly upon the arrival of the Anglo-Saxon invaders, who spoke Germanic languages with linguistic links to Dutch, Frisian, German and Scandinavian. There is little or no trace left in today's modern English language of the Celtic languages that existed before, except for a handful of place names and obscure words such as 'brock' (*badger*). However, some have speculated that English inherited some grammatical structures from the Celts [31].

Because there are no written records of Germanic languages in this period, we have little detail about the nature of the spoken language. St Augustine is said to have brought Latin religious texts to the Saxons in 597, which preceded the first Roman based English writing system by a century [32]. The Old English writings discovered from the seventh to ninth centuries show considerable regional variation, which continued evolving independently for several hundred years.

### The Norsemen from Scandinavia

In the eighth and ninth centuries, another invasion of England occurred, this time by the Norseman of Scandinavia. They set up camp in the northern and eastern parts of Britain, and brought their language with them. Their Northern Germanic language was not dissimilar to the Old English that was spoken at the time. Old English mainly followed the Germanic convention of creating native words instead of adopting those from foreign languages. However, some Scandinavian words were adopted, or hybridised in this period. Because of the similarities between the Anglo-Saxon and Scandinavian languages, the origin of these new words is not always clear. Nevertheless, Anglo-Saxon words form the basis of modern English, as can be seen in the following passage:

*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...[33]*

## Middle English

### The Norman conquest

In 1066, Britain was conquered by the Norman-French army. The Norman ruling elite spoke French and wrote in Latin [34]. A tidal wave of words entered into common use from these languages, and speaking a combination of English, Latin *and* French became the norm in business and professions. The following centuries brought tremendous change to the English language, setting the structural and grammatical foundations for how we speak today.

## The Carolingian reforms

In the ninth Century, a series of reforms were developed in the Carolingian Empire – what we know of today as France and Germany. The *Carolingian reforms* included a move to simplify and standardise the way that Latin was written. These reforms reached Britain in the following centuries, making it significantly easier to read texts.

Initially, words were separated by spaces. As can be seen in the excerpt below [35], the spaces between the words make it easier to identify individual words, but the characters are still all

PATER noster qui es in caelo  
sanctificetur nomen tuum  
adueniat regnum tuum fiat  
uoluntas tua sicut in caelo  
et in terra panem nostrum  
quotidianum da nobis hodie

the same height (for example the letters 'p' and 'd' are the same height as 'e' and 'n'). Having the same sized characters makes many different words look similar, and the reader has to look carefully at individual characters to differentiate a word from other words with a similar shape.

The next development was the extension of some characters above the central line (such as b, d, h, k, l, t) and below the central line (such as g, p, q), which gave words a distinctive shape, called the *Bouma* shape. This development enabled readers to use a cognitive short cut called *sight-word recognition*, whereby words were immediately recognised simply by their shape. This written format allowed for much faster reading and negated the need to read aloud. Once silent reading became possible, there was a sharp increase in personal communications, as well as seditious movements against public figures including the Pope and the King.

In addition to these changes, sentence structure and grammatical rules were standardised, including the introduction of the 'subject-verb-object' word order which in turn made silent reading easier.

## The official language again

There were a number of factors that contributed to English being reinstated as the official language of England. The Normans became "Anglicized" following the loss of international territories - Norman nobles soon saw themselves as British, paying more attention to their local interests. Subsequently, Norman French gradually fell away in use. While some in England spoke French and some spoke Latin (by then only a few spoke both), everyone, from the highest to the lowest, spoke English, and it gradually became the lingua franca of the nation once again.

The popularity of English was further helped by the 100 Year War against France (1337 - 1453), after which French was considered the language of the enemy. During this period, in just over a year, the Black Death killed a third of the English population, and a disproportionate number of the Latin-speaking clergy. Following this, the English-speaking working class became more

important in society and economics. Within a decade, there was little difference in the language of the nobility and commoners. In 1362, the Statute of Pleading made English 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 [37].

Because court clerks generally only had experience with Latin and French, many native spellings were retained from these languages in error, e.g. 'table' and 'double'. The spelling of many words was changed to reflect their anglicised pronunciation, such as 'beef' (boeuf) and 'mountain' (montagne). The spelling of other words was changed with questionable logic - e.g. 'people' (from the French *peuple*) [32].

## Standardisation

The numerous regional dialects of written and spoken English started to be overshadowed by the London Dialect. The elite in class and profession had adopted London English, giving it an air of superiority to regional dialects. Eventually, other dialects were stigmatised as reflecting low status, and the London dialect was widely adopted.

There was an organic change to vowel pronunciation at the time, which would have made many foreign words unrecognisable to their native speakers. This *vowel shift* did not accompany changes to spelling, producing many of the phonological inconsistencies in the English we speak today.

## The printing press

The end of Middle English period is marked by the introduction of the printing press. The printing press was developed by Gutenberg in the 1450s. Englishman William Caxton spent several years studying the technology in Bruges before bringing it to Westminster in 1476 [37]. The printing press allowed multiple, identical copies of books to be printed very quickly, and created a large market for books on diverse subjects [38]. It was economically important for books to be easy to read. In order to aid this, words were spelled in consistent ways and basic punctuation was introduced [39]. Caxton brought Flemish typesetters to Westminster, who made errors that were adopted into regular English, such as 'any' (which was originally spelled 'eny') and 'busy' (bisy). They are also thought to have intentionally lengthened some words to make margins neater and because they were paid by the line. They are attributed with adding the 'i' to friend, and the 'a' to head [32].

## Early Modern English

Several dictionaries and glossaries were created during this period, making various attempts to standardise spelling and vocabulary. In the lead up to this period, it was common for new words to be coined as needed. Many were not written down, and may have evolved throughout regions and over time, with no formal process. This was also the time of Shakespeare, who is thought to have coined, or amended the meaning of hundreds of words, such as 'accommodation', 'courtship' and 'laughable' [40].

In 1525, after years in exile, Tyndale published the first English language Bible, coining many new words in the process. He believed that the people should be able to read the Bible in a

language they could understand, rather than only hearing it read in Latin during sermons. Because this translation empowered Christians to understand and interpret scriptures by themselves, and threatened the power of the Church, English copies were illegal and regularly burned outside St Paul's Cathedral in London. This created a black market for copies, which were produced by Flemish and German typesetters overseas. As each new edition required manual typesetting, numerous spelling errors were introduced into the Bible. Because the Bible was often the only book that a family owned, some were adopted into common use. Spelling inconsistencies were so prevalent that it was not uncommon to see several spellings for the same word on a single page [32].

In response to these inconsistencies, Edmund Coote published the first edition of *The English Schoole-maister* in 1596. This was the first substantial English-only hard-word glossary helping to standardise spelling, based on the most common use. He removed unnecessary letters in many words e.g. 'hadde' became 'had', but sadly, he was not consistent in applying this rule. The first formal English dictionary *Table Alphabeticall*, was published in 1604. It provided authority for the use of new words introduced into the spoken language.

In 1755, after eight years in development, Samuel Johnson published a far more comprehensive English dictionary than had existed before. It contained 40,000 words with detailed definitions and quotes illustrating variations of use. Johnson had been commissioned to standardise the rules governing the English language in the process, however he found this task impossible, and instead recorded the language of the time [41]. He created different spellings for identically pronounced words with multiple meanings – such as 'there' and 'their', which made it easier for readers to understand meaning when they saw the word written.

From the early seventeenth century, British exploration vastly expanded the influence of English around the world. Colonisation and international trade led to words being adopted into English from many other languages. For example, American English contains many Spanish and West African words. When the British took English to new countries, such as North America, Australia and South Africa, their linguistic evolution split off from that of British English. For example, the vocabulary of Americans includes words such as 'trash', and 'faucet', which are not commonly used in Britain anymore.

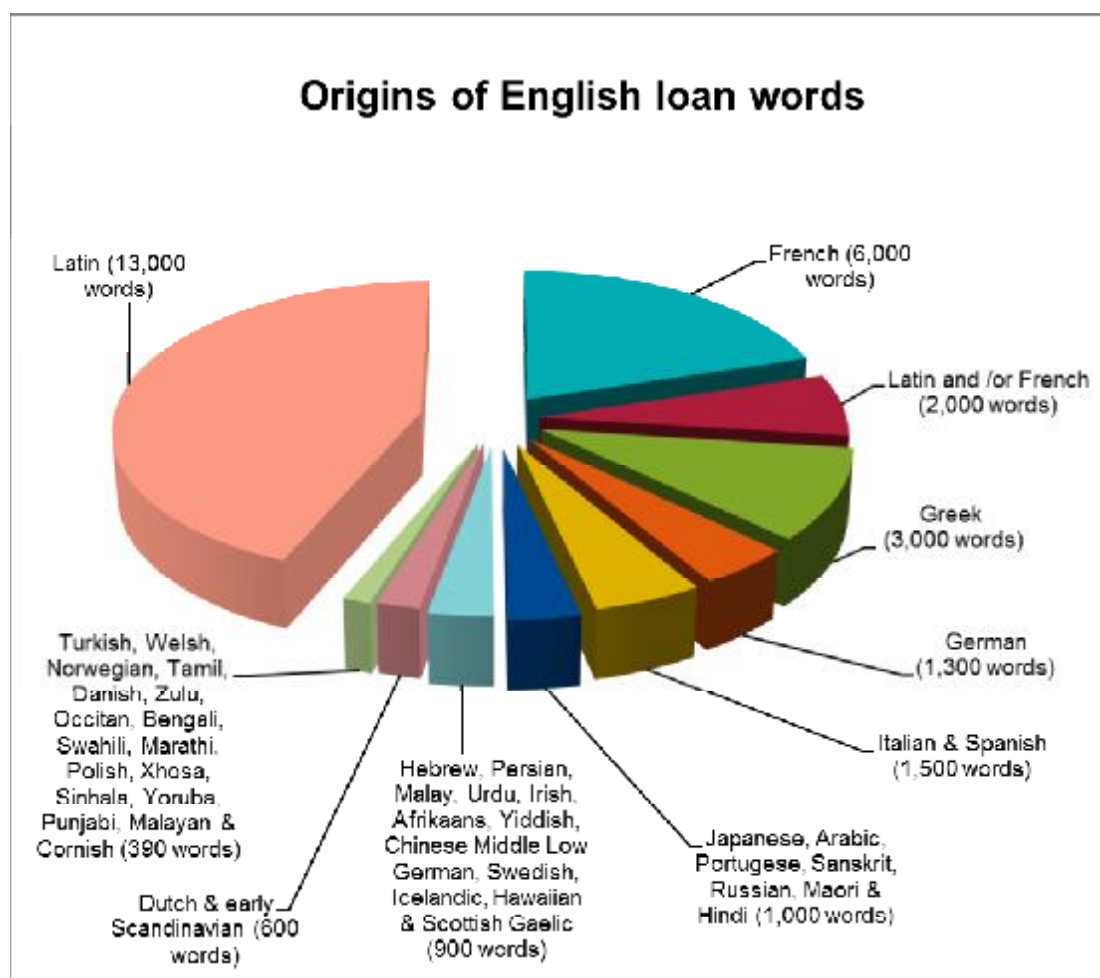
## Late Modern English

The English vocabulary exploded during the industrial revolution and the rise of the British Empire, which at the time covered about a quarter of the globe [42]. Most of the innovations in the following century were of British origin, in fields as diverse as steam, manufacturing and transportation. English also dominated the scientific and technological output between 1750 and 1900 [43]. It is estimated that 27,000 new words were added to English in this period, primarily because of the industrial revolution [44].

## 5. Why English has an Erratic Spelling System

### English is a collection of languages

As can be seen from the previous chapter, English is a patchwork language – it is full of words taken from those who conquered Britain and those who Britain conquered. It is heavily influenced by the Greek and Latin technical vocabulary, words that were simply made up, and from a myriad of other sources. Prominent Oxford English Dictionary etymologist, Dr Philip Durkin conducted a study on the national origins of English loan words. As you can see below, the vast majority are from Latin, French, Greek and German [44]. There are words from all over the globe and surprisingly few from local languages such as Welsh, Gaelic and Cornish.

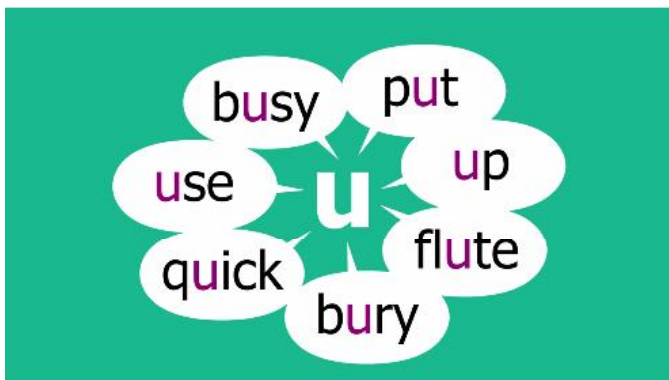


### The alphabet is too small

With the complex expansion of the English language came new phonemes (sounds) which had to be represented using the 26 characters in the Roman alphabet. Traditional Latin languages are *phonetic*, as they have a corresponding set of characters and phonemes. However English

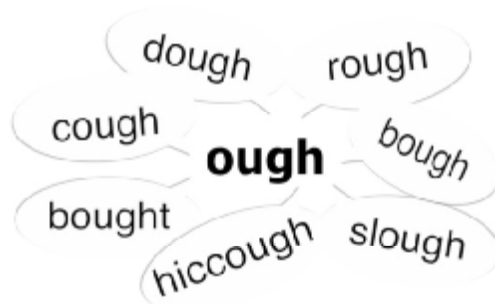


In the English alphabet, only 14 characters (graphemes) have only one phoneme - the other characters have up to seven different phonemes. For example:



## Digraphs

English uses many *digraphs*, or letter pairs, which represent some of the extra phonemes we use. Again, there are multiple ways to pronounce digraphs, which further add to the complexity of written English. Although there are some patterns that assist with learning pronunciation, there are an inordinate number of exceptions. For example:



## Syllables and silent letters

English uses syllables inconsistently, showing patterns that have evolved over time. Those who have studied Shakespeare might guess that the word 'converged' may have once been pronounced with three syllables, but only uses two in modern English. However, to an English language learner, how would they know that 'converged' has two syllables but 'converted' has three?

The English language is full of characters that are silent in some words, but spoken in similar contexts: the letter 'g' is silent in 'sign' but is pronounced in 'signature'. It would be impossible for an English learner to predict how 'chasm', 'know', 'debt' and 'thought' are pronounced!

It is clear that using conventional methods to learn English requires students to memorise multiple rules and thousands of exceptions - just to read everyday words. For those who struggle with reading for any reason, such as dyslexia, these inherent complexities cause considerable difficulties.

## Why Italians do it better

In phonetic languages, such as Italian, each letter or digraph represents a single sound, or *phoneme*. Once readers learn these phonemes, they can sound words out letter by letter, with



minimal assistance [46]. With practice, this leads to sight-word recognition, whereby words can be quickly identified by their shape without having to be sounded out.

Because spoken and written English evolved separately and organically, it contains a large proportion of non-phonetic words. This makes English much more difficult to learn to read than phonetic languages. There are many rules that help learners decode the sounds of written words, but these rules cannot be applied consistently. For example: for words with a *vowel + consonant + e* pattern, we generally pronounce the vowel by its name. So, the 'o' in 'rove' is pronounced /oh/ (as in 'go') rather than the /o/ sound in 'got'. This works for some words, like 'drove', 'wove' and 'cove', but not for others, like 'move', 'love' and 'glove'.

For every rule, English learners must build up a lexicon of exceptions to spelling and pronunciation. This process adds to the *cognitive load* of learning English, as it results in an inordinately complex mental map, and laborious memorisation. Often, students are taught non-phonetic words in a rote manner, skipping the sounding out stage and developing sight-word recognition by repeated exposure to the written word and its sound. This rote learning method is labour intensive, and takes much more effort than learning a word by sounding it out [46].

## 6. What is Reading?

Reading is the ability to decode the sounds of written words to understand their meaning. At a basic level, the reading process involves three steps:

- See a word
- Convert the word into sounds in your head (phonological decoding)
- Recognise the sound and understand the meaning of the word

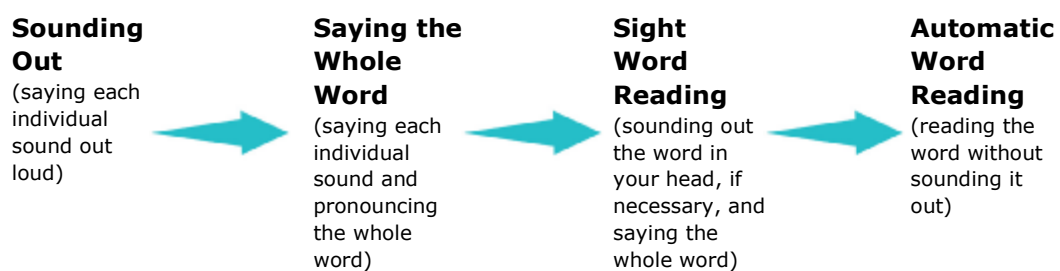
### Recognising written symbols

A writing system is a code that allows the reader to see a word and quickly retrieve its meaning. Although, from an evolutionary point of view, reading is a relatively new skill, it benefits from an ancient one. We use cognitive *schemas* of objects [47] that enable recognition of variations - such as long, short, curly or straight hair. We can also recognise objects from a partial view, for example, seeing a flash of snake skin in long grass is enough to recognise that one is present.

Because of these skills, we can recognise letters and words regardless of how they are presented: handwritten on scrunched up paper, typed and printed on glass, or produced using *any* number of different *fonts*. We can also recognise characters with unfamiliar features - for example, we can see the Roman 'a' in the German character *ä*, and 'e' in the French *é*.

à	À	Ä	Á	ɑ
ä	Ä	a	á	Α
á	À	ä	α	α
α	Α	Ä	á	ä
Ä	α	á	À	Α

Once the alphabet is known, learner readers can start to sound out words. Students initially learn to read by sounding out individual letters in phonetic words such as *cat*, *hat* and *bat*. They practise these words many times, until they can automatically recognise their shape without sounding out the letters. This skill is called *sight-word recognition*. It is a much faster process than sounding out individual letters, and is necessary for fluent reading [24]. Sight-word recognition is especially important for non-phonetic words, where sounding out individual characters is of little use. The brain's feature encoding system is highly sophisticated, allowing sight-word recognition to effectively discriminate between words with very similar shapes but very different pronunciations, such as *eight* and *sight*.



Progression of Regular Word Reading, adapted from University of Oregon Center on Teaching and Learning [48].

## 7. The Psychology and Biology of Reading

### Biologically primary and secondary knowledge

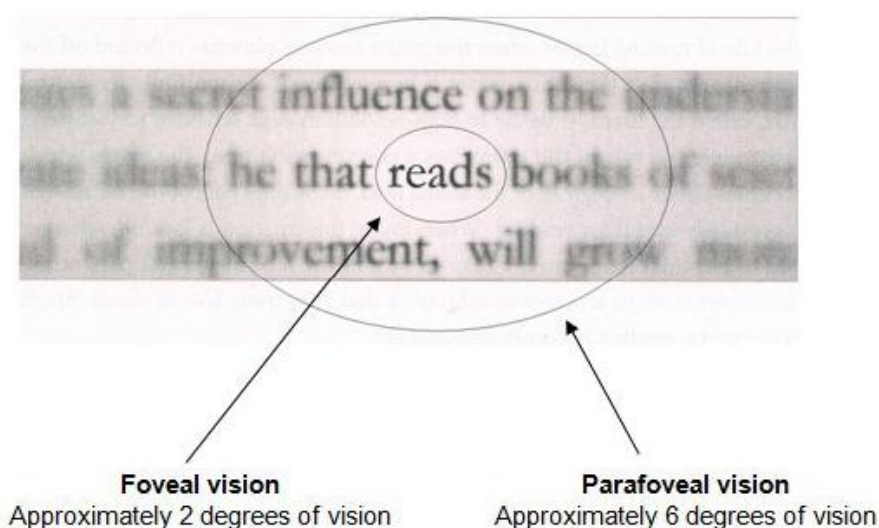
Although in the modern world we are often focussed on knowledge gained at school, a great deal of what we know is learned organically and has an important evolutionary function.

*Biologically primary learning* covers a wide range of knowledge and abilities such as spatial awareness, group dynamics, language recognition and speech production [49].

Academic learning, on the other hand, is *biologically secondary*, as it modifies primary abilities to develop culturally specific skills and knowledge. This includes the knowledge and abilities required to phonetically decode written symbols, or read. Learning to read and write brings together these very different types of learning.

### The eye as a scanner

When we read, we primarily use the *fovea*, a tiny area at the back of the eye which provides our sharpest vision. It only covers about two degrees of the visual field, however, and is assisted by the *parafovea*, which has less acuity but covers a further 12 degrees. The remainder of the visual field is provided by the *perifovea*, which can detect movement, but not detail.



Imaged adapted from *Reading in the Brain*, Dehaene (2009) **Error! Bookmark not defined.**

Because the eye has a tiny area with excellent visual acuity, it can only detect a limited number of characters at a time. When reading words, the eye typically looks at seven to nine characters in a block, then moves onto the next block of characters. This is done using *saccade movements* that stop at *fixation points* every seven to nine characters. This is the slowest part of the reading process [46].

## The reading brain

Many regions of the brain are employed when reading. Recent developments in brain scanning technology have allowed researchers to investigate how the brain functions when reading. Predictably, the brain regions responsible for sight (occipital lobe) and vocabulary (parietal lobe) are used extensively when reading. Understanding the link between written words and their sound requires co-ordination between the long term memory region (hippocampus) and the movement control area (cerebellum).

People who have more brain cells (neurons) in relevant brain areas are better at the reading tasks that employ them. For example, those who have more cells in the superior parietal lobe (which manages vocabulary) are better at sounding out words. Interestingly, the ability to sound out words has no relationship to general intelligence. There is however, a relationship between intelligence and how *quickly* someone can read out loud, with faster readers having higher intelligence. This is thought to be due to differences in information processing capacities [50].

Like any body system, the brain improves with practice. Studies have shown that children with reading difficulties can learn to activate the necessary parts of the brain with reading interventions [51]. Research has shown that children with dyslexia have poor connections between brain regions which need to co-ordinate with each other. This connectivity can be improved and the volume of brain cells increased with targeted reading practice [52]. These changes can also happen for adults – in a recent University study, participants were asked to read 30 pages of an engaging novel for several evenings. Brain imaging the following mornings and for several days afterwards, showed that there was improved connectivity in the language region of the brain following this intervention [53]. This improvement is called a ‘shadow activity’, which is like a muscle memory for the brain. So, any reading intervention needs to encourage significant practice – ideally that can be done without needing external assistance.

## Memory and learning

Learning a language (language acquisition) involves both the long term and short term (or *working*) memory systems. We process new information in our working memories, and encode this information into 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 as needed. However, information in long term memory that is not used for a long period can fade.

There are limits to how much information can be held in working memory at any time. Information Processing Theory first described in the 1950s that around seven new items (plus or minus two) can be processed at any time and that pieces of information can be *chunked*, or grouped, to make better use of this capacity [54]. More recently, research has investigated individual differences in working memory, discovering that some people have greater storage capacities whilst others use them more effectively [55]. Deficits in working memory have been found in many people, including those with dyslexia, ADHD, Down’s Syndrome and hypertension [56]. Working memory capacity increases from early childhood to adolescence,

and children of the same age can have very different capacities. Research has shown that working memory limits correlate with performance in English and Mathematics assessments in 11 year olds [56].

## Cognitive Load Theory

Cognitive load theory proposes that exceeding the limits of working memory impedes on the learning process [57]. The *cognitive load* of a task is the amount of short term memory capacity it requires. Your *cognitive limit* is the maximum amount of information that you can process at that moment [57]. Consequently, it is important that tasks do not exceed the learner's cognitive limit.

The way information is structured in your long term memory impacts on its retrieval into working memory. Our long term memories are structured into *schemas* that contain all the information about everything we know. Well structured schemas help you to make sense of what you have learned and provide a scaffold for new information to be added. For example, your long term memory will have a schema for *cars*, containing all of the information you have learned about them. Depending on your experience, your schema may contain information such as:

- the spelling and sound of the word 'car' in one or more languages
- sensory information about how cars look, smell and feel
- details about the component parts of cars e.g. steering wheel, fan belt
- knowledge about different models and prices
- knowledge about how to drive and road rules
- memories of your own experiences with cars (Sunday drives, racing events)

The more developed your schemas are, the better you are able to analyse and comprehend new information. Those with basic car schemas may struggle to understand information given by a mechanic, as their cognitive limit is likely to be exceeded with technical information.

We can only process new information and add it to our schemas when the cognitive load of a task is less than our cognitive limit. When you are a novice at something, like playing the piano, you have basic schemas, so very few aspects of the task are automatic. This makes the cognitive load very high, leading to stilted playing with constant errors. As one develops into an expert pianist, schemas are developed to include information about musical notes, finger placement, key signatures, tempo and dynamics. Well-developed schemas allow the pianist to read and perform the music fluently, as they reduce the cognitive load of the task [57].

English speakers likely have some similar language schemas in their long term memory, including vocabulary, word pronunciation and grammar. The more that these schemas are structured using patterns and relationships, the better we are able to encode new information and retrieve existing information. Because a huge number of English words don't follow consistent rules, our schemas contain thousands of items that don't fit into any logical structure. It is more laborious to load these non-phonetic words into schemas, because they aren't assisted by the logic of spelling rules or similarities to other words. Each non-phonetic word requires considerable repetition to be permanently loaded into a schema. This slows the



learning process considerably for everyone, but especially those with reduced cognitive limits and information processing difficulties.

## Stress and cortisol

The body has many mechanisms designed to keep us alive. One of the most impressive is the ability of the body to supercharge itself in times of extreme danger. Our ancestors would have regularly dealt with life threatening situations, like being attacked by a large animal or seeing a venomous reptile. When our brain detects danger, it floods the body with the hormone cortisol, which activates the most crucial body system to escape danger. This generally leads to one of three actions - we run away (flight), attack our opponent (fight) or remain completely still (freeze). Both the fight and flight responses use the cortisol during the response, so that there isn't much remaining in the blood stream once the situation is resolved.

These days, we don't come across life threatening situations as often. The brain is not very good at differentiating between extreme emotional threat and physical threat. So, when we experience strong anger, embarrassment, fear, or other negative emotions, our brain can flood the body with cortisol, thinking that our life is in danger.

These emotional reactions can happen in any situation, including the learning setting. A student may feel intimidated and fearful of a task that is too difficult; embarrassed by making mistakes in front of the class or frustrated that they don't understand a concept. They may even become enraged if they put significant effort into a task and still fail to grasp it. Any of these experiences can trigger cortisol to be released throughout the body. In this state, the brain is unable to focus on learning, because its resources have been diverted to survival. This compounds the student's difficulties. It is not surprising that research has demonstrated that high levels of cortisol impede our ability to learn [58].

When a student finds it difficult to read, they are very likely to experience emotional distress whilst in class. This can lead to reading avoidance, and a stress reaction before class has even started. This is a vicious cycle that stops these students from learning to read - as they fall further behind their peers, the task to catch up can seem like an impossible task.

When supporting these students, it is crucial to structure lessons to avoid triggering this cortisol reaction. Given the complexities and inconsistencies of the English language and given that these students may have a very poor self-image about their reading ability, it is a challenging task to help them achieve reading fluency without activating their cortisol response.

## 8. Reading Struggles and Dyslexia

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Dr. Sally Shaywitz is one of the leading experts on the topic of dyslexia. She has provided empirical validation of the nature of dyslexia and its relationship to the reading brain. Her research demonstrates that in typical readers, intelligence and reading are dynamically linked. However, in the case of dyslexia, a person can have very high intelligence and yet read at a much lower level in comparison [59].

Readers are taught the process of decoding words in order to achieve reading fluency and understand the meaning of texts. For so many, with or without the diagnosis of dyslexia, the process of decoding is strenuous. Some people have information processing difficulties, whilst others may experience a language barrier, or even both. Several parts of the brain are activated at the same time whilst we decode words, notably the parieto-temporal (auditory discrimination) and occipito-temporal (visual memory) systems [60].

### Auditory discrimination

Auditory discrimination involves decoding text characters into phonemes (units of sound), which combine to make up words. Once this decoding is accomplished, the reader internally “hears” each word. This activates the speech-understanding areas of the brain to obtain the word’s meaning. The ability to decode text characters into phonemes is called “phonemic awareness”. Good phonemic awareness skills help in “word-attack”, the ability to break a word into syllables then discern the sounds within the right sequence. Some typical mistakes that readers with poor phonemic awareness make are to: omit sounds from words, add sounds into words, switch sounds around or substitute sounds in words. For example, a reader may say “gril” for “girl” or “steam” for “stream”.

When a student with auditory discrimination difficulties misses a letter when pronouncing a word (like the ‘r’ in ‘stream’), they are usually able to identify the letter if asked to find it (i.e. what is the third letter in ‘stream’). Even after completing this exercise, if asked to read the word again, the student will most likely say ‘steam’, because when reading the word as a whole, they can’t discern their omission of the /r/ sound. Poor word attack skills drastically slow the reading process, leaving readers to resort to guessing which ultimately affects their comprehension of the text.

### Visual memory

No matter how good a learner’s phonemic awareness is, it will not help them to decode non-phonetic words, which constitute up to half of all English words. Instead, these words must rely on our visual memory to be learned: a reader needs to be able to remember the shape of a word and associate the word shape with its sound. The development of sight-word recognition relies heavily on the visual processing parts of the brain, and is essential to reading fluency. The more exposure to words a reader has, the greater the sight-word lexicon stored in the visual memory bank. Problems arise if readers cannot remember the shape of a word, and/or cannot associate the word shape with a sound. Those with poor visual



processing have no, or minimal sight-word recognition ability. They can have multiple exposures to a word and still be unable to recognise it. The main indicators of visual processing issues are slow reading and poor spelling.

## The non-phonetic word disadvantage

Research has found that the effects of dyslexia are not as limiting in countries with phonetic languages, such as Italian [61]. In phonetic languages, even students who struggle with reading can still learn to read by sounding out words. And with continued exposure to words and reading practice they can develop their sight-word recognition abilities.

## The dyslexia disadvantage

Those who struggle with reading and those who suffer with dyslexia learn in a different way to others, and often have particularly good creative and analytic skills [62]. 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 [63], and have a higher risk of mental illness [64], especially depression [65]. Tragically, adolescents with dyslexia are at higher risk of suicide than those with normal reading skills [66].

## 9. Stopping the Cycle of Illiteracy

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We know that English is an incredibly difficult language to learn to read - even the brightest students take years to become proficient. We also know that to reach proficiency, learners need to undertake focussed practice at home to supplement formal classes. 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. Dr. Sally Shaywitz is quoted as saying

*In dyslexia, there is an abundance of high quality scientific knowledge so that we have not a knowledge gap, but an action gap [59].*

We believe this is not only true for dyslexia, but for all struggling readers and illiteracy in general. Existing methods for teaching reading focus on the issues of the person reading, attempting to 'fix' the underlying causes of their struggle. Since every person is different, there is no one solution in any reading program, no matter how good it is. This is why we have decided to focus on the making English easier to read. Readable English is an attempt to fill the "action gap" and is a step towards breaking the cycle of illiteracy.

## 10. Attempts to Reform English Spelling

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There have been a number of attempts to reform English spelling over the last 400 years, none of which have been successful. Several noble attempts have been made, and several contributors have made it their life's work or contributed a huge financial contribution to the cause.

These attempts fall into two basic categories: those that operate within the existing Roman alphabet, and those that introduce new characters, or variants of existing characters. None of these proposals has ever been widely adopted, for a variety of reasons. Those that operate within the existing alphabet tend not to be able to reduce the ambiguities of written English without changing the spelling of words. For example, pronunciation guides that are used in dictionaries spell out words according to their pronunciation ('geography' as 'jeeogruhfee'). Those that introduce new characters, such as the International Phonetic Alphabet (IPA), also change the shape and spelling of words ('clothes' as 'kloðz').

The first call for spelling reform was in 1568 by Sir Thomas Smith, Secretary of State to Edward VI and Elizabeth I [67]. Sir Thomas attempted to align spelling to reflect the pronunciation of Southern English spoken in court. He proposed significant reforms, such as the removal of redundant letters like 'c' and 'q' and the reintroduction of several Greek characters. His reforms were far too drastic to be adopted - it also didn't help that he wrote his recommendations in Latin [68].

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 where a long sound was required and adding 6 new letters, for sounds such as /sh/, /ng/ and the soft /o/ sound in words like 'ball'. His alphabet wasn't very popular, even with those he was close to. It was only published in 1789, when fellow spelling reformer Noah Webster championed and included his reforms in his *Dissertations on the English Language* [69]. Webster later developed a less drastic iteration, without additional characters, publishing several works on the complex English language orthography. His efforts were also unpopular, ridiculed by critics as an 'unsightly corruption' of English.

There were many others in favour of spelling reform. In 1906, The American President Theodore Roosevelt introduced simplified spelling to the government office- this lasted only a couple of months before congress lobbied him to revert to Standard English. From 1934 to 1955, the publisher of the Chicago Tribune waged his own war on English spelling. Upon his death in 1955, the publishers maintained many of these changes, only reverting back to Standard English in 1975, when they accepted that the changes hadn't been adopted widely [70].

A number of other respected and influential people have been active supporters of spelling reform, including Charles Darwin, Andrew Carnegie, Isaac Pitman [71] and Lord Baden-Powell (one time Vice President of the Simplified Spelling Society) [72]. In addition, a number of famous authors including George Bernard Shaw [74], Mark Twain and Upton Sinclair, all campaigned for spelling reform. Despite significant efforts by this wide range of highly intelligent contributors, none of the attempts to reform English spelling have been successful.

## Barriers to Spelling Reform

One of the main reasons these alphabets have not been widely adopted, is because the shape and spelling of words is not maintained. Although English spelling is complicated, many of the patterns represent roots of words and are important to keep in the language to convey the meaning of words. The English writing system is classified as *morphophonemic*, because it represents both morphemes (units of meaning) and phonemes (units of sound) in its spelling. To illustrate the morphophonemic principle in English, the 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 many 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.

Further, when a reader learns to read phonetically using a system where the spelling of words is changed, there is little transference or benefit when reading standard English text. For example, learning to read the words 'through', 'vision' or 'knead' ('θru', 'vɪʒən' and 'nid' respectively) with the IPA would not help a reader if they then encountered the Standard English versions of those words. Would-be readers cannot develop sight-word recognition when learning with either of these phonetic alphabets, which, as discussed above, is fundamental for achieving reading fluency.

Unlike many other languages, there is no organisation that is in charge of the English language, so there is no authority that can compel change to its spelling. Even if legislated changes were made in one country, they may not be adopted in others. Any change, therefore, would have to be adopted voluntarily. Changing English spelling is unlikely to be popular. Those who want to retain the cultural heritage of the English language are likely to oppose English spelling reform. Changing the spelling of words would make everyone have to learn a new system, not just those that struggle with the language. People are likely to question why the majority are being penalised, for the minority who has difficulty reading. Another barrier is all of the existing texts that have been published in Standard English with its current erratic spelling. If people still need to learn the old spelling to access published information, they would essentially be forced to learn two systems.

## 11. How to Address the Erratic Spelling of English

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A new approach is needed to address the erratic spelling of English.

- The existing Roman alphabet and the word spelling must be retained.
- A new format must be created that enables emerging readers to sound out words character by character as in phonetic languages like Italian. This will enable emerging readers to go directly from sounding out letters to sight-word recognition without having to memorise the complex rules and exceptions in English.
- The new format must be simple, intuitive and easy to learn.
- Words in the new format must look like words in Standard English, so that skilled readers can effortlessly read words in the new format, and emerging readers can learn to read Standard English words more quickly.
- Readers need to be able to turn the new format on and off in electronic documents as their reading ability develops.
- The new format must be comprehensive. If a significant percentage of English words cannot be represented in the new format, a learning reader will still need to learn the phonics rules for those words that are not represented, defeating the purpose of the new format.
- A complete dictionary must be marked up in the new format so that readers can quickly and easily identify the pronunciation of any word by its mark- up in the new format.
- A full publishing system with an eBookstore must be provided to allow publishers to sell books and readers to buy books or other documents, in the new formats. Books should be available in both electronic and print, and publishers should be able to submit books in standard formats, such as PDF for print and ePub for eBook formats.
- Simple and intuitive data conversion software must be provided so that it is fast and efficient for readers and their parents or teachers to import documents Standard English and convert into the new format.

Unlike the previous attempts to overcome the problems resulting from the erratic spelling of English, Readable English has been specifically designed to address these issues.

## 12. The Development of Readable English

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We undertook a detailed analysis of the difficulties surrounding the erratic nature of English spelling and considered multiple possible solutions. We knew there were too many words to mark up by hand, and we couldn't use algorithms as there are too many words in English that are non-phonetic and don't follow rules. We also know that we couldn't use machine learning until we had a data set that it could be trained with.

We initially analysed the 10,000 most common English words, using computer, statistical and manual approaches. Once we had developed the first draft schema to mark-up words, we assessed how well it worked on different computer interfaces (computer, tablet and smart phone screens) and in print. We also tested how used friendly and learnable it was for a range of learners.

Learning from this first attempt, a second schema was developed and tested. It took 11 cycles of development before the mark-up schema was optimised. The final mark-up required the development of an entirely new, responsive font, which has now been applied to the Macquarie Dictionary's 140,000 words, providing a pronunciation guide in three different accents (US, UK and Australian).

The development occurred in four phases.

### Phase 1 – Conceptualisation and development

With our experience in publishing accessible formats and teaching reading, we started by asking what a format would look like that efficiently addressed the non-phonetic spelling of English? Answering this question required extensive research in linguistics, cognitive psychology, neuroscience and cognitive load theory. This research established that the most efficient way to learn to read occurs in phonetic languages, like Italian, where words can be sounded out character by character. Students in these settings progress to sight recognition far easier than in non-phonetic languages like English.

There have been numerous attempts to reform English spelling, to make it more phonetic. These have often involved changing the spelling of words which is unpopular due to the impact on proficient readers. Another approach, used by the International Phonetic Alphabet, is to create new characters so that there is only one phoneme per character. But this approach requires learning an entirely different character set. Neither of these approaches facilitate students to progress from sounding out words to recognising them by sight. This helped us realise that the spelling of English words must be preserved to enable the development of sight-word recognition and reading fluency.

To decode the sound of words simply and intuitively, students need to be able to predict with 100% accuracy the sound each character in the word makes. Given that 12 of the 26 letters of the English alphabet can make multiple sounds in different contexts, we realised that additional visual information would be needed to indicate correct pronunciation. Students

also need to be able to quickly and unambiguously break words into syllables, as long words are pronounced syllable-by-syllable.

This meant that we needed to develop a new intuitive pronunciation guide for each English word, requiring every word in English to be marked up.

## Syllables

We decided to study syllabification first. We realised that different dictionaries applied different syllabification rules and that the easiest way to sound out words was when the syllables followed speaking patterns rather than conventions based on spelling patterns. So we decided to mark syllables according to the way they are pronounced. For example, we broke up a word such as 'imaginary' as i·ma·gi·na·ry' rather than 'im·ag·i·nar·y', which is the conventional pattern. To analyse syllabification rules, we marked up the 10,000 most common words with syllable breaks, using an excel spread sheet and a simple dash.

## Making ambiguous character sounds unambiguous

Having broken words into syllables, it was then easier to identify different character sound patterns. We recalled our days of using flash cards with struggling readers to stimulate sight-word recognition. The flash card method involved writing one word in black marker on a card, then adding pronunciation markings in pencil to aid word recognition. For example, for non-phonetic characters like the 'a' in 'want', a symbol was added overhead in pencil to indicate the correct /o/ sound. As recognition of words improved, the pencil markings were removed until sight-word recognition was possible with the original word.

With that in mind, we started marking up the obvious differences, like when a vowel makes a long sound such as in 'ate', 'me' and 'use', as opposed to a short sound as in 'at', 'met' and 'us'. We then moved to other patterns that we already knew, such as the *schwa* sound, /uh/, in words like about, enevelope, penil, and elouquent, supply and sibyl.

We had been advised to use Unicode symbols to mark these irregular phonemes, as they were already in common use. We chose a selection of Unicode symbols, or *glyphs*, which all had a logical link to the sounds they represented. For example, the schwa glyph looked like a little 'u', and we used a little 'o' glyph for that sound (e.g. in woch). We also used glyphs that were already in common use, such as a dash over long vowel sounds. We ended up with 16 glyphs that covered the irregular phonemes in 99% of our 10,000 words. For the 1% of words with sounds that weren't covered, we wrote the phonetic version of the word in brackets afterwards.

## Silent characters

Around the same time, the presence of silent letters became evident, so we started working on signposting these. We needed to find a way to alter silent characters that was clear in lots of different formats - on screen and print, colour or black and white. The change had to be easily recognisable, without interfering with the overall shape of the word (called the *Bouma* shape). We experimented with the 'Reverse video' format (where the colour of the letter and background are swapped - like when you highlight text in a document). When tested, some users found this affected the shape of the word and actually drew more attention to the silent character. Following a lengthy design period, we determined that greying out the silent

characters was a good solution (e.g. limb, night) as it provided a simple enough cue to readers not to pronounce those letters whilst retaining the integrity of the word.

## Phase 2 - Informal testing

Once the initial database of the 10,000 most common English words were marked up, we decided to informally test the logic and usability of the glyphs. So we developed videos and online lessons to teach the glyphs to students, moving from individual sounds and syllables, to words, sentences and paragraphs. We also wanted to test if the integrity of words was maintained and how much the system improved reading. We recruited a small group of struggling high school students and a group of English language learners, and provided them with nine hours of tuition. We then obtained their feedback.

The overall results were very promising - several teachers reported that Readable English had helped break down barriers to reading, and that previously disengaged students were suddenly participating in class. One student was reported to have gone up a full grade level in their reading comprehension after the brief intervention. Another used it to type up subtitles for a movie he was watching, and a couple of learners started teaching their grandparents. One of the parents was thrilled to report that their child had started asking for books and magazines instead of iTunes music. The participants overwhelmingly said that they wanted to have Readable English in an app, so they could always have it nearby if they needed it.

Our participants told us that overall, the glyphs were easy to learn. However, there were a handful of glyphs that weren't clear, because they were indistinct or unintuitive. Almost all of the glyphs made a single sound, which students found easy to learn. However, we had used a single symbol to indicate a long vowel sound for all vowels. Because this glyph could represent any long vowel, it was confusing. So, we reanalysed the vowel sounds and created several new glyphs to ensure that each one represented a single sound.

The feedback clearly showed that the integrity of the Bouma shape of the words had been maintained by Readable English, as participants had no difficulty recognising Standard English words they already knew when it was marked up in Readable English. Similarly, students who learned to sight-word read new words in Readable English were then also able to recognise the word shape in Standard English. This was an important result, because it showed that students could use Readable English to learn to read a word by sight and then read that word in Standard English – there was little if any transitioning between the two formats. This was not unexpected, as people are very good at identifying known letters in the presence of distractors – for example, we can easily recognise the letter e in the character ë.)

## Phase 3 - Further development

The next stage of development had several goals:

- Expand the glyph repertoire, so that each glyph had only one sound
- Redesign glyphs so that they were more intuitive, easier to remember and more easily identifiable



In our process of refining the glyph system to cover all the sounds of English, while making each glyph memorable and intuitive, we realised that we needed to create some new glyphs. We also realised that we had exhausted the suitable Unicode symbols, and we created our own special Readable English font.

Eventually, we added another six glyphs, bringing the total to 21. This provided a much more comprehensive coverage of English sounds, without inconsistencies. Each glyph had a corresponding mnemonic, to assist with retention and make the learning process more fun. For example, one of the new glyphs is called *Dome* - it makes the *vowel* sound /oh/ and looks like a dome (Ô).

We also renamed some of the existing glyphs to make them more fun and memorable. We created catchy videos to teach them, reinforcing the visual and auditory association between the glyph and its sound.

Below is a table of the 22 glyphs that are used in the Australian English version of Readable English. Each glyph has a name which makes the sound of the glyph and a mnemonic to assist memory. For example, the glyph called 'Aussie Oswald' makes the sound that both Aussie and Oswald start with. The second column shows the sound the glyph makes, which is the [o] in the word 'off'. The third column lists all of the letters that sometimes make this sound, and the final column gives example words with the glyph in place.

### Marking up words into Readable English

Our analysis of the 10,000 most common English words showed conclusively that rule-based systems cannot accurately handle the erratic spelling rules and exceptions of English. The next step was to develop efficient manual mark-up systems for the next 50,000 words. Importantly, we noticed that as new words were being added, the number of new syllables rose slowly, as a lot of the new words were made up of existing syllables. This enabled us to optimise the manual mark-up system, an editor was able to pick from existing syllables when marking up words. Once these 50,000 words were marked up, we had a large enough data set to train a machine learning system.

We used the training set to initially teach a multi-label online learning classifier. This classifier learns to predict which Readable English character a letter will be, given its context within a word. We noticed that mistakes often didn't conform to known syllables, so we were able to dramatically improve the performance of the classifier by confining the results to known or allowed syllables.

However, there were still thousands, sometimes millions, of possible ways to break up an English word into Readable English syllables, and as the return time to perform one mark-up took around 10 minutes there was little point pursuing this direction.

Though combinatorial search techniques coupled with the classifier, we were able to *intelligently* search the space of all possible syllable combinations for the most probable options, reducing that search space from millions to around 10,000 or less.

The machine learning mark-up system now provides the six most probable mark-up options for each word to an editor. In 92% of cases, the highest priority option is correct, and the top six results contain the accurate mark-up about 99% of the time, approximately only one word

in 100 needs to be marked up by hand. We marked up thousands more words, including the entire Macquarie Dictionary.

This initial database was constructed using American (Californian) English, so we next turned our attention to Australian English and the local accent. We analysed the phonemes in Australian English and discovered that a 22nd glyph was needed. Once we had developed this glyph, we used a combination of machine learning and expert human knowledge to create the Australian Readable English dictionary database.

Glyph Name	Glyph Sound	Letters	Example Words
Aussie Oswald	[o] as in off	â, ê	wâ·tch, ên·core
Dome	[oh] as in open	ê, ô	sêw, ôat
Ed Says	[e] as in Ed	ă, ú	să·id, bú·ry
Fast R	[ar] as in art, [or] as in more	á, ó	báth, thó·ught
Fun Enough	[f] as in fun	ġ	to·uġh
Happy Face	[ee] as in eat	ě, ĭ, ŷ	ě·ach, tax·ĭ, hap·pŷ
Hey April	[ey] as in April	á, é	á·te, é·ight
Hook	[oo] as in hook	õ, ŭ	bõ·ok, pŭt
I Spy	[ahy] as in ice	ī, ŷ	kī·te, flŷ
Infinite	[i] as in if	ă, ě, ǒ, ŭ, ŷ	vil·lă·ge, prĕ·t·ty, wǒ·men, bŭ·sy, mŷth
J Dot	[j] as in jam	d, ġ	sol·d·ier, ġ·em
Noisy Tail	[z] as in zoo	ş, x	iş, xy·lo·phone
Say Cheese	[ch] as in cheese	č, ț	čel·lo, pic·ț·ure
Sharp Hat	[sh] as in sharp	ĉ, ŝ, ĥ	o·ĉ·ean, ŝ·ure, na·ț·ion
Silly C	[s] as in silly	ç	ç·ell
T Crossed D	[t] as in tipped	đ	skippedđ
That Noisy TH	[th] as in that	th	th·em
Treasure Chest	[zh] as in treasure	ĝ, ŝ, ž	ga·raĝ·e, vi·ŝ·ion, sei·ž·ure
Two Moons	[oo] as in moon	ë, ö, ü	grëw, shö·e, flüte
Unicorn	[yoo] as in unicorn	ê, ú	fêw, ú·se
Upper Cup	[uh] as in up	ă, ě, ĭ, ǒ, ŷ	ă·bout, a·ca·dĕ·my, pen·cĭl, sǒn, sŷ·ringe
Wonder One	[w] as in wonder	ŭ, ǒ	qú·ick, ǒ·nce

## Phase 4 - Extensive testing

Before proceeding to formal testing within schools, we tested the mark up on proficient native Australian English readers. We tasked them with decoding unfamiliar non-phonetic words, to test how easily they learned and applied the new glyphs. Participants were given 20 non-phonetic place names that they were unlikely to know (i.e. Godmanchester), and their spoken answers were recorded and graded. Most of the participants pronounced less than 25% correctly. Some participants reported that the only words they pronounced correctly were the words that they happened to know.

The participants then received ten minutes tuition on Readable English, focussing on the glyphs that occurred in the place names. Following this lesson, they were presented with the same words in Readable English (i.e. Godmanche-stër). With this very brief tuition, most of the participants could now pronounce 75% of the words correctly. This test also highlighted that even proficient native English readers can't accurately decode the sound of non-phonetic English words that they don't know.

## Part A - The pilot study

We obtained permission from the New South Wales Department of Education and invited several Sydney schools to participate in a Readable English trial. Readable English was pilot tested with 27 students in school years 4-6 across three Sydney schools. Each student completed a standardised test of reading accuracy and speed (the Gray Oral Reading Test), and a survey about their attitude towards reading. Students then received eight hours of classroom-based training in Readable English - two half-hour classes per week for eight weeks. During this period, they also had access to the Readable English website at home. Once this had concluded, their reading ability in Readable English was re-tested, as well as their attitude.

**The results showed a significant improvement in oral reading fluency.** All of the students were able to read faster and with fewer errors than before. Over half of the students (19 of 27) were reading at a higher grade level than before and a quarter of these (5 of 19) were reading two grades higher than before. The eight students who stayed within the same reading grade made 40% fewer mistakes in the post-test than before in the pre-test.

**There was also a significant improvement in self-reported attitude, which was validated by teachers.** The students scored significantly higher on the attitude survey after learning Readable English. We asked teachers if they had noticed any change in the students' reading and attitude to reading. Around 80% of teachers reported an improvement in reading ability and two thirds noticed an improvement in their attitude towards reading.

## Part B - The full study

The second study was more comprehensive in its design. It compared reading changes between children trained to use Readable English to a control group who received regular reading instruction. This second study also aimed to assess improvements in students' reading ability when reading in Standard English (without the phonetic cues of Readable

English). The sample was larger and slightly longer (12 weeks), and additional reading assessments were undertaken, including a comprehension component.

One class of 23 students acted as our control group, and the other 37 students (spread across two classes) had instruction in Readable English. As before, students in the Readable English group participated in two half-hour classes per week, learning the Readable English system, and could access Readable English online at home. Students in the control group participated in their regular reading classes during this time. Seven participants were excluded from the study due to absenteeism.

All students were assessed pre- and post-tested using several measures:

- **The Neale Analysis of Reading Ability**, measuring reading accuracy, comprehension and rate. Each of these scores was converted to a reading age.
- **The Gray Oral Reading Test**, selected passages were used to assess reading fluency and error rates
- **Attitude survey**, assessing students' attitudes towards reading.

To avoid practice effect, alternate versions of the reading assessments were used in the pre- and post-tests. The control group undertook both the GORT and NEALE assessments using Standard English, as would be expected. The Readable English group read the passages from the GORT solely using Standard English in both the pre- and post-tests, and only read in Readable English for the post-test NEALE assessment. This allowed us to separately assess how reading ability changed when reading in Standard English and Readable English.

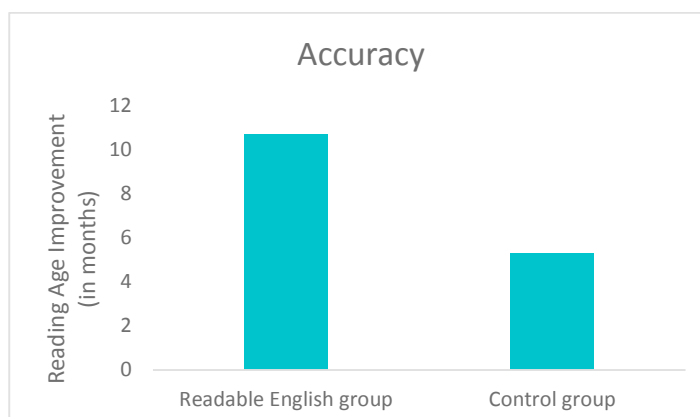
The study design can be explained using the following table:

CONTROL GROUP		REDABLE ENGLISH GROUP	
PRE TEST	POST TEST	PRE TEST	POST TEST
GORT (Test A)	GORT (Test B)	GORT (Test A)	GORT (Test B)
Neale (Test A)	Neale (Test B)	Neale (Test A)	Neale (Test B)*
Attitude Survey	Attitude Survey	Attitude Survey	Attitude Survey

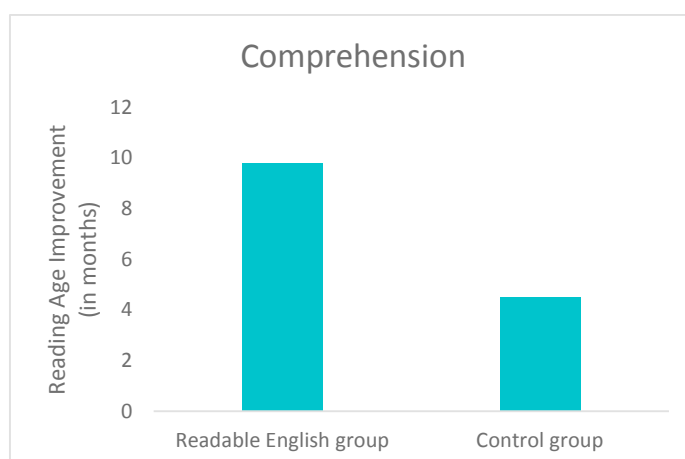
\*test conducted with Readable English amendments (i.e. syllable breaks, glyphs and greyed out characters)

**The results showed conclusively that Readable English had improved the reading ability of the students who learnt it.**

Over the course of the four month experiment, the control group's *accuracy* reading age increased on average by 5.3 months, as would be expected. The Readable English group initially did the Neale accuracy test using Standard English, then Readable English in the post test period. Their *accuracy reading age* had increased by 10.7 months in the same period - twice the rate as the control group. The difference between these figures was statistically significant.

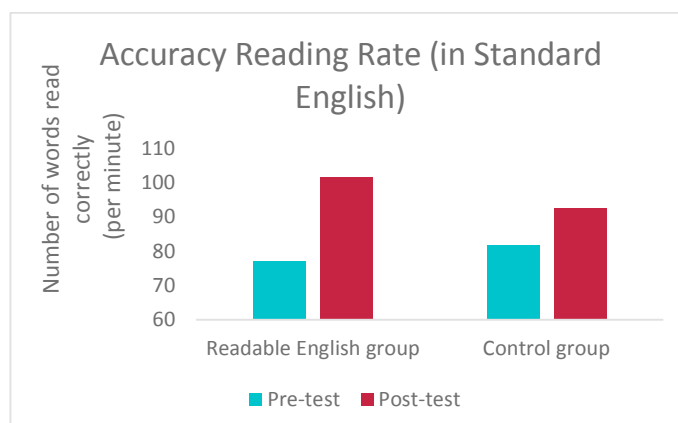


The improvement in *comprehension* followed a similar pattern: the control group improved their comprehension reading age by 4.5 months, and the Readable English group doubled this (9.8 months). The difference between these figures was also statistically significant.



There was no significant difference between the groups for changes in reading rate.

**To test whether Readable English training improves Standard English reading, we tested both groups with the passages from the GORT, using Standard English.** Again, both groups showed improvement in fluency over the test period, with the Readable English group improving at twice the rate of the control group. In the post test, the Readable English group read 25 more words correctly per minute than before training, compared to an improvement of 11 more words correct per minute in the control group. The difference in improvement between the groups was also statistically significant.



There was no difference in error rates between the two groups. This is not surprising, because these were very low to start.

Attitudes towards reading remained high for both groups throughout the study. As a result, there was no significant difference between the groups in changes in attitude, from the attitude survey. Importantly, no students reported worse attitudes following training in Readable English.

## 13. Teaching Reading Using Readable English

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Successful reading programs often stimulate visual, auditory, and kinaesthetic pathways simultaneously. They are implemented step-by-step, with lots of repetition and progression through more complex exercises. This structure allows students time to integrate skills and knowledge as the course progresses. The Readable English teaching structure adopts these principles.

### Motivation

English is hard to learn to read – even for those who excel at it. It takes a huge amount of effort, intentional practice and perseverance to master the thousands of spelling and pronunciation exceptions in common words. It is common for struggling readers to avoid reading tasks. They often think that their difficulties are due to a personal failing, feeling humiliated and frustrated when they stumble awkwardly through passages. Some struggling readers believe that they are stupid and many become resigned to the belief that they will never read.

For this reason, the Readable English teaching process starts by explaining why English is so hard to learn, and how Readable English makes reading easier. This introduction is designed to convince students that their difficulties 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. The inclusion of games in learning has long been recognised for their ability to improve learning outcomes [46]. To maintain motivation and provide additional stimulation, each lesson includes game components. Readable English has been designed to provide students with lessons that challenge them appropriately, which means that if they make a reasonable effort, they are likely to succeed. Being able to master new information consistently helps to alleviate negative views they have about their abilities, helping them to relax. As students relax, their stress levels should drop, which in turn increases their capacity to learn.

### Flexible learning

We structured the Readable English learning program to be flexible or structured – so it can meet the needs of different learners. It allows students to learn by themselves in an organic way, or through a step-by-step online program. Readable English can be integrated into the classroom and can also be used as a reading practice tool that allows teachers and parents to monitor progress. Regardless of the pathway, learners complete fun, stimulating exercises to maintain motivation.

## A step-by-step approach

The step-by-step program starts with videos of Standard English letter-sound associations, teaching them the most usual sound a letter makes. These videos assist students to correct their pronunciation by mirroring the mouth shape and tongue position. There are games that improve auditory discrimination and pronunciation, which flow into quizzes on consonant, vowel and digraph sounds. Once these skills are mastered, students are introduced to the most common single syllable words.

At this point, syllable breaks, silent letters and the Readable English glyphs are introduced. This is done in a gradual manner, starting with individual characters and glyphs, then syllables and words. Each glyph has a fun introductory video that reinforces the glyph name, sound and shape. The *Choose or Lose* game helps students practise how well they know what sound each character and glyph makes, and having just one sound per character reduces the cognitive load for students while learning.

The cognitive load on students is further reduced because Readable English does not require the teaching of syllabification or word attack skills, as syllable breaks are displayed to students in the word. Once sight-word recognition is achieved, syllable breaks are no longer needed. We have observed that many students pick up accurate word attack skills as a result of reading words marked up in Readable English suggesting that syllabification in Readable English is a biologically primary learning function. A similar reduction on cognitive load is achieved with the display of greyed out silent characters.

When sound/symbol association is mastered, students then learn the sounds of common syllables and words, developing auditory discrimination and sight-word recognition at the same time. This is an efficient approach that again reduces cognitive load. There are 13,802 words in the Readable English database that are made up of combinations of the 500 most common syllables, so students learning the 500 most common syllables can easily decode the sound of over 13,000 words.

## Building on the foundations

Once a student has become proficient enough to read multi-syllable words, they move onto phrases, sentences and paragraphs. Progression through stages must happen only once the student has mastered the previous one. This ensures that the cognitive load of the next level is manageable, and they can focus on comprehension.

## The importance of reading practice

Many people believe that intelligence is genetically determined - that we are either born smart or are born dumb. This belief is a *fixed* mindset, perception that people hold about themselves. People with a fixed mindset believe that talent or intelligence is something we are born with and that is just how things are. They usually fail to live up to their potential because they avoid challenges, give up easily on things, see making an effort as a waste of time, and ignore useful, critical feedback.

The people who have done best academically and in their lives are people who are not afraid to make mistakes. These people have a *growth* mindset, as they understand that intelligence is developed, that the brain grows when learning, making us smarter. Those with a growth mindset embrace challenges, persist despite setbacks and see effort as the path to mastery, learning from errors and criticism. They don't see mistakes as failures, but as signs there is simply more to be learned. Because of this attitude toward learning, they are not afraid to challenge themselves. And they practice at getting better at what they are learning. As a result they reach higher and higher levels of achievement. As they improve, a positive feedback loop is created which encourages them to keep learning and improving [74].

Students who have growth mindset do better than students who don't. In one study it was found that students who understood the growth mindset put in more effort and were more engaged [75]. Science has shown time and time again that our brains can change – that is they have plasticity. This means that intelligence is malleable and the brain grows from experience. If we spend time learning, the brain reprograms itself to become better at learning, creating a positive feedback loop. “Experience influences myelin formation and that the resulting myelin supports learning and improvement of skills” [76].

Scientific research is also showing that the innate abilities you were born with don't determine your eventual skill –how consistently and deliberately you work to improve your performance does. The key here is that the learner engages in *deliberate practice*, which means engaging in a structured activity with the specific goal of improving performance. Deliberate practice includes four essential components [77]:

1. There should be motivation and willingness to exert effort to improve performance
2. The task that is practiced should be designed for current skill level based on pre-existing knowledge
3. Immediate feedback on performance should be given for efficient learning
4. Tasks should be repeated

## Independent reading practice

Studies have also shown that independent reading practice is the necessary key to building vocabulary, fluency, comprehension, writing and higher order thinking skills [78]. The OECD Programme for International Student Achievement (PISA) did a study of 174,000 15-year-old pupils in 32 countries and found that time spent reading books is the best single predictor of academic achievement, more highly correlated than even socioeconomic status or ethnicity [79].

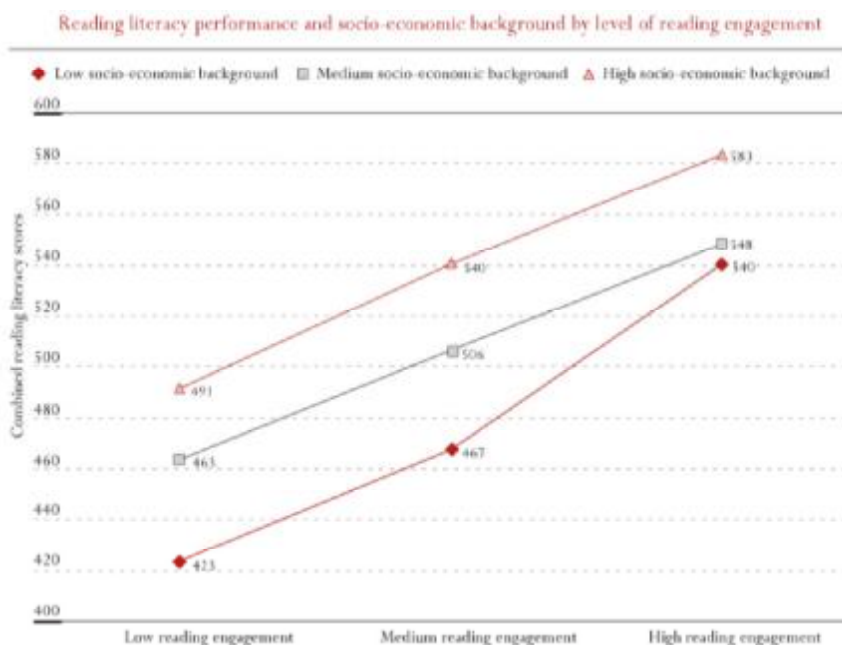
The cumulative benefits of extended reading practice become clear when you do some simple maths. Someone who does 20 minutes reading practice a day will be exposed to 1,800,000 words over the course of primary school – versus someone reading for 5 minutes a day, who will be exposed to only 282,000 words. This equates to having spent 60 whole school days reading, versus 12 school days for those who read only 5 minutes a day [80].

Like any other skill, reading develops through practice. Readable English supports students to practice reading independently, and provides the essential components of *deliberate practice*. Readable English starts with teaching students about the Growth Mindset and the importance of practice. We outline the complexities of the English language in videos, so that students understand learn how these complexities make English a difficult language for everyone.

The Readable English Learning Platform provides students with videos and games to hone their basic skills, including sound-symbol association, auditory

discrimination and phonemic awareness. The games are fun and only move onto harder tasks once the student has mastered the foundation skills. Students also receive immediate feedback on their performance. This helps students to stay motivated to do enough practice to develop the automaticity needed for fluent reading. Sufficient reading passages and comprehension tasks are provided at varying levels of difficulty, to enable learners to do a minimum of 20 minutes of daily practice.

The eReader has been designed to facilitate on-going reading practice. It allows students to control the way text is displayed, hear the sound of any word or passage and access definitions easily, so that they can practice independently at their own pace. Students can also import materials allowing them to practice reading what they really want to read. Parents and teachers can also monitor how much time their students are spending practicing. Daily reading practice is optimal for the brain to reprogram itself to learn to read. When we can read, we are empowered to learn what we want to learn.



Source: OECD PISA database, 2001, Table 5.9.



## 14. Our Hope for Readable English

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Ultimately, our greatest ambition for Readable English is to stop the cycle of illiteracy.

Our research has shown that Readable English helps students learn twice as fast – for all students, not just those who were struggling. Imagine not having to spend years learning the multitude of rules to decode words and the thousands of exceptions that go with them. Imagine how much more time would be available for both teachers and students to get on with learning about the world around us. We believe that the achievement gap can largely be addressed by “fixing” the English language and making it easier to learn to read.

## Appendix 1 – The Readable English Tools

### Learn

The Learn feature of the website is where students can quickly and easily learn Readable English. It includes a Learning Portal with:

- twelve 15-minute lessons for learning the Readable English system and the sounds of English, with:
  - videos
  - games
  - pronunciation practice
  - reading practice
  - comprehension games
  - the 1000 most common words in English
- 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

### Introduction to Readable English

Lesson 10: Sharp Hat, Treasure Chest, Wonder One

What the colours mean:

● You're done! ● In progress ● To do

◀ BACK

▶ NEXT

A Watch

B Play

C Pronounce

D Play

E Read

F Review

t	✓
ac <sup>^</sup> t <sup>o</sup> n	✓
frac <sup>^</sup> t <sup>o</sup> n	✓
s̄	✓
mea <sup>~</sup> s <sup>u</sup> re	✓
mea <sup>~</sup> s <sup>u</sup> re <sup>~</sup> ment	✓
ó	✓
ón <sup>e</sup>	✓
ón <sup>ç</sup> <sup>e</sup>	✓
s <sup>o</sup> me <sup>o</sup> ón <sup>e</sup>	✓

frac<sup>^</sup>t<sup>o</sup>n

1 Listen

2 Record this word

3 Play your recording

**Glyph**

t<sup>^</sup> Sharp Hat

o<sup>~</sup> Upper Cup

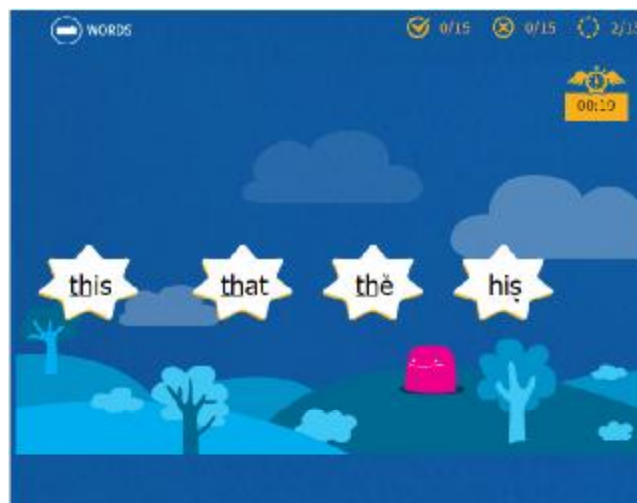
## Play

Play while learning to read! The Readable English games are available on the website and as apps. They teach and develop specific reading skills while keeping students engaged and cumulatively building upon their knowledge. The three most popular games are:

### Choose or Lose

The goal of this game is 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:

- sound-letter 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 1000 most common syllables in English
- sight recognition of the 1000 most common 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:

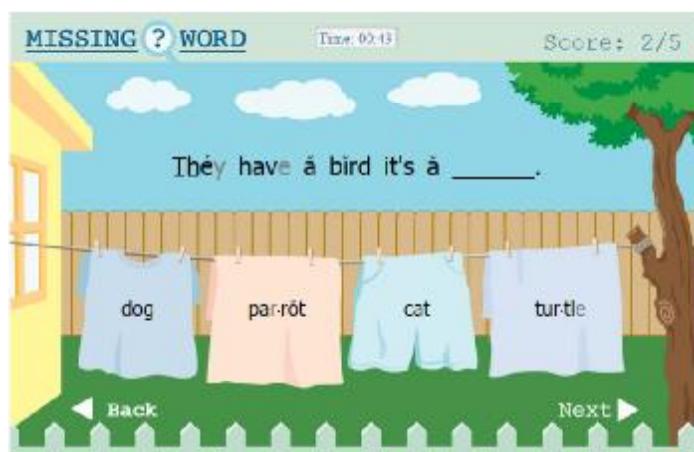
- phonemic awareness - the ability to discern the sounds and the sequence of sounds in a word
- auditory discrimination of vowel sounds, initial blends and ending blends
- word segmentation and blending - the ability to segment a word into its individual sounds and then blend the sounds together for whole word reading



## Missing Word

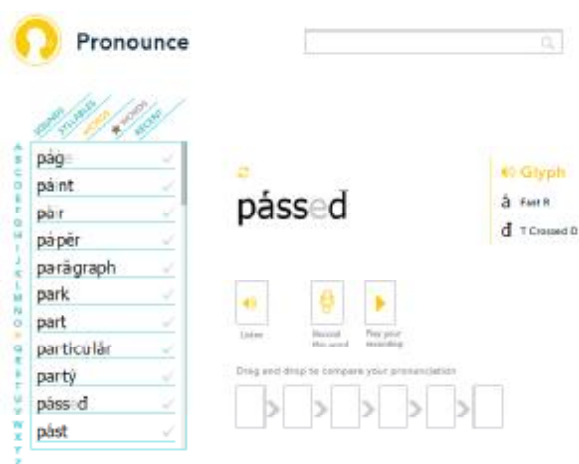
Students read a sentence with a missing word and have to choose the correct word from four options to complete the sentence. The game develops:

- reading comprehension
- vocabulary
- word attack skills – the ability to make sense of a new word in context
- higher order thinking skills – the 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



## Pronounce

The Pronounce tool was specifically developed for English Language Learners to help them practise and improve their pronunciation. Available on the website, users can:



- select an American or Australian accent (British coming soon)
- practise pronouncing any word in English and compare their recording to a native speaker
- hear their pronunciation compared to the native speaker's in quick succession with customisable playback
- practise pronouncing the individual sounds of English
- practise pronouncing the 1000 most common syllables in English
- practise pronouncing the 1000 most common words in English
- save sounds, syllables or words 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
- written instructions including tongue and lip placement for how to make specific sounds

## Search

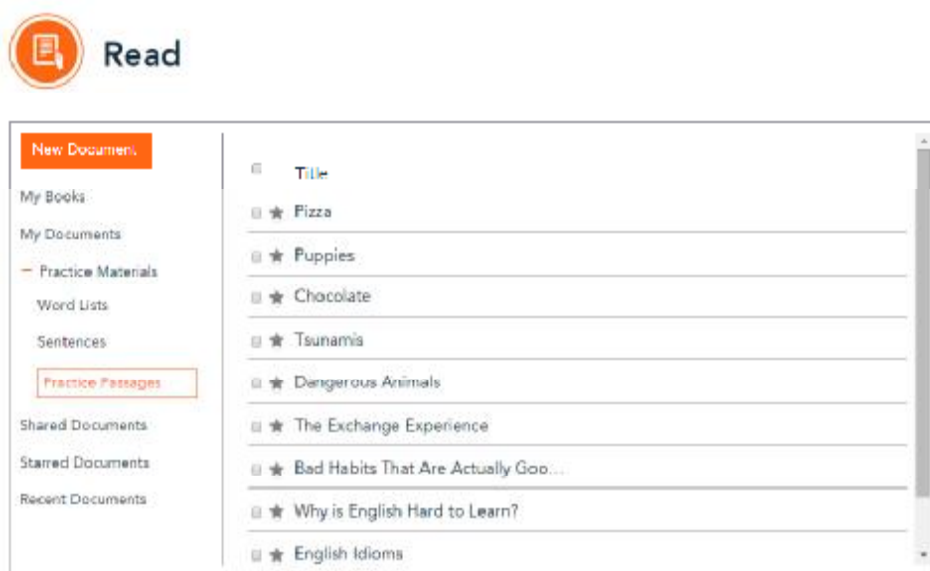
The Search tool is our online Readable English dictionary. It allows students to look up and learn words via the website or the app. Users can look up words in Readable English and can learn new words with Word of the Day. For each word users can:

- see the definition
- see the translation in different languages
- hear the whole word or by syllable
- toggle the word between Readable English to 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



## Read

The Readable English eReader is an accessible reading tool that offers a full range of customisable features, allowing readers to read documents and books in individually optimised formats. Through the Readable English mobile-compatible website, readers can read what they want to read or use the practice materials and books provided on the website.

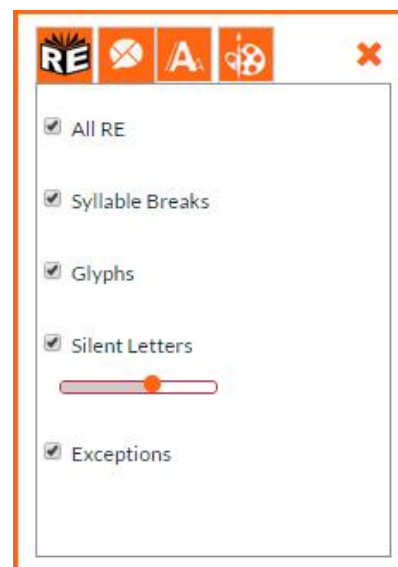


### Customisable Features:

- Font size
- Word spacing
- Line spacing
- Line length (short lines)
- Paragraph indents
- Font colour

### Additional Tools:

- Text-to-speech with synchronised highlighting
- Word definition and translation
- Audio of full word and by syllable
- Star words to add to favourites list
- Word search functionality



### Readable English Features:

- Words can be shown di-vi-ded in-to syl-la-bles
- Silent letters may be greyed out – e.g. *though, limb, knight*
- Visual cues can be added to letters to indicate how they are pronounced when they do not make their usual sound
- All Readable English features can be used si-mul-ta-ne-ous-ly, or can be turned on/off for specific words and entire documents
- Parts of speech can be shown in colours
- Prefixes and suffixes can be shown clearly in colours
- Digraphs (two letters that make one sound) can be shown in colours
- Last but not least, idioms and phrasal verbs can be pointed out in colours

### Readers can:

- Upload, edit, and save their own documents
- Convert personal documents into Readable English
- Share documents with other readers
- Read provided practice materials - word lists, sentences, practice passages
- Purchase books in Readable English from the Readable English Book Store

## Book Store

Users have access to the full functionality of the eReader when reading books purchased from the Readable English Book Store. This includes all the accessibility features and the ability to read in Standard or Readable English.



## Usability

The Readable English website and Apps can:

- Run on all devices: smart phones, tablets and PCs
- Be integrated into a classroom and used by individuals learn at home
- Import documents into Readable English and share them between readers
- Allow readers to personalise the format of the display so that it suits them
- Log student activity to collect data for research into English learning and teaching

## Appendix 2 – Readable English Sample Text

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The Man From Snowy River

By A. B. Banjo Paterson.

There was movement at the station, for the word had passed around

That the colt from old Regret had got away,

And had joined the wild bush horses - he was worth a thousand pound,

So all the cracks had gathered to the fray.

All the tried and noted riders from the stations near and far

Had mustered at the home-stead overnight,

For the bush-men love hard riding where the wild bush horses are,

And the stock-horse snuffs the battle with delight.

There was Harryson, who made his pile when Pardner won the cup,

The old man with his hair as white as snow;

But few could ride beside him when his blood was fairly up

He would go wherever horse and man could go.

And Claney of the Over-flow came down to lend a hand,

No better horse-man ever held the reins;

For ne·vēr horse cōuld thrōw him whīle thē sad·dle gīrths  
wōuld stand,

Hé lēarnt tō rīde whīle drō·ving on thē plāins.

And óne wās thēre, ā strip·ling on ā smāll and wēe·dý  
béast,

Hé wās sōme·thing līke ā ráce·horse un·dēr·sized,

With ā touch of Tí·mor pô·ný - thrée parts  
thō·rough·bred at léast -

And such aš are bȳ moun·tain horse·men prīzed.

Hé wās hard and touġh and wī·rý - just thē sort thāt  
wōn't sáy dīe

Thēre wās cou·ráge in hīš quick im·pá·tīent tread;

And hé bore thē badge of gáme·ness in hīš brīght and  
fīe·rý eȳe,

And thē proud and lof·tý car·riage of hīš head.

But still sō slīght and wēe·dý, óne wōuld doubt hīš  
pow·ēr tō stáy,

And thē ôld man sáid, "Thāt horse will ne·vēr dō

For ā long ā tī·ring gal·lōp - lad, yōu'd bet·tēr stop  
ā·wáy,

Thōše hīlls are far tōo rouġh for such aš yōu."

So hé wáited sad and wist·fūl - ôn·lȳ Clan·gý stōod hīš  
friend -

"I think wē óught tō let him cōme," hé sáid;

"Ī wār·rānt hé'll bé with us when hé's wān·ted at thē  
end,

For bōth hiş horse and hé are moun·tain bred.

"Hé háilş from Snōw·ý Ri·vēr, up bȳ Ko·şcī·us·kō's sīde,  
Where thē hillş are twīge aş stēep and twīge aş rouġh,  
Where ā hor·se's hōofs strīke fīre·līght from thē flint  
stōneş eve·rý strīde,

Thē man thāt hōldş hiş ōwn iş gōod ě·nouġh.

And thē Snōw·ý Ri·vēr rī·dērş on thē moun·tains máke  
their hōme,

Where thē ri·vēr runş thoşē gī·ānt hillş bē·twēen;

Ī have sēen fūll mǎ·ný horse·men sinġe Ī fīrst  
cōm·menġed tō rôam,

But nô·where yet such horse·men have I sēen."

Sô hé went - théy found thē hor·seş bȳ thē big  
mi·mō·sǎ clump -

Thēy ráced ā·wáy tō·wārdş thē moun·tain's brow,

And thē ōld man gáve hiş or·dērş, "Boys, gō at them  
from thē jump,

Nô use tō trȳ for fan·ġý rī·ding now.

And, Clan·ġý, yōu must whēel them, trȳ and whēel them  
tō thē rīght.

Rīde bōld·lý, lad, and ne·vēr féar thē spillş,

For ne-ver yet was ri-der that could keep the mob in  
sight,

If once they gain the shel-ter of those hills."

So Clan-gy rode to wheel them - he was ra-çing on the  
wing

Where the best and bol-dest ri-ders take their place,  
And he ra-çed his stock-horse past them, and he made  
the ra-çes ring

With the stock-whip, as he met them face to face.

Then they hal-ted for a mo-ment, while he swung the  
drea-ded lash,

But they saw their well-loved moun-tain full in view,  
And they charged be-neath the stock-whip with a sharp  
and sud-den dash,

And off in-to the moun-tain scrub they flew.

Then fast the horse-men fol-lowed, where the gor-çes  
deep and black

Re-çoun-ded to the thun-der of their tread,

And the stock-whips woke the e-çoes, and they fierçe-ly  
an-swered back

From cliffs and crags that be-tled o-ver-head.

And up-ward, e-ver up-ward, the wild hor-ses held their  
way,

Where moun-tain ash and kur-ra-jong grew wide;



And thé ôld man mut-tered fiérce-ly, "Wé máy bid thé  
mob gōod dáy,

Nô man can hōld them down thé ô-thēr sīde."

When théy réachēd thě moun-tain's sum-mit, é-ven  
Clan-çý tōok ā pull,

It well mīght máke thě bōl-dest hōld their breath,  
Thě wīld hop scrub grēw thick-ly, and thě hid-den  
ground wās fūll

Of wom-bat hōlēş, and ā-ny slip wās death.

But thě man from Snōw-ý Ri-vēr let thě pō-ný have hiş  
head,

And hē swung hiş stock-whip round and gáve ā chēer,  
And hē ráçēd him down thě moun-tain līke ā tor-rent  
down its bed,

Whīle thě ô-thērş stōod and wātchēd in ve-rý féar.

Hé sent thě flint stōnes flý-ing, but thě pō-ný kept hiş  
féet,

Hé cléared thě fāl-len tim-bēr in hiş strīde,

And thě man from Snōw-ý Ri-vēr ne-vēr shif-ted in hiş  
séat -

It wās grand tō sée that moun-tain horse-mān rīde.

Thróugh thě string-ý-barks and sap-lingş, on thě rouġh  
and brō-ken ground,

Down thě hill-sīde at ā rá-çing páçe hē went;



And h  ne-v r dr w th  br -dle till h  lan-ded s f  and  
sound,

At th  bot-t m of th t ter-ri-ble d -scent.

H  w s r ght  -m ng th  hor-se   s th y cl mbed th   
fur-th r hill,

And th  wat-ch r  on th  moun-tain stan-ding m te,

S w him pl y th  stock-whip fi rce-l y, h  w s r ght  
 -m ng th m still,

 s h  r c d  -cross th  cl ar-ing in pur-suit.

Th n th y lost him for   m -ment, wh r  tw  moun-tain  
gul-li   met

In th  r n-g  , but   f -nal glimpse r -v   

On   dim and dis-t nt hill-s de th  w ld hor-se  r - ng  
yet,

With th  man from Sn w-  Ri-v r at th ir h   .

And h  ran th m sin-gle-h n-ded till th ir s de  w r   
wh te with f  m.

H  fol-l wed l ke   bl od-hound on th ir track,

Till th y h l-ted c w d and b  -ten, th n h  turned th ir  
head  for h   ,

And  -l    and un- -sis-ted br ught th m back.

But hi  har-d y moun-tain p -n y h  c  ld sc r e-l y r        
trot,

He wās blōd from hip tō shōul·dēr from thē spur;  
 But hiş pluck wās still un·dāun·ted, and hiş cou·rāge  
 fīe·rý hot,  
 For ne·vēr yet wās moun·tain horse ā cur.

And down by Ko·ścí·us·kô, where thē pīne·clad rid·geş  
 ráiše  
 Thēir torn and rug·ged bat·tle·ments on hīgh,  
 Where thē āir iş clēar aş crýs·tal, and thē whīte starş  
 fāir·lý blāze  
 At mid·nīght in thē cōld and fros·tý ský,  
 And where ā·round Thē Ô·vēr·flōw thē réed bedş swēep  
 and swáy  
 Tō thē brée·zeş, and thē rôl·ling pláinş are wīde,  
 Thē man from Snôw·ý Ri·vēr iş ā house·hōld wōrd  
 tō·dáy,  
 And thē stock·men tell thē stor·ý of hiş rīde.



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# The Silent Epidemic

The Impact of Illiteracy on Health

**The cost of illiteracy to the global economy is estimated at US\$1.19 trillion**

- World Literacy Foundation



# The effects of illiteracy include:

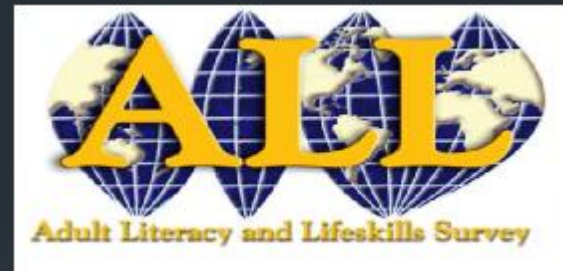
- World Literacy Foundation

- § Limited opportunities for employment or income generation
- § Dependence on social welfare or charity
- § Turning to crime
- § Higher chances of poor health



**46% of the Australian  
population is functionally  
illiterate.**

Australian Bureau of Statistics 2006



# What is functional illiteracy?



The term *functional illiteracy* applies to adults who read, write, and understand material at less than the fifth grade level.

“...a person may be able to read and write simple words, but cannot apply these skills to tasks such as reading a medicine label, balancing a checkbook, or filling out a job application.”

- [www.proliteracy.org](http://www.proliteracy.org)

# Cost of Illiteracy in Social Terms:




## Education and the role of the family

- § When parents are uninvolved in their children's education, young students are more likely to:
  - § Display behavioral problems,
  - § Get poor school results
  - § Repeat school years
  - § Drop out of school
- § Illiterate parents cannot read to their children, nor encourage a love of learning
- § Children from the poorest homes are almost a year behind their middle class counterparts by the time they start school
- § Word Poverty

The Economic & Social Cost of Illiteracy

Interim Report from the World  
Literacy Foundation Jan 2012



Children from low income families on average hear **32 million** fewer words than the average middle class child.

- Betty Hart, PhD & Todd Risley, PhD

Louisa C. Moats Ed.D. termed this  
**“Word Poverty”**

## Impact on children whose parents have poor literacy

- § The family is more likely to have financial hardship, and stress
- § Generational illiteracy - parents can't teach their children to read
- § The children may not be fed a proper healthy diet
- § Parental resignation and despair can affect their children



# Helping People with Dyslexia: A National Agenda

Report to the  
Hon Bill Shorten by Emeritus  
Prof Max Coltheart,  
Macquarie University et al  
January 10, 2010

§ Research has shown that such [dyslexic] children are at serious risk of mental health difficulties, especially depression. Juvenile delinquency is more common amongst such children, as is dropout from school and unemployment. (Australian Bureau of Statistics)

§ **People with poor literacy are less responsive to health education and use of disease prevention strategies, are less able to manage chronic disorders such as diabetes and asthma, and incur significantly higher health costs.**

§ All these personal costs of dyslexia explain why a significantly higher proportion of people with dyslexia are likely to attempt suicide than adolescents with normal reading.

§ **...The National Health and Reform Commission has identified that strengthening functional literacy is a key strategy to improving health outcomes in Australia.**

# Cost of Illiteracy in Social Terms:



## Crime

- § Studies show that a majority of prison inmates have poor literacy skills.
- § Amongst juvenile delinquents, up to 85% are functionally illiterate.

The Economic & Social Cost of Illiteracy

Interim Report from the World Literacy  
Foundation Jan 2012

# Cost of Illiteracy in Social Terms:



## Welfare

- § Illiterate people are more likely to be on welfare or unemployment benefits having dropped out of school or being unable to find work
- § High school dropouts are 3 times more likely to receive welfare than high school graduates

The Economic & Social Cost of Illiteracy

Interim Report from the World Literacy  
Foundation Jan 2012

# Cost of Illiteracy in Social Terms:



## Health

Illiteracy significantly limits a person's ability to access, understand and apply health-related information resulting in:

- § Poor household and personal health and hygiene
- § Poor nutrition
- § Higher rate of disease, accidents, stress and other health issues
- § Raised demand for medical services
- § Causes job absenteeism
- § Increased work related accidents
- § Often leads to permanent disability or death
- § Increased likelihood of adolescent pregnancy

The Economic & Social Cost of Illiteracy

Interim Report from the World Literacy  
Foundation Jan 2012

# Alzheimer's and Literacy



Prof Henry Brodaty AO, MD DSc  
Science of Nutrition in Medicine and Healthcare  
Friday 5 May 2013

§ People from a low education background are more likely to

- § Develop Alzheimer's

- § Develop Alzheimer's earlier in life

§ Delaying the onset of Alzheimer's by 3 years will reduce the number of people with Alzheimer's by around 50%.

# Illiteracy can have major impact on patients' understanding of health care information



Peter P. Morgan, MD, DPH  
Can Med Assoc J 1993; 148 (7)

Everyone is beginning to recognize that people's health depends in part on their ability to read and understand information involving:

- § food labeling
- § prescription medicines
- § over-the-counter medications
- § preventative lifestyle information
- § birth control instructions
- § invitations to immunization clinics
- § warnings on environmental safety

# Mortality from Leading Causes by Education and Race in the US

Ahmedin Jemal MD et al

2001

American Journal of  
Preventive Medicine Am  
J Prev Med 2008;34(1)

- § Potentially avoidable factors associated with lower educational status account for almost half of all death among working-aged adults in the US.
- § These deaths were not confined to any single racial or ethnic group.

# Literacy and Health Outcomes: A Systematic Review of the Literature



Darren A Dewalt MD MPH et al  
J Gen Intern Med 2004;19:12228-1239

- § Patients with low literacy were generally 1.5 to 3 times more likely to experience a given poor [health] outcome.
- § Our systematic review [of the Literature] confirms that low literacy is associated with a range of adverse health outcomes.

# The Silent Epidemic – The Health Effects of Illiteracy

Erin N Marcus MD

New England Journal of  
Medicine 355:4

- § Many physicians and other health care workers remain unaware that their patients may have reading problems.
- § Patients with reading problems may avoid outpatient doctors' offices and clinics because they are intimidated by paperwork.

# Optimize Patient Health by Treating Literacy and Language Barriers



**§ The stigma of illiteracy ... keeps patients from disclosing their limitations.**

Dreger, Vicki et al

AORN Journal Feb 2002 75, 2

# Illiteracy can have a major impact on patients' understanding of health care information



## Physicians' Literacy Checklist

- § Clues to limited literacy often come from a patient's difficulty with intake forms.
  - § Office staff can be alerted to spot limited reading ability and bring it to the physician's attention
  - § Simple printed instructions for common procedures and medications may be a start
  - § Best to be sure that patients suspected of having limited literacy can repeat verbal instructions
- § Entrust the most literate member of a family with the interpretation of written instructions

# The Health Care Experience of Patients with Low Literacy

Baker, DW et al

Arch Fam Med 1996;5:329-34


## Behaviors Suggestive of Inadequate Health Literacy Skills

- § Asking staff for help
- § Bringing along someone who can read
- § Inability to keep appointments
- § Making excuses (“I forgot my glasses.”)
- § Noncompliance with medication
- § Poor adherence to recommended interventions
- § Postponing decision making (“May I take the instructions home?” or “I’ll read through this when I get home.”)
- § Watching others (mimicking behavior)

# Improving Patient Education for Patients with Low Literacy Outcomes


EJ Mayeaux Jr MD et al

American Family Physician,  
January 1996



§ Most physicians tend to give too much information on too high a level for many patients.

§ To be effective with patients whose literacy skills are low, patient education materials should be short and simple, contain culturally sensitive graphics and encourage desired behavior.




## **Optimize Patient Health by Treating Literacy and Language Barriers**

Dreger, Vicki et al

AORN Journal Feb 2002 75, 2

§ Health care providers who can communicate with their patients through multilingual, low literacy patient education materials .... markedly improve the quality of care for their patients and the resulting outcomes.



## **The Impact of Low Health Literacy on Medical Costs of Medicare Managed Care Enrollees**

David J Howard PhD et al

American Journal of Medicine  
2005 118 371-377

§ .. interventions that hold promise for improving health literacy... include educational tools designed specifically for patients with low health literacy,

§ health education programs for students and

§ efforts to facilitate communication between patients and providers.

# The Role of Health Literacy in Patient-Physician Communication



## 6 Steps to Enhance Understanding Among Patients with Low Health Literacy

1. Take the time to assess the patient's health literacy skills
2. Use “living room” language instead of medical terminology
3. Show or draw pictures to enhance understanding and subsequent recall
4. Limit information given at each interaction, and repeat instructions
5. Use a “teach back” or “show me” approach to confirm understanding (e.g., repeat how to take their medication) to ensure that education has been adequate
6. Be respectful, caring, and sensitive, thereby empowering patients to participate in their own health care.

Baker, DW et al

Arch Fam Med 1996;5:329-34

Queensland scientists have developed a cartoon that has led to a dramatic reduction in parasitic worm infection in China.

The scientists credit the success to a simple story told in a fun, yet educational way.

New England Journal of Medicine  
2013; 368:1603- April 2013  
161210.1056/NEJMoa1204885



# Doctors can Promote Literacy




Source: [www.ncbi.nlm.nih.gov/pmc/articles/PMC2795688](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2795688)

- § Have appropriate books and magazines available in the waiting room.
- § Display visual reminders (posters and videos) of parents reading out loud to children.
- § Implement a reading promotion program in your own practice.
- § Encourage parents to watch less television and read more to their children
- § Cultivate strong relationships between parents and medical providers to help parents help their children develop a love for books and reading.
- § Use volunteer readers to demonstrate vividly in the waiting room that reading aloud can be a source of pleasure and entertainment.
- § At office visits, provide parents with resource lists of how to select books that are age-appropriate. Many libraries offer such resources.
- § Encourage visits to local libraries.
- § Tell parents who cannot afford to buy books to consider getting a library card.



**These solutions address the symptoms of illiteracy but what about treating the root cause?**




## The Impact of Women's Literacy on Child Health and its Interaction with Access to Health Services

P Sandiford et al

Population Studies 49(1995) 5-15

Could it be that  
education is sometimes  
a more cost-effective  
intervention than  
increasing access to  
health services?



**“The Government’s position that early literacy interventions are an investment that saves money in the long run is evidence-based.”**

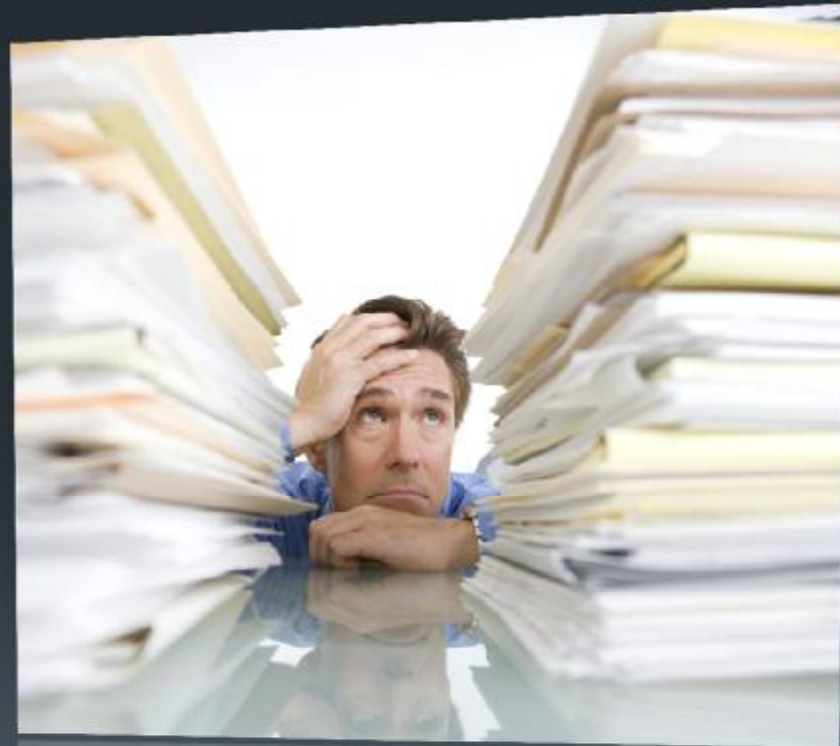
- The UK House of Commons  
Science & Technology Committee  
Report of 19 December 2009



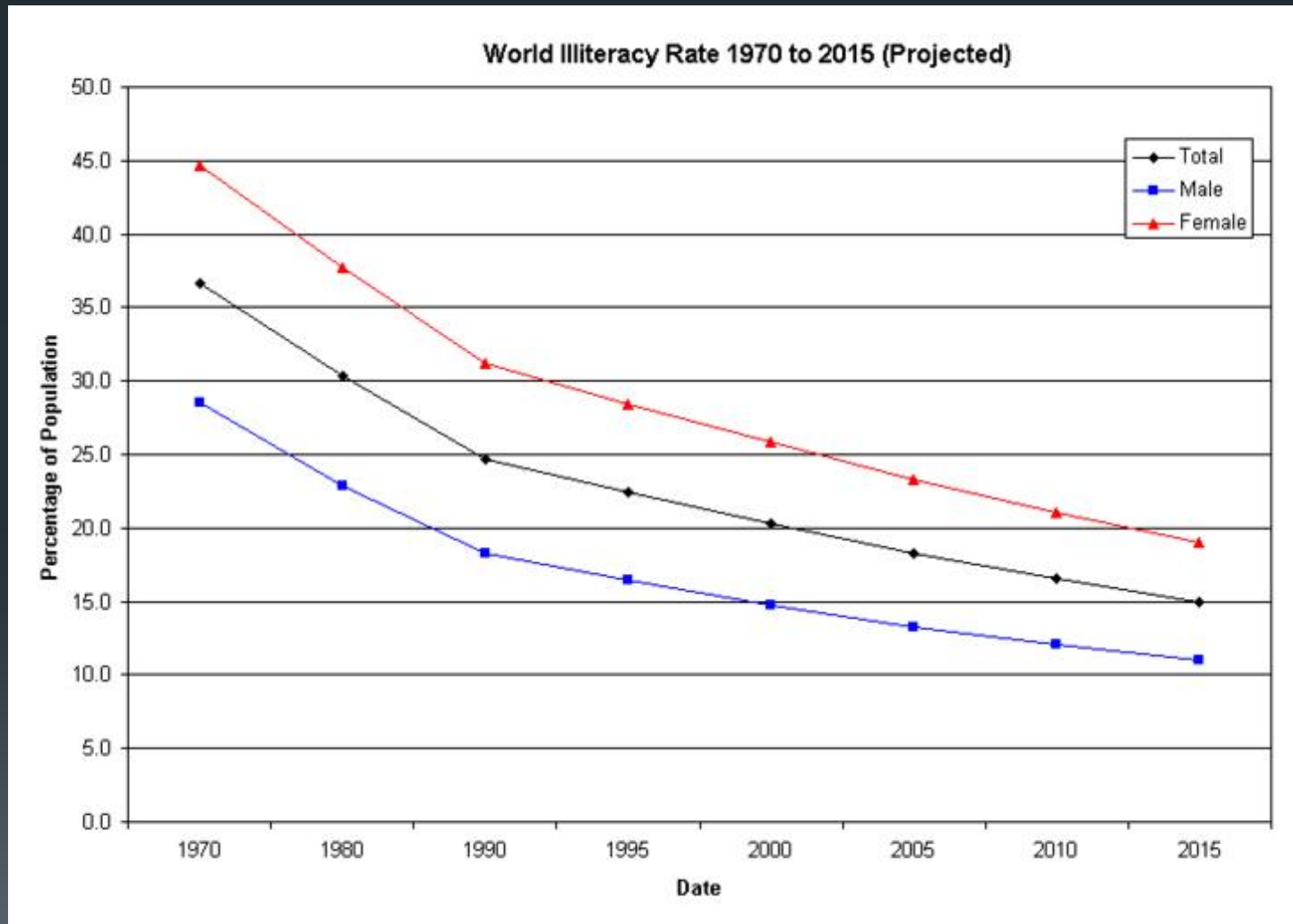
**International Reading Association**

*The World's Leading Organization of Literacy Professionals*

**“...more than one thousand research papers are written each year on the subject of literacy.”**



# Literacy rates remain stubbornly low!






**It can take native English speakers anywhere from 5-10 years of reading practice to become truly proficient readers.**

**Why?**



**“One of the main causes for illiteracy is the highly erratic spelling system of the English language.”**



One must learn multiple rules and literally  
**thousands of exceptions** just to be able to  
read the common words of English.

In other words,

**English is Complicated!**

# Contrast English with Italian

Italian kids learn to read –  
decode the sounds of  
Italian words – in only 3 – 6  
months

**Why?**

Because Italian is  
*phonetic*





**What if English could be as  
easy to learn as Italian?**

# What if English was Phonetic?



**English would be one of the simplest languages to learn because of its:**

- 1. Simple sentence construction and word order**
- 2. Simple verb tenses and usage (I, you, we, they walk - he/she/it walks)**
- 3. Simple declension rules (I – me; those – them)**
- 4. Simple Grammar**
- 5. In English, biology determines the sex of words – biological male is male, biological female is female, everything else is neuter**



**What if you could have a  
pronunciation guide built  
right into each word to help  
you read it?**



**That's exactly what we've done!**

***Readable English*** makes over 99%  
of the words in English phonetic –  
without changing the spelling!

### 3 Simple Steps

1. Words are broken into syllables

am·mu·ni·tion

2. Silent letters are greyed out

daughter

3. “Glyphs” are used to tell you exactly what sound each letter will make

möön



**Learning to read should be easy and fun!**

**International Phonetic Alphabet:**

'lərnɪŋ tə 'ri:d kən 'bi: 'i:zi: ənd 'fən!

**Readable English:**

Lĕar·ning tō read can bē ēa·şŷ and fun!



# Phonetic Languages

Students learning to read phonetic languages, such as Italian, Spanish, Hungarian and Finnish learn the languages more quickly and have a higher rate of literacy than do students learning non phonetic languages.

Prof Stanislaus Dehane  
Reading in the Brain, Penguin, 2011

Initial small tests using Readable English showed learning rates similar to the learning rates of phonetic languages.

# Dealing with Negative Self Images



Prof Carole Dweck, Stanford University  
Mindset: The New Psychology of Success, Random House

- § Most people who can't read want to read, but many are convinced they never will and that there is something wrong with them
- § These people won't try to read unless the belief that they cannot read is challenged
- § The belief that IQ is fixed is debunked using videos:
  - § Modern brain science and brain plasticity – if you practice you WILL improve
  - § Students who are praised for being bright do not want to take on challenging tasks in case they fail as their “bright” image is challenged
  - § Students who are rewarded for effort are better able to deal with failure – it is not a personal deficiency – there is simply more to learn

# Motivating Students to Practice



## § Reading practice is essential

- § Every good reader has spent a lot of time practicing reading

## § Explain in videos that everyone can understand

- § Complexities of English

- § How Readable English overcomes these complexities

- § Challenge negative self images

## § Design for Success

- § Simple lessons

- § Online feedback to students, teachers and parents

## § Let students import and read what **THEY** want to read e.g.

- § Facebook, Twitter so they can feel included?

- § Driving manuals to get a driving license?

# **SUMMARY**

## **Impact of Poor Literacy on Society**



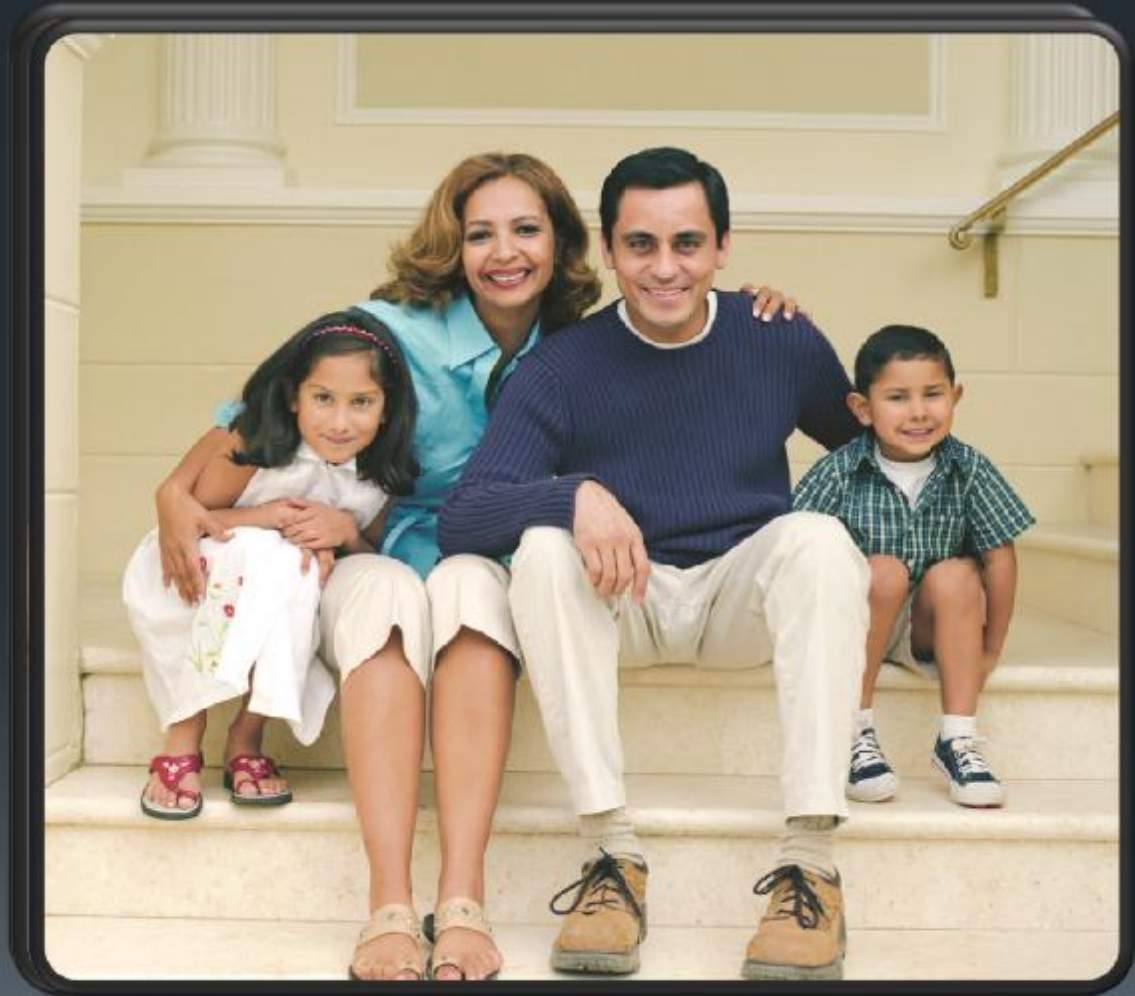
- § Unemployment**
- § Limited productivity in the workplace**
- § Increased workplace accidents**
- § Dependence on Social Services**
- § Increased incarceration**
- § Increased health costs**
- § Poor disease prevention strategy results**
- § Poor mental health**
- § Poor nutrition**
- § Poor health**



Literacy is a fundamental right and a spring board, not only for achieving education for all, but also for eradicating poverty, and for broadening participation in Society.

# Studies have shown the far-reaching benefits of literacy

- § Increased economic prosperity
- § Greater social equality and
- § Better health





**Readable English** is a treatment for illiteracy

**Let's get people reading,  
for everyone's sake!**

# Announcing the First Large Scale Online Test of Readable English

- § An online test of the new Readable English Learning Portal will commence on Monday, 1<sup>st</sup> July 2013 and will continue for 3 months
- § Up to 1000 struggling English readers will be recruited as participants
- § Participants will need PC, Mac, Apple iPad or Android tablet plus connection to the internet
- § Participants will be required to:
  - § Complete an online survey about their native language, education level etc. and a short online reading test before using the Portal
  - § Complete a short online reading test and short survey each month
  - § Be available for up to 2 online or phone interviews
- § Participants who use Readable English regularly over the 3 month test will be offered a free subscription for one year

