Chapter

The Three Educational Faces of Dyslexia: Identification and Remediation in the Orthographic Phase

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Abstract

Frith defined a her 3-phase and 6-step psychological model of dyslexia. The three phases were named Logographic, Alphabetic and Orthographic in which sometimes the steps in reading and at other times spelling were in the lead. Using this model, it was possible to consider what teachers would experience when meeting dyslexic pupils in the different phases and resulted in being able to identify three different educational faces. In the process of this research the dyslexic characteristics were more clearly illustrated and identified in the written work of dyslexics rather than in their reading. What they wrote displayed in concrete terms their knowledge of the alphabetic system and the structure of words. Many able readers were identified who found it almost impossible to write a legible, coherent and correctly spelled script at any age but the poorest spellers were able to read much more than they could write. It was found that nearly 20% of pupils in a range of schools had dyslexic-type spelling problems but these were generally ignored if they could read adequately. In this publication the subject is the Orthographic face and what teachers may do to help.

Keywords: dyslexia, orthographic stage, spelling, remediation, cognitive process strategies, word pattern

1. Introduction

Dyslexia is an unexpected difficulty in learning to read and spell in relation to age and ability by the methods normally used in classrooms. However the reading difficulties became the predominant concern in education and psychological research. For example in England the Department for Education stated, "dyslexia or reading difficulties" [1] in its guidance on special needs. This reflected the widespread opinion in both education and psychological research that reading was the essential component and the main target for investigation and remediation. The major focus of the National Literacy Strategy [2] for example was also reading.

Spelling teaching had become a neglected area in England since the 1950s when the Look and Say reading teaching method was introduced and replaced phonics teaching systems. Thereafter spelling was "caught" rather than taught [3, 4] and the only spelling "teaching" method left over from the earlier era was in copywriting.

The British Dyslexia Association (BDA) [5] was established in the 1970s by Marion Welchman with help of like-minded colleagues. The purpose of the BDA was to promote understanding and research into dyslexia. Welchman had seen a method developed by Gillingham and Stillman [6] in the US work with her dyslexic son. It was adapted from the original phonics methods imported from England in the earlier part of the 20th century. The G and S system introduced multisensory phonogram training and explicit strategies for teaching reading and spelling linking them through synthetic phonics and cursive handwriting, the particular expertise of the remedial teacher Bessie Stillman. The method only progressed at the learning rate of the individual dyslexic. The programme was imported into the UK by Kathleen Hickey [7, 8] who developed an anglicised version. But it was not widely adopted because it was the antithesis of the prevalent reading teaching orthodoxy and use of print script copywriting. It remained largely unknown except in specialist dyslexia centres in a band across the south of England whose leaders had attended the original training events promoted by the Bath Dyslexia Association and the Invalid Children's Aid Association [9].

In the multisensory Alphabetic-Phonic-Syllabic-Linguistic (APSL) programme of Hickey there was a balance between reading and spelling using reading and spelling pack phonogram cards linked with cursive handwriting training. All of which was in contrast to the "Look and Say" practices when phonics and spelling teaching was introduced later once reading was established and in some classrooms not at all. This was despite the researches by Chall [10, 11]; Clark [12] and Ferreiro, et al. [13] that showed that more dyslexia resulted in Look and Say regimes rather than Phonics in a ratio of 4 to 1–1.5. **Table 1** below shows results from APSL programmes balancing spelling and reading teaching methods and teacher-designed programmes emphasising reading.

Data on 50 teachers [14] using the Hickey Multisensory Language Course but leaving out the spelling pack work and dictations has been excluded from the table. Her results were Reading Age = 1.21 and Spelling Age = 0.96 showing how essential the spelling component is in a dyslexia remedial programme.

The 2-year effectiveness criterion was established by Vellutino [15] and this was that an effective remediation programme at 10 years for example must give at least 2 years uplift in each year of intervention. One year's progress is equivalent to one Standard Deviation in statistical terms but to make progress and catch up with peers the rate must be 2 years, or 1 year in 6 months. Any intervention that does not achieve this should be discontinued and another system implemented. After no progress for a year or two it is not enough for success to be claimed for an improvement of 3 or 4 months as is often the case.

Despite effective remediation offered by the specialist dyslexia programmes some problems remain. Adult recovered dyslexics have residual spelling difficulties that arise when they meet new and technical vocabulary and they are generally slower at reading. In addition the remedial programmes are most effective when they are begun early [16, 17] preferably well before the dyslexic is the age of 7 years. Recent research has shown that it can be most effective when given in the Reception Year [18]. It is therefore problematic that most specialist dyslexia provision in the

Reading age uplift	2.83 (APSL)	0.76 (non APSL)
Spelling age uplift	2.24 (APSL)	0.38 (non APSL)
	N = 179	172

Table 1.
Meta-analysis showing dyslexics' progress in 1 year in APSL and non-APSL programmes.

UK is not considered until a child is at least 7 years old and this "rule" has been in operation since before the Bullock Report [19] endorsed the practice. Later it was endorsed in the government Code of Practice [20] insisting on School Action and School Action plus before referral for specialist intervention.

This orthographic research began in the 1980s with the development of a Bachelor of Education honours programme on Learning Difficulties for teacher education students. This made links with the local education authority dyslexia teaching Reading Centre where the teachers had been trained by Hickey. The four teachers there were helped to write their variant of Hickey's Multisensory Language Course (HMLC) [7, 8] as their in-service updating project and it was called Teaching Reading Through Spelling (TRTS) [21–23] and it was this that was introduced to the B.Ed students.

During the teaching of this course it emerged that some of the student teachers had either been diagnosed as dyslexic at school or now realised that they had been dyslexic and it had not been identified. They all did have residual spelling problems to varying degrees and some had slow reading problems. However a number of them reported that they had never had reading problems and a few had even learned to read self-taught. This did not fit with the general perspective on dyslexia then prevalent.

However whatever the origins of their difficulties there was a clear need to offer them some remedial support but what this should be was not clear since they were beyond the remit of the APSL programmes. The investigation began by setting up individual lunchtime clinics to which students could refer themselves. Here it was found that their spelling correcting strategies were limited to rote learning of the correct versions, visualisation, look-cover-write-check, "does it look right" and asking a friend to proof read what they had written before they handed in any work. It was in examinations that they became most vulnerable to detection for their own proof reading too often missed the errors.

Why they had residual spelling problems seems to arise because reading is easier to learn because it is a recognition skill and all the details are already present on the page. Spelling is a recall skill and the words have to be constructed from letters by the learner and put down correctly on the page in handwriting. Some more able learners have such good visual recall that in the early years they can remember words "photographically" and only begin to falter at the age of about 8 as the vocabulary in their books broadens. They appear suddenly to "become dyslexic" especially in spelling.

For others it only becomes a problem at degree level. They do not receive remedial help because they read well but they lose marks and reach lower standards because of their spelling problems. It was this group that was termed "dysorthographics." The ratio of dyslexic males to females was thought to be 4 to 1 [5] but it is from referral data. Out in the community in 10,000 international cases it was found to be 1.5 to 1 males to females [24] and in England 1.2 to 1. [25]. Girls' needs were being overlooked.

Amongst both dyslexics and dysorthographics were a subset that in addition had handwriting coordination problems – dysgraphia and this caused them even more difficulties in associating sounds with symbols in the early years and in producing a legible speedy script later on [26–28]. It seemed from these studies that spelling was a more fundamental problem in literacy learning than had previously been supposed and a better balance in general teaching schemes needed to be established to include spelling and handwriting. In addition something needed to be done to help those with residual spelling difficulties already in the system to raise their achievements whatever their level of ability.

Frith in 1985 [29] had provided a psychological model of dyslexia in which there were three phases and 6 steps in which sometimes reading was the pacemaker and at

other times it was spelling. The three phases were the **Logographic phase** in which dyslexics were thought to have difficulties moving from an early phase of acquisition in which reading was visually based (logographic), to the **Alphabetic phase** when children were able to use letter-sound associations for both reading and spelling. Later some dyslexics failed to move on into the **Orthographic phase** where reading and spelling were automatic and considered to be independent of sound.

Using this model it was possible to identify in the data collections three different educational aspects or "faces" connected with the psychological phases that teachers would meet and need to deal with. Over time it was also possible to devise identification and intervention procedures related to each "face" that proved to be effective. The identification procedures involved collecting the free writing scripts of all subjects referred and undertaking a spelling analysis. A range of researchers, Gentry [30], Read [31], Rosencrans [32], Bourassa et al., [33] and Ehri [34] have all shown that the errors that students make when they write are not casual or unintentional but reveal very clearly their level of literacy knowledge and level of development.

The successful intervention methods were found to be Multisensory Articulatory Phonogram Training (MAPT) in the Logographic phase [18], Alphabetic-Phonic-Syllabic-Linguistic (APSL) training in the Alphabetic phase [35] and Cognitive Process Spelling Strategies (CPSS) in the orthographic phase under consideration here. It means that dyslexics will already have learned sound-symbol correspondence during the alphabetic phase and can spell most common words. Government guidelines now insist all pupils should be taught using systematic synthetic phonics (SSP) and when this does not work in severe dyslexia cases the pupil may receive individual intervention by trained dyslexia tutors. Even then a few do not benefit from the methods especially if not of the APSL kind for them SSP is necessary but not sufficient. However most dyslexics do move on to the orthographic phase with just a few phonic errors to clear up. These are usually problems with consonant digraphs in particular the "wh" digraph in question words; the "ou" and "ow" diphthongs, homophones and inflectional suffixes.

2. The development of the cognitive process strategies for spelling

The research began with a real problem to solve and this was how to help intending teachers correct their misspellings and in the process learn how to help their pupils do the same. At the time there were few techniques and no programmes available to do this. The students had a history of being told to "use a dictionary" but not how to use it and "learn the rules" but which ones and why? Others said they must not be lazy or careless and just memorise the correct spelling.

Although there were no available programmes there was spelling teaching advice for example in *Logical Spelling* [36]; *Dyslexia The Problems of Spelling* [37], Cowdery et al. *The Spelling Notebook* 1983–7 [21–23], and Moseley's research [38]. He used a range of techniques to help improve the spelling of 13–15-year old poor spellers. His experimental group gained 3.7 months per month over a 5-month period. Controls using Look-Cover-Write-Check (LCWC) made no such progress.

The strategies were as follows:

- Say the word to suit the spelling
- Trace and say
- Sky-write

- Visualise the word and count the letters
- Use a mnemonic
- Use spelling patterns and some rules
- Focus on the tricky parts
- Say the alphabet names
- Make a rhyming word

Focusing on the tricky parts, patterns and rules might be most appropriate for adult learners but if we do not know how to spell a particular word how do we try to construct it? In this reflective frame of mind a list of strategies was invented that might assist in correcting misspellings. These worked out to a maximum of 12 and became the "cognitive process" or "brain engage" strategies that could serve as alternatives to the major rote learning procedures. The most widely used of these were mnemonics, visualisation, singing and rhyming and Look-Cover-Write-Check. It was hoped that the 12 strategies would prove to be more effective and be generalizable to more than one word at a time.

The original categorisations of spelling and reading errors were developed in a survey of studies by Spache [39] and have remained largely unchanged since then. The Neale Reading Analysis [40, 41] for example used Omissions, Inversions, Substitutions, Reversals, Additions, Transpositions (e.g., librety) and these have remained unchanged in test updates and revisions.

It was in analysis of these reading error types that it became clear that the most important information for the teacher was to know exactly what the learner had substituted, reversed, omitted or transposed rather these labels. They might just reflect the spelling knowledge to date and be similar to errors made by younger children. When this was tested and the same spelling test was given to dyslexics and controls who were 3 years younger it was found the spelling errors made were not significantly different [42]. This meant that the popular description of dyslexic errors as "bizarre" needed to be challenged for it was likely that the error merely reflected a much lower level of spelling development that was unexpected in a student of that age.

In order to find out if there were any more strategies in use a set of 12 difficult to spell words was selected and these words were deliberately misspelled to mislead. The subjects were to be asked to spell the words correctly and explain the strategies they found themselves using.

Spelling test: Ass-ee-9, Brag-ar-doh-chio, Virr-mill-aeon, Rare-ee-figh, Im-pahst-err, Row-cocoa, Lick-we-fye, Sack-ree-lidge-ious, Pav-ill-aeon, Ack-come-oh-dait, Se-pehr-ate, Dessy-kate.

Cohorts of students and experienced teachers on in-service training courses were each presented visually and orally with the misspelling test and were asked to write the words correctly, reflect on their mental processes in doing this and later share what strategies they were using.

The limited range of most people's strategies soon became apparent. They syllabified, used phonics and analogies with known words, wrote it then tried to assess if it "looked right." Some used meaning and the knowledge of another language. Many suggested how useful mnemonics (a verse or device for aiding the memory) could be. It was explained that finding a mnemonic was often a lengthy process and then only corrected the one misspelling making it not so useful as they might

believe. Strategies were needed that would generalise to a range of words and misspellings.

In the developmental period 1700 subjects had been tested. Over time several thousand responses were recorded and no participant ever scored 12. Only a handful of subjects from this large group had scored more than 8 correct. Many had scored only 1 or 2 points to their great surprise and indignation. The best spellers appeared to have the largest range of strategies.

Twelve CPS strategies had been devised and in all the feedback from the subjects no more than these 12 were ever recorded. To convert them into a programme for intervention each needed an explanation to show how it could be used. Teachers would then have a general toolkit to use to help their pupils and their own spelling development and correct misspellings. The main problem that remained was that once a spelling had been corrected it must remain so and not reappear in subsequent days. This was a second problem that needed to be dealt with.

3. Testing the 12 CPSS for effectiveness

The students were invited to come individually for spelling help to lunchtime clinics and asked to bring a list of their misspellings from a recent essay plus the essay itself so that other errors they might have missed could be found and included. Together with the tutor they worked on correcting two errors per session using the list of 12 strategies below to give them ideas. The plan was for them to decide on two strategies to help them remember the correct spelling. First they must look up the correct spelling in a "good" dictionary. The "good" dictionary must contain 5 forms of information (1) correct spelling, (2) meaning, (3) pronunciation, (4) origins, (5) related words and uses.

The second strategy was for backup such as a "Funny."

3.1 The 12 cognitive process strategies for spelling

Lower order strategies

- **Articulation** - The misspelled word is clearly and precisely articulated for spelling - citation mode
- **Over articulation** - The word is enunciated with an emphasis on each of the syllables or unstressed sound. e.g., parli (a) ment, gover (n) ment, w(h)ere
- **Cue articulation** - The word is pronounced almost incorrectly, e.g. Wed - nes - day, Feb - ru - ary.
- **Syllabification** - The word is broken down into syllables, misdemeanour - mis/de/mean/our.
- **Phonics** - A comprehensible articulatory skeleton or phonetic word scaffold is made to build upon – km, cm then cum, may appear before come.
- **Rule** - A few rules can help unravel a range of spelling problems e.g. the l - f - s rule, these letters are doubled in one-syllabled words after a short vowel sound - ball, puff, dress. The exceptions are made into several sentences e.g.; "YES," the BUS runs on GAS PAL, IF you pay NILyou get turned off.

I before E except after C rule – receive, perceive to keep the "c" soft.

3.2 Higher order strategies

- **Origin** - The root in another language may give clues - op/**port**/unity; an opening, a **port** or a haven

- **Linguistics** - Syllable types - open, closed, accented and unaccented need to be taught as well as the 4 suffixing rules which govern most words e.g. Add, Double, Drop, Change

- **Family/base word** - Family helps reveal silent letters and correct representation for the "schwa" unstressed vowel e.g. Canada, Canadian; bomb, bombing, bombardier, bombardment; sign, signature signal, resign, resignation. Basewords can make families of words e.g. form, reform, forming, deformed, formation

- **Meaning** - Separate is often misspelled as sep/e/rate. The dictionary meaning shows it means to divide or part or even to pare. The pupil then just needs to remember "cut or part" and "pare" to separate.

- **Analogy** - comparison of the word or the key part of it with a word the pupil does know how to spell. "it is like boot - hoot, root; 'hazard' one 'z'" as in haze, maze

- **Funnies** - Sometimes it is not possible to find another strategy and so a "funny" can help out e.g. "cess pit" helped me remember how to spell "necessary."

Over time and use the 12 strategies were divided into lower and higher order strategies as in the above. This was because the younger pupils and those with the poorest spelling needed more of the lower order CPSS and little or no dictionary work to begin with.

3.3 The second problem to resolve

Remedial teachers consistently complained that when they taught how to correct a misspelling it inevitably re-appeared next time the pupil wrote the word. The student teachers in the clinics also reported this problem. The most favoured correction strategy they used was Look-Cover-Write-Check (LCWC) undertaken three times. In the Gillingham and Stillman [6] programme Bessie Stillman, the remedial teacher introduced her Simultaneous Oral Spelling (SOS) method. It involved saying the names of the letters of the correct spelling whilst writing the letters down in cursive. The pupil does this three times. It seems that LCWC was a diminished version of this. SOS was designed to make and stabilise the link between handwriting and spelling, the grapheme and phoneme.

The following protocol was developed for use with CPSS.

3.4 The 7-step protocol for using CPSS

i. Select **two** misspellings to learn in any one session.

ii. Identify the **area of error,** usually only one letter with help of the tutor or dictionary.

iii. Put a **ring round** the area of error and notice how much of the rest is correct.

iv. The student is taught (later selects) a **CPSS to** correct the misspelling; a reserve strategy is also noted where possible.

v. **Talk the strategy over** with the tutor and write the corrected spelling.

vi. **Check** the spelling to see if it is correct - the dictionary can be used again here.

vii. If correct the student covers up the spelling and writes the word three times from memory in **joined up/full cursive, naming** the letters - Simultaneous Oral Spelling (SOS). It is especially important to use the joined script at least **over the area of error** if full cursive presents a problem.

3.5 Why two strategies are needed to correct misspellings

Research by Kuczaj [43] found that the motor programmes for spelling words, particularly their bases and affixes were stored together in the brain. This meant that learning to write syllables and base words as cursive writing units during early learning was an important strategy that could contribute to spelling accuracy. It involves morphemes the smallest units of meaning and the word meaning in the lexicon (word memory store) is consistently associated with its motor memory (motoreme).

The posterior frontal lobe area (usually left hemisphere) organises and initiates the voluntary motor movements involved in forming the individual graphemes and syllables. These are stored in the motor memory linked with programmes in the cerebellum or "hind brain" and are available to be called up during writing. Over time and practice this process becomes automatic so that during essay writing we do not have to think about the details of the spelling or forming the letters. Rather like learning to play the piano.

The problem arises when as young writers or dyslexics we store incorrect spellings. In order to correct them we have to address the error both in the word memory store and in the motor memory store. The CPSS corrects the error in the lexicon and the SOS strategy is needed to correct it in the motor memory. As old memories are not deleted but persist they also will be called up when writing. The CPSS however gives the new spelling a higher profile and as the writer writes a sentence and the "problem" word comes nearer "warning bells" ring and the writer recalls the strategy, slows down and writes the correct version. Soon the writer is able to write the correct version without having to pause and recall the strategy. Eventually the correct version arises each time unless under stress when it may pop up again. On these occasions proof reading will clear it out.

LCWC may be useful in learning spellings but not in correcting them as it only deals with the motor programme. The neurology suggests that two strategies are needed if a spelling is to be corrected. One strategy is needed to correct the motor or handwriting programme already established. The second strategy needs to correct the spelling entry in the word memory store, the lexicon. The handwriting process thus connects spelling and meaning. SOS contributes to this through naming whilst writing is in progress.

The neurological significance of handwriting in learning to read was later established by James et al. [44]. Their research showed during fMRI scanning that

when preliterate 5-year olds traced, printed or typed letters and shapes and then were shown images of these stimuli that a previously discovered "reading circuit" in the brain was activated during letter perception. This only occurred **after handwriting** not after tracing or copying that are frequently used in early years education.

The conclusion is that handwriting supports symbol-sound knowledge development in normal subjects and why multisensory phonogram training has been found to be effective. However in dyslexics, there appears to be a disruption in that neurological system possibly caused by a dissociation in the area of the left angular gyrus [45] so that very specific and often repetitive training is needed initially to overcome the barrier. This problem was identified as giving rise to an articulation awareness deficit [42] in dyslexics compared with reading and spelling matched controls. This meant that dyslexics initially had no concrete articulatory cues to link the abstract perceptual units [46] the sound and the symbol.

3.6 An early CPSS pilot study in elementary school

In this research project Parrant [47] tried the CPSS techniques with elementary school children. It showed effective results in 6 weeks with classes of 11 year olds (Year 6). The control class of 23 pupils and the experimental class of 21 pupils, including 7 with specific learning difficulties in reading and spelling were given a 100-word dictation pre and post intervention. Each week they worked on a set of common errors from the dictation. The control group was taught to use Look-Cover-Write-Check and write the word correctly three times. The experimental group tackled the same errors with CPSS, also writing the word correctly three times. Both groups' spelling improved but for the controls there was not a significant gain but the experimental groups' improvement was very significant ($p < 0.01$). Even the group with SpLD improved their spelling significantly ($p < 0.05$). The error rate of the experimental group for example dropped from 273 to 162.

Parrant also recorded a change to a positive attitude to spelling in the experimental group. They were more interested in spelling and more confident in their writing after the intervention. They had lost a "learned helplessness" in dealing with spelling that many pupils develop. This attitude change also occurred amongst the students in the clinics and they began to enjoy spelling.

3.7 A secondary school topic-based approach to strategic spelling

In her MA project Schaapkins [16] decided to test the value of introducing a small version of CPSS in Food Technology with Year 10 pupils. Pupils each year were given lists of technology words to learn but no specific techniques had been offered to help them study the words other than to tell them to memorise them.

The spelling list was: design, technology, temperature, coagulation, protein, carbohydrate, analytic, evaluation, hygiene, ingredients, manufacture, recipe, specification, research, vitamin, mineral, polysaccharides, whisk, hazard, nutrition.

There were two mixed ability classes and one served as the control group and the other as the experimental group. The experimental group was given copies of the 12 CPSS list for personal use and each word was syllabified when it was introduced to give them an example to follow. The post-test results showed no significant improvement in spelling accuracy in the controls but significant improvements and a lowering of spelling errors in the experimental group.

3.8 Comparison of the levels of spelling errors made by student teachers and year 7 s

An analysis of the types of spelling errors made by Year 4 undergraduate teacher education students in a 3-hour examination was undertaken. In 55 scripts there were 165 errors in total and 152 different errors. The estimated number of words was 3000 words per script making 165,000 words in total giving an error rate of 0.018% and a modest writing speed of 17 words per minute, taking into account that thinking time was involved. This compared favourably with previous error studies of 1.5% by Wing et al. [48] testing a cohort of 40 undergraduates writing an estimated 10,000 words.

The preponderance of errors of the B.Ed undergraduates fell into the linguistic/morphemic or higher order area rather than the lower order articulation and phonics areas. These higher order errors are not unexpected for an adult group and can be compared with the Year 7 results in **Table 3** below (p. 12).

Multiple errors of the same words' misspelling by an individual were only counted once.

The main difference between the Year 7 s and the undergraduates was that in developmental terms the Year 7 made more errors of a basic kind such as with articulation and phonics and in their grammatical knowledge.

Within the student group there were two who had been diagnosed as dyslexic at school and in their Year 3 examinations had made as many as 20 misspellings which had caused concern to their tutors and upset to the students. This was why they had opted to follow the Learning Difficulties course and had attended the clinics. In the final year examination their scripts showed no dyslexic-type errors. They in fact made no more than 3 and 5 misspellings and each of these was the slip of the pen or missing letter type that is common when essay writing at speed and that would not normally cause comment.

The spelling research resumed later when a suite of MA distance programmes was designed for Middlesex University, these included an MA SEN, MA SpLD and MA Gifted Education. On its resumption handwriting had also become a major concern in UAch and 10 and 20 minute handwriting speed tests were designed to investigate this aspect [2]. This provided the Year 7 data in **Table 2** below and the

Sequencing	**What the errors actually reveal about spelling knowledge**
bronwe (brown)	A typical visual recall error after Look and Say teaching plus phonics and long vowel "e" over-generalisation
filed (field)	Part phonic effort with long vowel sound error but visual recall of all the letters
berdy (buried)	Phonetic attempt, y added to deal with "ie" sound trace
colse (close)	Visual recall, lack of knowledge of "cl" blend
biult (built)	Visual recall, with "bi" use of phonetics
nigt (night)	Phonic structure but lack of knowledge of silent letters and origins
aronud (around)	Mix of phonic and visual recall needs diphthong knowledge
pepels (peoples)	Basic phonetic structure
"Bizarre"	
ckach (chase)	Mix of phonetic errors, long vowel sound correct, check articulation
takt (chased)	t, d. often used for ch. Lack of phonic knowledge except for vowel "a." Check articulation of words for spelling
janjoys (enjoys)	articulation error, and local dialect issue
coicens (cousins)	Outline phonetic structure with some visual recall and lack of phonic knowledge

Sequencing	What the errors actually reveal about spelling knowledge
oncl (uncle)	Vowel error and lack of knowledge of final stable syllable "-le"
evetchers (adventures)	Articulation errors with basic phonetic structure
haja (hair)	Phonetic structure plus local dialect emphasis
Omissions	
sise (since)	Lack of 'n' concealed by nasalified vowel
nity (ninety)	Lack of 'n' concealed by nasalified vowel
haging (Hanging)	As above
enharse (enhance)	As above
bscapering (scampering)	Articulation error as above
whet (went)	As above with "wh" digraph error
thigs (things)	As above also check articulation.
Concatenations	
favote (favourite)	All these errors show a lack of syllabification use and a need to articulate clearly in "citation mode" for spelling
deiced (decided)	
probl (probably)	
Basic phonics	
oncl (uncle)	Needs more help with short vowel sound knowledge and articulation
inuf (enough)	Basic phonetic structure, needs systematic synthetic phonics **support**
safen (Southend)	As above with articulation training and word structure knowledge
coules (colours)	Phonetic structure, needs systematic word building and synthetic phonics
thand (found)	Phonetic structure with th/f dialect confusion and lack of diphthong knowledge
moe (more)	Phonetic structure of local dialect
Reversals	
None	E.g. "was for saw" and "on for no" usually disappear in children's writing by about the age of 8 years.

Table 2.
Dyslexic errors using "traditional" categories from school C.

spelling data in **Table 3** below. The 6 types of error analysis in **Table 2** had been suggested by Miles [49].

The dyslexics in this case were the 4% of the School C cohort who had made the most misspellings and this turned out to be 10 or more misspellings per 100 words. At this age they were expected to make no more than 5 misspellings per 100 words [50].

As can be seen each error contains a wealth of information that could help a teacher intervene and make a difference to dyslexics' reading and spelling performance. It was decided that the CPSS programme could be used to summarise issues and suggest key interventions. However it would need an expansion of the category identified as Linguistic Rules to help teachers with rules they might not know having been brought up in a Look and Say teaching and learning era. There are of course many English teachers who have studied linguistics but the knowledge is not necessarily in the possession of Remedial teachers, Learning Support tutors or SENCos who on a day-to-day basis meet students who need this help.

Error type %	BEds	Cohort B	Cohort C	B + C
	N = 55	(N = 160)	(N = 251)	(Error %)
SYNTHETIC PHONICS				
Artic/Pronunciation/Syll	19 (Syll)	11.9%	12.9%	0.58%
Phonetic/Phonic	0	28.7%	29.1%	1.23%
MORPHEMICS				
Baseword/Origin	55	30.0%	19.6%	0.82%
Suffix/Pref/vowel rules	75	18.4%	17.2%	0.73%
Homophone	3	3.5%	9.5%	0.40%
Grammatical	0	9.7%	11.7%	0.49%
Total numbers of errors	152 (0.018%)	1953	2651	4.25%

Table 3.
Spelling error data, B Ed and Year 7 cohorts (20-minute test).

4. Case analysis studies and 15 linguistic rules (spells)

According to Hanna and Hanna et al. [51] it was possible to spell 85% of the English language with knowledge of phonics and some basic rules. These researchers found that it was possible to programme a computer to spell 17,000 basic words with some 300 rules and knowledge of how sounds were transcribed and represented by alphabetic symbols - phonics. But they were dealing with rules governing letter order and frequencies often called "surface rules" rather than with deep structure rules about word and syllable structure, morphemics and linguistics necessary in an opaque language.

Henry [52] in the USA suggested that with a knowledge of roots the rules governing only 14 words could teach all the spellings that an elementary school child might be expected to know. Her techniques were based upon different syllable structures but not a problem-solving approach and were laborious. However it did show that syllable structure and basic rules could contribute to correcting misspellings.

The collection of spelling error data in the speed writing research project made it possible to work out the most common linguistic errors that pupils made. It was the Linguistic rules in the CPSS that needed to be developed but with about a dozen not 300 rules. The list of rules had to be brief enough not to be daunting for someone unfamiliar with the subject and easy enough to remember for young students.

By this stage teacher education students, and teachers were testing out CPSS and undertaking case intervention studies and dissertations on the topic. Others were referring scripts for advice. It was the accumulation of error information from all these sources that enabled a list of 15 potential rules called "Spells" for the most common errors to be devised.

4.1 The "15 Spells" (for a barge trip)

1. **CUT** (cvc) short vowel, closed syllable. DOUBLING rule for adding suffixes - cut-t-ing, putting, running, bedding, hopping, sitting, in polysyllables - rudder, potter, kipper, cutter.

2. **HULL** (cvcc) short vowel and l-f-s rule. Must double l-f-s after a short vowel in single syllables till, hill, pill; off, boff, sniff; hiss, miss, (10 exception

words - if, gas, bus, yes, pal, nil – invent 2 sentences to remember and include them all).

3. **ROPE** (cvce) After long vowel sound in a closed syllable, silent/e/denotes long vowel sound. DROP silent/e/when adding suffixes: roping, hoping, riding.

4. **SAIL** (cvvc) "When two vowels go walking the first one does the talking, 'usually' rain, paint, cleats, load, tear." Bear Just ADD suffix - raining, painted, cleated, loads.

5. **COOK** (cvvc) book, look, took, hook, good, double/oo/short vowel sound, ADD rule, cooking MOON (cvvc) Long vowel sound/oo/in noon, cool, saloon, zoom, room, tool, ADD rule – zooming.

6. **LIST** (cvcc) short vowel followed by double consonants simply ADD rule applies - listing, rushed, missed, rusting, posted. Master, lasting, faster, bath - dialect change in south of England from short to longer/ar/sound.

7. **BARGE** (vowel r, –ge) r changes a in words large, are, art, mart; e softens g - ge.

8. **WHEEL** (wh- digraph) teach/wh/question words as a group why, who, where, what, which, when. (whether). Teach the 6 consonant digraphs ch, ph, ch, sh, wh and th voiced and unvoiced.

9. **LADEN** (cvc/ic/id/in) open syllables: these words follow the long vowel rule in open syllables – o pen, ba con, spo ken, la den, to ken. Exceptions are: cabin, robin, rapid, vapid probably pronounced with the long vowels once or an effect of vowel "i."

10. **WATER** (wa/or/and wo/ir/rules). W changes the vowel sounds of "a" and "o" - war, ward, walk, warm. Work, world, whorl, word, worm, worst.

11. **PAY** (cvy) CHANGE rule. Change y to i when suffixing. Instead of the regular form payed and sayed we change "y" to "I" and add "d" - paid, said, laid.

12. **ROUND** (diphthong/ou/ow sound is ah -oo or two sounds) ground, bound, found, sound, hound. Rouse, louse; row, cow; oi diphthong in oil, boil, toil. ow is also a digraph as in low, row, know.

13. **SIGN** (cv - gn, silent letters) Family words will help with detecting some silent letters - sign, signal; bomb, bombardment. Some letters were once pronounced knife, knight, knave, knitting perhaps from Norse.

14. **TABLE** - final stable common syllables e..g. "-le" and "-ly"; "-tion," "-sion" and "-cian," "-us" and "-ous."

15. **PAIR** "-air" and "-are" words. Pair, lair, fair, stair and pare, stare, ware, care.

Stress and unstressed syllables might replace "-air" words depending on the needs that emerge from the pupil's spellings but by the time they have worked through the 15 spells they will be able to investigate the problem and origins using the Spelling Detective Dictionary [53].

4.2 Development of the casework

Students on the 3 different MA programmes all undertook casework on the written scripts of key pupils in their schools or tutorial practices and demonstrated that they could use CPSS effectively. The casework showed that the programme was able to improve the spelling ability of the pupils and that it gave 2 years uplift in spelling most frequently in the less severe cases especially those without dysgraphia. It could often be achieved in a few months with only a three 10–15 minute tutorials per week. The pupils enjoyed the power it gave them to deal with their own chosen misspellings and said they looked forward to the sessions. This was after many of them had become disillusioned by the repeated attempts to help them and the boring nature previously of overtraining and rote learning.

Maia age 9 years 4 months after a year on CPSS tutorials [54].

- RA 10 years 4 months (2 years uplift in 1 year)
- SA 8 years 4 months (11 months uplift in 1 year).

Maia had problems using cursive writing and avoided using the SOS strategy and as Ridehalgh found this handicapped the spelling progress.

Natalie aged 15 was surprised that no one had thought to teach her the suffixing rules before. As the sessions progressed she gained in confidence and was enjoying studying spelling and getting very obvious benefit that she herself could see and experience. Her dyslexia tutor explained:

"Many of the students I work with have been following dyslexia spelling programmes with private tutors for years with little or no improvement in their ability to spell accurately when under pressure especially in a test or exam. When I first read about CPSS I was a little dubious as it seemed a time consuming way of teaching students correct spelling however I was desperate to find something which would work after years of repeatedly correcting the same errors."

As the CPSS became more widely known parents and teachers began to refer case example scripts for advice and information this was especially in the context of a pupil who was underachieving. Sometimes adults would refer themselves for advice following the increasing understanding of Dual and Multiple Exceptionality [55].

Figure 1 below shows the type of problem that teachers faced in determining interventions at the Orthographic stage. A typical CPSS analysis was offered as in the following case report. The pupil was asked to write a story or about a favourite topic in exactly 10 minutes as quickly as possible and not to worry about the spelling.

4.3 Case report "Alan"

Alan is in the late stage of the Alphabetic Phase and ready to move into the Orthographic Phase with CPSS help. He uses his phonic knowledge to create phonetic scaffolds onto which some orthographic mapping has taken place [34] and more can be assimilated.

4.3.1 The misspellings

wack (woke) downsters opend are (our) cousans knew(new) stokings and stockings chuweng (chewing) tine/time grand perants evaning are (our) preset are (our) shweets choclt wached filme wich 1 acloc.

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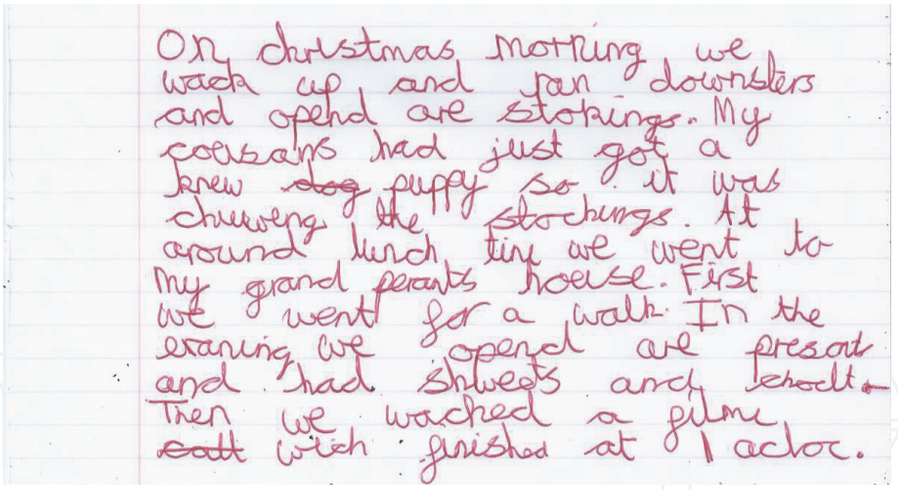
On christmas morning we wack up and ran downsters and opehd are stokings. My coesans had just got a brew dog puppy so it was chewing the stockings. At around lunch tim we went to my grand perants hoeuse. First we went for a walk. In the evaning we opend are presat and had shwees and chocklt. Then we wached a filme eatt wich finished at 1 aclor.

Figure 1.
Handwritten script of a year 7 pupil. Half size.

There are two scribal errors where after letter "o" the link to "u" is formed as an "e" making "coeusans" and "hoeuse." The "v" in evening is malformed or closed.

4.3.2 The handwriting

The script is rather large and round. It is mainly in cursive style and mostly with lead-in strokes. This indicates previous remedial training. The script shows mild coordination problems in that rivers of space run down the page and although there are lines to write on the script runs above and below it. Body size of letters and slope vary.

4.4 Correcting the misspellings

1. Ask Alan to **proof read** the script and to underline any errors and then write out the correct version to be checked with the dictionary.

2. **Check:** That he can hear and feel the difference between a long vowel and a short vowel sound. Long vowels "say their own names" e.g. A, E, I, O, U. Teach him to recognise these differences if necessary as the need arises during the following.

Below are example strategies that can be tried but **not all at once**. Select two words to work on in any one session to see how CPSS works. Then use the current written work and Alan's own choices.

wsck (woke) Possibly planned to write "waked" here.

1. Articulate clearly for spelling. Note the **long vowel O** sound in "woke."

2. In a one-syllabled word with the **long vowel** sound a silent "e" at the end tells us to make the long vowel sound (Do not call it magic "e" now) e.g. make, woke, lake, made, spoke, rode, tide, rude. Get him to generate some more and find them in a page of a book.

downsters – pronounce the word as he has written it and the target word "downstairs."

Can he spell it correctly when pronounced correctly? Explain it is a compund word made up of "down" and "stairs," Generate some more compound words together and help him find some on a newspaper page.

opend – the word "open" is a **verb** or doing word. To change it to the past tense we must add "-ed" after the consonant. We just add a "d" when there is already vowel "e" present as in "close" and "closed." Collect some examples "mend-ed," "land-ed," "change-d."

are (our) – articulate the two versions "are" and "our." Note that "our" has the "ahoo" sound or diphthong. We use "ou" to denote the "ahoo" sound in words e.g. our, out, and in ground, sound, loud, found.

cousans – Over-articulate for spelling e.g. *cous* – ins, think of "in–laws."

knew(new) - discuss the meaning and origins of the two words. They are homophones.

The origin of knew is from Norse – kna – meaning to know. Related words are knowledge and knowing. To remember the family pronounce the now silent letter like the Norsemen did k-new to remember it. Cue articulate.

stoking and stocking: teach "c" "ck" and "k" rules.

1. Syllabify for spelling "stock" with suffix "– ing" added.

2. In one syllabled words with a short vowel and no other consonant before the last /k/use "–ck." Tell the story is of "kicking/k/and cushion consonant/c/." e.g. back, tack, ick, tick. Can he generate some more examples?

3. Use "c" in the middle of words – decoy, decay, recant.

4. When there is an extra consonant or an extra vowel before "kicking k" they protect the short vowel and the cushion is not needed e.g. leek, leak, seek, weak, mink, wink, sink.

chuweng – for the (u) sound we use "ew" at the end of one-syllabled words e.g. chew, knew, crew, flew, dew.

tine/time - Check that he articulates and can identify the different consonant sounds of "n" and "m." Describe together the different articulatory feel of these letters.

grand perants - this looks like a visual error, switching the position of "a" and "e." Over articulate "ar" and syllabify for spelling as in "pa – rent." Make a funny.

evaning – identify the Baseword **– "eve"** and its meaning, syllabify for spelling "eve – ning."and e-ven-ing.

preset – teach the –nt blend in words. It is difficult to detect the "n" before "d" and "t" because it nasalifies the preceding vowel. Hold nose whilst trying to say "bend," "went" and "present."

shweets – show the difference between shw- and sh- by getting him to articulate them.

choclt – articulate clearly and syllabify for spelling e.g. choc – o - late.

wached – the hard (ch) sound in words is represented by "tch" immediately after a **short vowel** sound e.g. watch, fetch, catch, witch, switch, after anything else we use "ch" e.g. lunch, munch, beach, beech, teach (exception is "which" because we already have "witch").

filme This is an over-generalisation of the long vowel rule. After short vowel sound the silent "e" is not needed because it only tells us to make the long vowel sound that is incorrect here for film.

wich – teach the "wh" digraph for all the question words. E.g. why, who, where, which, when, what. Try to aspirate the "wh" sound in these words as a cue.

acloc (one o'clock) articulate clearly (citation mode). The full version is "one of the clock" we put in the inverted comma to show the omission. Think of other examples e.g. do not; cannot; will not ask Alan to give the full versions of them as well.

4.5 Handwriting suggestions

To improve the fluency and form of the handwriting draw sets of double lines so that he writes the groups of 3 versions of his corrected spellings in between the lines. See LDRP example below.

The rules are:

- The bodies of the letters should all be the same size as defined by the lines.
- All the bodies of the letters must sit on the bottom line and be the same size.
- All the "tails" of the letters must hang below the line.
- The "t" is a small letter.
- All the sticks must stand above the body line.
- All sticks and tails must be parallel to each other.

The ovoid sloping cursive is the fastest script. Left-handers may need to let their letters have a backward slope. Children in secondary schools who did not write at a speed of 15 words per minute were failing in all areas of the curriculum and had low self-esteem (**Figure 2**) [56].

4.6 An example of casework with an adult dyslexic

"John" aged 56 referred himself for advice about his misspellings after suspecting he had Dual and Multiple Exceptionality (DME) [55]. From school age he had severe writing and reading difficulties. Much later he discovered he was dyslexic with an IQ on WAIS (Wechsler Adult Intelligence Scale) of 132. (His scores on the test would be depressed by the dyslexia and would be likely to be 10 points higher in real terms). He had been a successful businessman and returning to academia was working on his PhD. His handwiting was almost indecipherable and he had to leave notes for people in print.

These are the examples given by "John" with the target CPSS discussed.

- typical or typicle? Final stable syllables –le, –al, –el; Family
- impact or empact? Prefixes – Articulation citation mode
- bureau or burreau? Short vowel rule
- recruit or recrute? Cue articulation
- vendor or vender – Both are regarded as correct just use one
- des or dis at the beginning? Meaning of prefixes

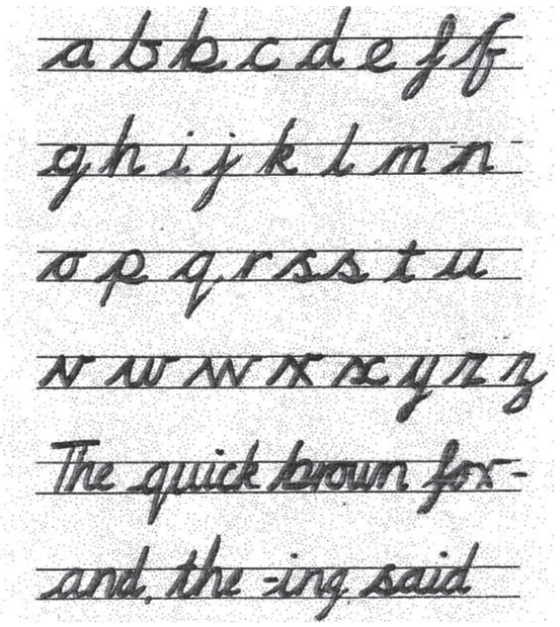

Figure 2.
LDRP ovoid cursive style.

- proposition – propo-propa-prope-propi? Basewords
- mitigation – miti- mita-mite? Meaning
- first – fist? Overarticulation
- relevant – rele-reli-rela? Origins
- decent or desent? Phonic rule
- deliberately- deliberatly? Suffixing Add rule

A special dictionary was compiled to help teachers correct pupil misspellings. The errors were those found in scripts from the 20 and 10-minute speed writing tests.

4.7 Examples to show the "Spelling Detective Dictionary" approach www.ldrp.org.uk

blurred
blured

1. identify the baseword "blur" and the closed syllable pattern (CCVC)

2. teach the DOUBLING rule that after the short vowel sound in a two syllabled word we must have two consonants to keep the short vowel pattern so we double consonant "r" (– VCCV -) blur - r - ed., blurring; occur, occurring, occurred

_____.

boarded
boaded boarded

1. identify the baseword "board" and its meanings such as a "plank of wood" and to go "on board" a ship or a boat

2. board and boat both have the vowel digraph "oa" in them, when a vowel is followed by consonant "r" it changes the usual sound it makes e.g. "oar" and "oa"

3. look for the "oars" on board the boats

4. check the articulation captures the final blend "-rd"

5. find five more words with the end blend "-rd" sword, ford, word, hard, nerd

_____.

bodies
bobys, bodys

1. identify the base word "body"

2. clench the two fists with the thumbs up straight and put the knuckles together to form "bod" or "b d" showing where the ascenders should be

3. articulate (b - od) feeling the difference in the mouth for "b" and "d"

4. ask the pupil to describe the feel of these consonants in the mouth e.g "b" starts with lips closed

5. teach the CHANGE rule for suffixing plurals - after "y"we must change "y" to "i" and add the plural "es" - bod - i - es, babies, nannies.

_____.

5. Recent writing and underachievement project

Concerns had been expressed by parents in Potential Plus UK about their children's writing and possible underachievement. This led to a new writing project. Any PPUK member could refer their child with High Learning Potential (HLP) and send a sample of handwriting using the 10-minute test.

Initially 30 families participated - 43 school age pupils and 7 adults. Later some schools also referred their problematic cases and made a total of 83 investigations.

In the PPUK 2016 sample there were 37 primary school-age pupils in Reception to Year 6; 3 in Year 7; 2 in Year 8 and one in Year 9. The statistical analysis focused upon the 40 pupils in Reception to Year 7 as follows:

- 8 girls and 32 boys took part in the study.

- 8 pupils (16%) were left- handed. This is above the 12% national average.

- Six handwriting factors: speed, style, form, fluency, legibility and coordination difficulties were reported upon.

- The number and nature of any spelling errors were analysed.

Of the 40 pupils only 8 had no identifiable spelling or speed and coordination handwriting problems except that in 7 cases suggestions were made that would improve legibility.

"Dyslexics" were those who made more than 10 misspellings per 100 words after the Reception year or wrote no decipherable words in Reception.

Speed problems were identified as cases where rate per minute was lower than the mean for the Year group (one word per minute faster than actual age) although the more able should be writing faster than other pupils.

Legibility was not scored but based on a Test of Handwriting Form and Legibility T-HFL interventions were suggested as appropriate and related to "body," size, ascenders and descenders, use of lines, letter formation and word space.

Of the whole group of 40:

- 8 were diagnosed with dyslexia (16%), only 2 had a formal diagnosis
- 4 had dyslexia and speed problems (50% of the dyslexics)
- 5 dyslexics had coordination difficulties (12.5% of the dyslexics)
- 13 had significantly slow speed, 25 per cent or more slower than the mean. (26%)
- 22 had handwriting/coordination difficulties (55%)
- 27 had some form of handwriting difficulty in speed or coordination (67.5%)
- 8 had both speed and coordination problems (16%)
- 28 had a speed 40 per cent or more slower than might be predicted from their high ability (70%).
- 32 of the group of 40 had a problem that would be detrimental to potential high achievement in school (80%).
- 7 used the more problematic quadruped or thumb over grip (17.5%), not the usual tripod flexible or rigid grips.
- Other problems such as weak grip and too firm a grip had to be inferred from pressure or lack of it on the scripts and reference to coloured photographs.
- Several adults and children reported pain in their writing hands after a few minutes of writing although this information was not specifically requested.

The conclusion from this sample is that in the majority of cases potential achievement was undermined by difficulties in handwriting and/or spelling. Handwriting difficulties were in the majority, two thirds of the sample. The distress that this creates in many such cases makes them vulnerable to nervous illness and withdrawal from school such is the disparity between their high ability and their writing accomplishment and its reception by the their teachers. If handwriting skill does not respond to intervention assistive technology should be introduced and this may be needed as soon as formal schooling begins in about 1% of cases. In relation to dyslexia a handwriting problem handicaps the remedial intervention strategies and contributes to the severe cases.

6. Conclusion

Although this research began with a concern about spelling problems in a wider group than just dyslexics a second problem emerged. This was a difficulty in handwriting and the large number of cases of potential underachievement it caused across the ability range that was going unobserved in schools. Neurological fMRI studies showed that handwriting was an essential component in both reading and spelling acquisition and development [44]. This meant that handwriting and spelling needed more attention in dyslexia remedial programmes following the approaches of the dyslexia pioneers using cursive and SOS training [25]. Government guidelines [57] on handwriting offer only a semi-cursive approach with 4 different places to start letters rather than one.

A further problem was revealed in the research and this was the case of very bright dyslexics with HLP who were identified late who read well but spellt poorly and often had problems with writing – the dysorthographics. Traditional SSP interventions were not relevant for them and they needed a strategic approach to spelling. This did work well.

For most of the 20th century, the belief was that English spelling was highly irregular and pupils did not use prior knowledge of previously learned words to help spell new words [58]. Because of these beliefs, spelling instruction in most classrooms was based on rote memorisation of assigned lists of words selected by the teacher or a spelling textbook that emphasised visual memorisation of the most common irregular sound/symbol correspondences [59]. These beliefs have been difficult to change and have become embedded in the limited approaches found in the UK government guidelines.

Because the strategies learnt by intending literacy teachers in England are limited to SSP they do not require them to be familiar with the stages in spelling development or understand how the English language system is organised. Research has shown however that spelling is not an exclusive process of rote memorising [60] and pupils do not learn spelling words in isolation instead they use prior knowledge and understandings to help make decisions and form concepts about how to spell new words.

Bear et al. [61] found that as children's knowledge of language, letters, sounds, and other phonological processes developed so did their ability to notice patterns within words. From basic letter-to-sound correspondences, to patterns associated with long and short vowels sounds, to structures within words associated with syllables and affixes, and finally, to Greek and Latin roots and stems, the child's brain looks for invariant patterns to help it spell efficiently. They suggested a hierarchical process in development. Although word pattern knowledge may develop in this way in non-dyslexics by implicit learning processes, dyslexics need specific help to learn the skills or at least get started on them as illustrated in the CPSS case example above.

A traditional spelling curriculum that assigns words based on content vocabulary, somewhat random spelling rules and synthetic phonics does not take advantage of the brain's capacity to learn through predictable patterns [62]. Word pattern theory has become a dominant theme in spelling research especially in the US and is relevant to the flexible CPSS approach described above for later phase dyslexics.

This wider research supports the view of spelling as a complex cognitive process intrinsically related to language, reading, and writing [34, 63] In support of this approach with dyslexics the International Dyslexia Association [64] stated that a spelling programme should not emphasise visual memory but instead, make the process of discovering the features of words more salient and allow students to become more efficient spellers.

Society, in general, values correct spelling above all other writing conventions and making anything beyond a few minor spelling errors is equated with ignorance and incompetence [65]. Helping dyslexics into the orthographic phase of development by giving them insights into word pattern structures and their linguistic rules can thus prevent them from becoming doubly disadvantaged. The CPSS system teaches dyslexics and other poor spellers key phonological, morphological and etymological information that good readers and writers pick up implicitly during reading and spelling.

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