The 3Ds: Dyslexia, Dysgraphia, Dyscalculia
A Workshop for Teachers, Parents and School Support Staff

BILL'S GLOSSARY TO PRE-TEACH *some* VOCAB *and* LOWER COGNITIVE LOAD
(come teaching time)

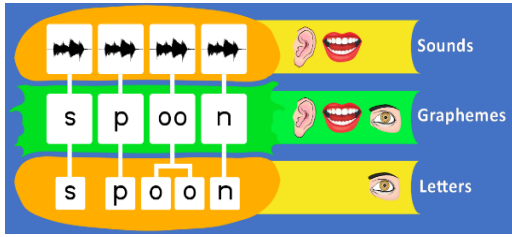|	
Cognitive Load Theory	Cognitive load refers to the amount of working memory used in a task. Cognitive load theory was developed in the late 1980s by John Sweller who argued that instructional design (how we teach) can be used to reduce cognitive load in learners. Information may only be stored in long term memory after first being attended to, and processed by, working memory. Working memory, however, is extremely limited in both capacity and duration. These limitations will, under some conditions, impede learning. Heavy cognitive load can have negative effects on task completion.
	The fundamental tenet of cognitive load theory is that the quality of instructional design will be raised if greater consideration is given to the role and limitations of working memory. With increased distractions, particularly from cell phone use, students are more prone to experiencing high cognitive load which can reduce academic success.
	(Wikipedia)
Working Memory **= *hold and do* with information**	Working memory keeps information active in your mind for a short time to be able to use it for further processing. Working memory is a temporary storage system and is vital for many day-to-day tasks (e.g. following instructions, responding in conversations, listening and reading comprehension, doing a mental maths task and organising yourself).
	Working memory involves the manipulation and transformation (*hold and do*) of verbal and visual information (e.g. remembering instructions and their content to then carry it out, remembering what to say when called upon, keeping your place on the page when reading, reverse sequences of objects/numbers).
The visuospatial sketchpad **(visual working memory)**	The visuospatial sketchpad is a component of working memory responsible for handling visual and spatial information. It temporarily stores information on how things look and allows us to manipulate images in our mind, such as when we mentally rotate a shape to see how it might appear from a different angle or when we give directions to a friend to help them navigate through a city. If you can mentally visualise a long addition sum and do the mental manipulation of carried numbers, you have a strong visuospatial sketchpad. https://www.alleydog.com/glossary/definition.php?term=Visuospatial+Sketchpad

The phonological loop **(auditory working memory)**	The phonological loop comprises a phonological store that is dedicated to working memory and that serves to temporarily hold verbal information, and an articulatory loop, through which inner speech is used to reactivate, or "refresh," the representations in the phonological store. When you continually repeat to yourself a list of items you want to remember, you are using your phonological loop.
Short term memory **= hold information**	Short term memory refers to the short term information required for a verbal or visual task (e.g. remembering a phone number, blending sounds into words when reading, remembering objects, colours, location, direction). It is a system that holds verbal or visual information for a short time.
Decoding	The ability to convert graphemes (letters and groups of letters) on the page accurately to sounds (phonemes) that you hear in your mind. *It's how sounds are lifted off the page*. This is a fundamental reading skill.
Encoding	The ability to take a Phoneme (sound) in your head and convert it to a series of letters (graphemes) to put in print. This is a fundamental spelling skill BUT only gets a speller part of the way to being a competent speller (see orthographic processing).
Dyslexia	A specific learning disorder - means a 'disorder with words'. Dyslexia is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and **decoding** abilities. These difficulties typically result from a deficit in the phonological component of language (**Phonological awareness** - see below), that is unexpected in relation to other cognitive abilities. Dyslexia is neurological in origin. (International Dyslexia Association). Even when remediated by quality intervention, many people with Dyslexia remain slow(ish), but accurate readers and find accurate spelling a challenge. They get by perfectly well with strategies and assistive technology.
Dyscalculia	A specific learning disorder - means a 'disorder in calculation' and can be viewed as the mathematical equivalent of Dyslexia. People with Dyscalculia demonstrate a fundamental difficulty in acquiring basic number sense (Dehaene 2011). Problems with strategic thinking and concentration also add to the impact of the disorder. Like Dyslexia, Dyscalculia is not a result of poor teaching, it has neurological origins. Dyscalculia can be effectively remediated by effective intervention that focuses on key areas that make up *number sense.*
Dysgraphia	A specific learning disorder - literally means a 'disorder in writing'. Dysgraphia affects written expression regardless of how well a person can read, think or verbally express their thoughts and opinions. It appears as difficulties with spelling, poor handwriting and trouble putting thoughts on paper. Like Dyslexia and Dyscalculia – it has nothing to do with intelligence. It is neurological and appears as soon as students begin to write.

Phoneme	**The smallest unit of speech sound in a word**. The word *Cat* has three phonemes: (k), (ă), (t)
Phonological awareness	A broad skill set that includes identifying and manipulating units of oral language – parts such as words, syllables, and onsets and rimes. Children who have phonological awareness are able to identify and make oral rhymes, can clap out the number of syllables in a word, and can recognize words with the same initial sounds like 'money' and 'mother.' (source: Reading Rockets). As it advances, single phonemes can be mentally manipulated within words and syllables. Phonemic Awareness is a sub-set of Phonological Awareness that involves the ability to easily and quickly focus on and manipulate (chop out, replace, move around) individual phonemes in spoken words. Students at risk of reading difficulties (like dyslexia) have phonological processing difficulties that result in poor phonemic awareness (see below). These skills can be trained and improved. These skills are the best predictor of later reading success or failure and teaching them across the school will reduce later reading problems by between 50 and 75 percent (National Reading Panel US, 2000)
Phonemic Awareness	It's an advanced set of Phonological Awareness skills where single phonemes can be mentally manipulated within words and syllables. Phonemic Awareness involves the ability to easily and quickly focus on and manipulate (chop out, replace, move around) individual sounds (phonemes) in spoken words. People with dyslexia have an inborn weakness with this set of skills
Grapheme	**The smallest unit of spelling in words - letters or groups of letters that spell phonemes.** The word *cat* has three graphemes: c a t that spell its three phonemes: /k/ /ă/ /t/. The word *boat* also has three phonemes: /b/, /ō/, /t/ that spell its three graphemes: b oa t. **Dr. Bartek Rajkowski's** (The Reading Doctor) *Word Burger* explains the relationship between phonemes, graphemes and letters very nicely. *Graphemes* are how the creators of the English spelling system (aka English orthography) solved the 26/44 problem.

Morpheme
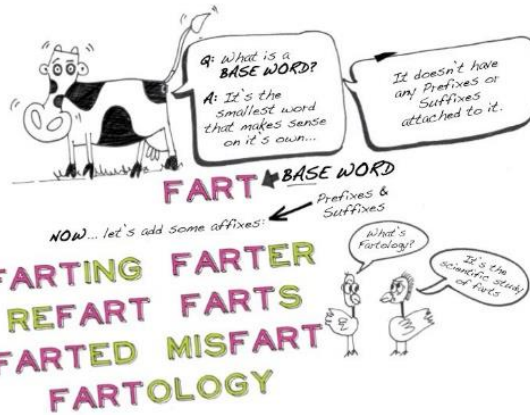
The smallest units of meaning in words.

Morph meaning to change,
eme meaning smallest part of.

Words can contain *bases* or *roots*, *prefixes* and *suffixes*. The word *rewriting* has 3 morphemes: The prefix *re* that means to do again, the root word *write* which is the verb and the suffix *ing* that implies it is in the present tense. Tractor has two morphemes – the root *tract* which means to draw or pull and the suffix *or* which means *a person or thing that does something*.

In secondary school, morphology is particularly important, as Latin roots like 'cise' (to cut) 'spir' (to breathe) and Greek combining forms like 'phono' (sound), 'path' (suffering or disease), 'crat' (rule, strength, power) and 'therm' (heat or hot) sneak their way into the discourses of the sciences and humanities and need to be understood so to improve understanding of abstract concepts.

For an excellent short article on Morphological Awareness by the International Dyslexia Association go to:

https://app.box.com/s/hheu57q67b8szxoxg2rfzzfcxi934tx9

Orthography

Ortho = correct
Graph= writing

The conventional spelling system of a language. In other words, the correct (straight) writing (graph) of words.

English is a complex orthography because of the 26/44 problem (44 sounds and only 26 letters to spell them with). Finnish and Italian are among the simpler orthographies because there's an almost total correspondence between the number of phonemes and letters. Kids learn to read fluently much faster in languages with simpler orthographies.

Orthographic Processing	**The ability to quickly and accurately identify (and recall) the correct spelling of a grapheme, or word by its look.** In other words, how you know a word is spelled right or wrong by its look. Words have phonic (sound) and orthographic (letter order) features that are both processed in the brain. *Naturally strong spellers* have innately efficient orthographic processing. This means their brains quickly and easily store and recall (for spelling) correct letter strings for different words. They easily intuit which letter strings should go in which words and where they should go in the word without needing knowledge of spelling rules or morphological rules. In other words, they easily and accurately store and recall the correct letter strings (letter order) for words. This is important in an orthography where there are multiple spellings for sounds depending on the word. As an example, below is the word *smoke* with three common spellings of the long (ō) vowel phoneme. In English, <u>o-e</u>, <u>oa</u> or <u>ow</u> are all common spellings for this sound. ## *smoke　　smoak　　smowk* A person with strong orthographic processing will easily store the correct letter string for *smoke,* but will also be unconsciously aware of the *oa* in *cloak* and *ow* on the end of *show*. Once these words are learned, they will rarely choose the wrong grapheme for the (ō) vowel phoneme. Without being able to explain where <u>oa</u> and <u>o-e</u> are used, they will unconsciously know which to use in which words and will know that <u>ow</u> usually goes on the end of base words, but will also know the exceptions like *toe*. So, strong spellers are typically born, but many need to be made through excellent spelling instruction. Even though there are plenty of kids who will be naturally strong spellers because of their strong phonic and orthographic systems, everyone does better when all students get high quality instruction on phonics, spelling rules, positional frequency of long vowel spelling, morphology, and etymology (word origin) to compensate for orthographic processing weaknesses. Orthographic processing is NOT visual memory. Visual memory is **not** involved in word storage.
Phonics	The structured and systematic teaching of the correspondences between the 44 phonemes of the English language and the graphemes that spell them – going from the most common (regular) graphemes to less regularly used graphemes for each of the phonemes. As soon as a small number of phoneme-grapheme correspondences are taught, students are taught to *synthesise* them in varying combinations to read and spell new words. In typically developing readers and spellers, it only takes a few exposures to phoneme-grapheme correspondences for them to mentally bond in long term memory for easy and fast recall. For students with dyslexia, many, many more exposures are needed for this to occur. This is due to the inborn phonological disorder.

E.D.I. **E**xplicit **D**irect **I**nstruction	**Explicit, Direct Instruction:** A form of teaching where a teacher has a high level of mastery over content and can break a skill down into small components and directly teach it part by part. In EDI, the **TAPPLE** model is followed, where the skill or concept is directly **T**aught to the group, understanding is checked by the teacher… **A**sking a question to the whole group and… **P**ausing for the group to think about and process. The teacher then… **P**icks a non-volunteer to answer the question. The student's response is… **L**istened to and… **E**ffective feedback is given. EDI is a trademarked approach (Ybarra and Hollingsworth) but is based on Direct Instruction, developed by Siegfried Engelmann). Direct / Explicit modes of teaching have a far greater effect size than inquiry-based methods (Hattie).
Assistive Technology *Should never replace intervention that targets and remediates the core difficulties of a learning difficulty*	Assistive Technology for people with Learning Difficulties is defined as any device, piece of equipment or system that helps bypass, work around or compensate for an individual's specific learning deficits. Over the past decade, a number of studies have demonstrated the efficacy of Assistive Technology for individuals with Learning Difficulties. Assistive Technology doesn't cure or eliminate learning difficulties, but it can help students reach their academic potential because it allows them to capitalize on their strengths and bypass areas of difficulty. For example, a student who struggles with reading but who has good listening skills might benefit from listening to audiobooks. https://www.readingrockets.org/article/assistive-technology-kids-learning-disabilities-overview A student with dyslexia or dysgraphia may benefit from having a device read text on screen to them (text-to-speech), or to be able to dictate to a digital device that will transcribe for them (speech-to-text). This allows them to dedicate working memory capacity to the higher-level skills of a task instead of being bogged down in lower order tasks that other students without specific learning difficulties have automated.
Accommodations	Accommodations are simply adjustments that are made to the curriculum, instructional components, environmental elements or the requirements and expectations of students. These adjustments are part of what teachers do to meet the needs of diverse learners and allow equal opportunity for students to access the curriculum and achieve results in the least restrictive manner. Accommodations include adaptations and modifications. https://dsf.net.au/professionals/teachers-and-tutors/supporting-students-with-learning-difficulties-in-/what-are-accommodations