# SureSpell - Teaching Dyslexic Children Language Skills

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The word *dyslexia* has a Greek origin and means *difficulty with words*. It covers a number of more specific conditions which often manifest themselves as difficulties in reading, writing and particularly spelling. Dyslexia often overlaps with other learning difficulties such as spoken language, motor skills, autistic spectrum disorder, Asperger's syndrome and behavioural problems.

According to the British Dyslexia Association (BDA), about 10% of the population are dyslexic to some extent, with about 4% of the population being severely dyslexic, meaning they need specific help to overcome their dyslexia.

In recent years, dyslexia and related conditions have become more widely diagnosed and serious research has taken place with a view to understanding the condition and helping those it affects. Whilst much progress has been made, there is still much that remains unknown about the condition.

Dyslexia affects people of all abilities and from all backgrounds, though three to four times as many males are affected as are females. It is known to be a genetic condition in which the brain processes language information differently. Dyslexic people can be very intelligent, and may possess distinctive strengths along with the distinctive difficulties associated with dyslexia.

The BDA categorises the following difficulties that many dyslexics experience:

- Reading hesitantly.
- Misreading, making understanding difficult.
- Difficulty with sequences, for example getting dates in order, remembering the letters of the alphabet, the days of the week, multiplication tables and the order of letters in words.
- Poor organisation or time management.
- Difficulty organising thoughts clearly.
- Erratic or bizarre spelling.

And the following strengths:

- Innovative thinkers.
- Excellent trouble shooters.
- Intuitive problem solving.
- Creative in many different ways.
- Lateral thinkers.

### Famous dyslexics

Dyslexia need not be a handicap. The following well known people have succeeded in spite of, or perhaps because of their dyslexia;

- Albert Einstein
- Leonardo da Vinci
- Thomas Edison
- Alexander Graham Bell
- Winston Churchill
- George Washington
- Thomas Jefferson
- John F. Kennedy
- Hans Christian Andersen
- Richard Branson
- William Hewlett
- Steve Redgrave
- John Lennon
- Robin Williams
- Pablo Picasso

### The other side of the coin

Dyslexics often find that traditional teaching methods do not suit their needs and thus they may perform badly at school. This can also lead to social problems. Studies have suggested that the writing skills of 80% of the prison population of the UK are below those expected of an eleven year old. The corresponding figures for reading ability and numeracy are 50% and 65% respectively. Whether or not this can be largely or even partially attributed to a greater then expected number of dyslexics being found among the prison population is still a matter of some debate but what is clear is that the education of many dyslexics is suffering because their brain physiology has a predilection towards methods of learning other than those commonly found in schools.

Most people with dyslexia learn best when they are able to see the whole picture, but traditional teaching methods teach details. Dyslexics will usually learn best by using their kinesthetic senses (touching, feeling, tasting), before their visual and aural senses. In contrast they will typically be taught exactly the other way around, first aurally, then visually and then maybe kinesthetically.

## 17.1 DysCypher

My parents run the Farnborough Dyslexia & Learning Centre which aims to help those with dyslexia and related conditions improve their language skills. My mother is a fully qualified special educational needs consultant, and my sister has a BSc in Speech Science from University College London. Some of my family members have been diagnosed with dyslexia.

The brain works by making neural connections. Small babies hear sounds and copy them by trial and error. This process first makes and then reinforces the neural connections. The centre follows a system of teaching which is based on a multi-sensory repetitive technique designed

to develop the cerebellum, connect or reconnect the neural pathways in the brain and improve memory and organisational skills.

The idea is to use as many senses as possible in the teaching process. The words and letters are seen on the screen, they are heard being read out, the students say them out loud as they type them and they feel the keys as they type. The students are encouraged to touch type, but the keyboard is colour coded to help those who have not yet mastered that skill. (The students are not encouraged either to lick or smell the computers.)

Exercises range from the simple, such as *MY MUM IS FUN*, to the complicated where a number of exercises follow a particular theme, each many sentences long. The earliest exercises are in upper case to enable students to find the keys more easily.

The teaching method also looks at ways to stimulate the brain including:

- good nutrition
- drinking plenty of water
- balancing activities
- coordination activities such as juggling
- thinking, memorising, music
- regular and sufficient sleep

Not only can this system help those who are dyslexic (dysphonetic and/or dyseidetic) but also those who have other speech and language disorders, dyscalculia, dyspraxia, and behavioural difficulties such as ADD/ADHD.

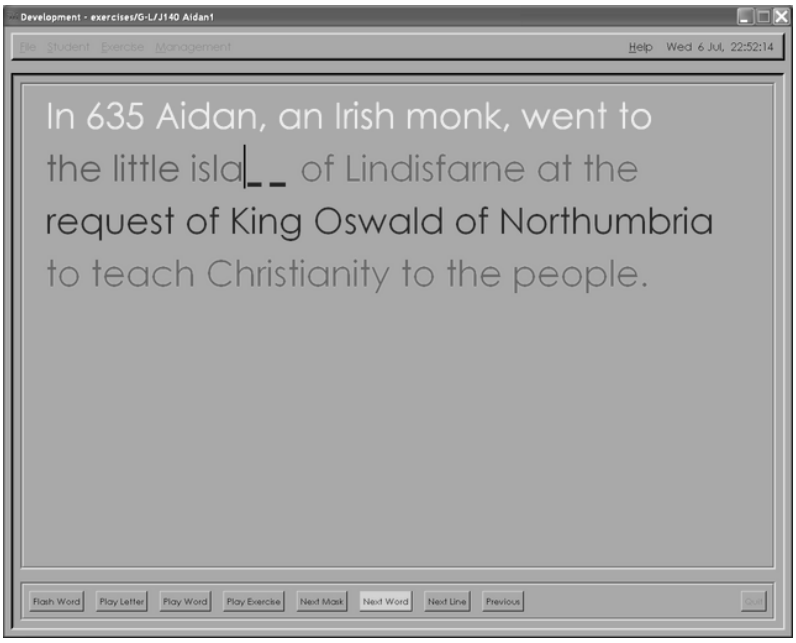
## 17.2 SureSpell

In early 2000 my parents decided that the program they had been using in their centre wasn't doing quite what they wanted and we discussed writing something which would allow them to teach their students in exactly the way they wanted to. I decided to take a couple of months to write just what they needed. The result was a program called SureSpell.

SureSpell works by displaying text on the screen, playing a recording of the entire text, individual words and individual letters, and allowing the students to type in the text a number of times. This multi-sensory repetitive approach can be a much more effective method of learning for people with dyslexia.

Surespell is written in Perl, of course. Since the centre's computers run some programs which require Windows, it is necessary that Surespell runs under Windows, and since I was not willing to develop under Windows it was necessary to find a cross platform gui toolkit. At that time, Tk was the obvious choice, and the combination has proven to be very easy to work with.

The primary section of the program is based around the canvas widget and a custom event loop. The only part which is not cross-platform is the part to play sounds. On Windows I use Win32::API::Prototype, and on Unix systems I fork, exec a command line player, sleep for a while and then kill the process. It's not particularly subtle, but it works well. Part of the way though an exercise the screen may look something like:




At the beginning of each exercise the entire text is displayed and the exercise read out loud. The student will then over-type the exercise on top of the displayed text. Each word is typed in by the students between one and three times, depending on the difficulty of the word. After the first time, one or more of the letters may be blanked out so the students need to remember the letters they typed previously. At the beginning of each word it is read aloud and optionally each letter my be read out as it is typed. At the end of each exercise the entire text is read again and the tutor will discuss it with the pupil before proceeding to ensure comprehension.

Colour is often very important to the dyslexic brain, and each student is tested to determine which colours are the easiest for them to use. The condition in which a dyslexic's reading ability is improved through the use of colour is known as Meares-Irlen syndrome. Surespell uses each student's individual colour preferences to display their exercises. They will usually select a background colour and five foreground colours. The exercises are displayed with lines of text in alternating colours making it easier for the eye to follow across the page without skipping lines. As the student types in each word it is shown in a different colour. As each word is completed it is shown in another colour, again with text on different lines in alternating colours. These colours are also used for other computer based exercises the students use.

At the end of each exercise the student is given a *reward*. This takes the form of clearing the screen in some way. I'm not a games programmer, so this is pretty basic. One method is to randomly remove the letters. Another has them shaking for a bit then falling to the bottom of the screen, and another has a cannon wheeling out and shooting the letters away. To my surprise, and as basic as they are, these rewards seem to have the desired effect.

The Surespell program records information about how each student performs the exercises. This includes details about when each exercise was completed, how long it took, how many mistakes were made and so on. This is all stored in a database along with data from other tests and this allows progress graphs to be displayed plotting students' abilities against age.

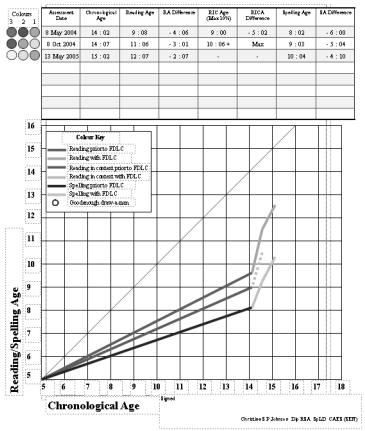
The database is really just a big hash, and may be stored in Data::Dumper, YAML or Storable format. Initially I preferred Data::Dumper format so the database could be edited if required. At that point YAML was too buggy for me to use. Now, with the program more stable Storable is the preferred format. Typically, a master databse will be copied to all the machines in the centre each morning so that students can work on any machiine which is available. At the end of the day the databases are all merged.

The exercises are entered using Surespell itself, as are the details of the students, and these are stored with the database, as are the mp3 files of the exercises, words and letters. We initially tried playing the words as a short section of the exercise file, but not only was it difficult to start and stop the playback at the precise time required, but the way in which the exercise was read as a whole meant that some words would blend into other words and that some words would not sound right when heard on their own.

Creation of the exercises requires skill to ensure that they help the students learn correclty, and time and effort to record the words and sentences and to specify how the exercise should be completed by the student.

## 17.3 Progress

Students will typically receive two one hour long lessons per week, and at that level there is an average learning rate of five times that shown previously, with some students increasing that to fifteen times. The amount of progress made usually depends primarily on the willingness of the students themselves to learn. A typical student's progress chart might look something like:




## 17.4 Conclusion

Surespell and the DysCypher exercises, together with individual tuition and a fair amount of effort, allows students to:

- improve their ability to read, write, spell and communicate
- improve their confidence, interest and ability to learn
- improve their coordination
- improve their behaviour and relationships with others

Perl and Tk, together with a plethora of CPAN modules, have allowed SureSpell to be written with a minimum of fuss, and to function with minimal problems in a cross platform environment for the past five years, forming the core of a very successful programme helping dyslexic children and adults improve their language skills.

See also, `http://www.surespell.com`