

Exploring the efficacy of a dynamic assessment procedure of spelling in children with dyslexia

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This thesis is submitted in partial fulfilment of the requirements of the award
of Doctor of Philosophy.

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For my sons, who started me on this journey and inspire me every day

I, Jennifer Donovan, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Word count: 69,410

Acknowledgements

This thesis has been supported by many different people. I would first like to thank my supervisors. Professor Chloë Marshall, University College London, kindly helped to shape my initial idea into a viable research project and generously shared her time and knowledge at all stages of this thesis. Dr Bernard Camilleri, City University, London provided input and insights in the field of dynamic assessment that have been invaluable.

I would also like to thank Dr Emma Sumner for her helpful feedback as an internal reader as well as my colleague at UCL, Nelly Joye, who kindly agreed to help with the coding of my data. Thank you also to Assistant Professor, Sarah Critten, Coventry University, and Associate Professor, Daisy Powell, Reading University, for agreeing to examine this thesis.

This research was made possible by the generous support of many teachers, schools, parents and children who agreed to participate in this research. My sincere thanks goes to them all for their support with particular thanks to the specialist teachers who participated in the final study donating both their time and expertise.

Finally I would like to thank my friends and family for their positive support throughout.

Abstract

This thesis seeks to link the theory of assessment with the practice of dyslexia specialists in the UK. The studies outline the development of an alternative approach to the assessment of spelling in children with dyslexia that incorporates a dynamic assessment approach. The thesis presents four studies that build on each other to provide evidence for a Dynamic Assessment (DA) in the curriculum domain of spelling. The first study reports on the current assessment practices of 299 dyslexia specialists in the UK, identifying that while conventional static testing provides a measure of spelling accuracy compared to same-aged peers, further information is needed to inform intervention/support. As a foundation for an interactive (dynamic) assessment approach, Study Two builds on research by Critten et al. (2007) and Rittle-Johnson and Siegler (1999) to determine whether children with dyslexia are able to explain their spelling choices in a similar way as same-age and spelling-age matched groups (66 children aged between 6;3 and 9;9) and to investigate the spelling strategies they use. Study Three outlines the development of a Dynamic Assessment of Spelling (DASp) using the theoretical framework of Lidz (2014) for curriculum-based DA. The assessment developed for this thesis utilised a teach-train-teach format incorporating a graduated prompt procedure at post-test. Fifty children with dyslexia between the ages of 8 years and 9 years 11 months participated in this study. Information collected from the DASp procedure allowed the assessor to develop spelling profiles that revealed differences in the children's spelling abilities even when they achieved similar spelling scores on a static spelling task. Finally, Study Four reports the outcome of a pilot study with 6 qualified dyslexia specialists who used the DASp to develop an intervention programme for 12 children (mean age 8;8). All of the specialists reported improved outcomes for the children in the study and overall evaluations were positive. Implications for practice, limitations of the studies, and suggestions for future studies are discussed.

Impact Statement

Effective support for children with literacy difficulties such as dyslexia, starts with thorough and informative assessment. Despite considerable research evidence identifying that reading and spelling involve similar cognitive processes, spelling assessments used by dyslexia specialists in the UK most often only provide a binary measure of the number of words that a child has spelt correct or incorrectly. The gathering of additional information to inform support, for example by using error analysis, is done on an ad hoc basis. Very few other tools exist for this purpose.

Accurate spelling requires not only phonological, orthographic and morphological knowledge but also a repertoire of reliable strategies that children can use when encountering an unfamiliar word. There is evidence that even very young children use strategies in their attempts to spell new words and are able to report what these are. Numerous studies have examined how typically developing children use these strategies. However, the role of strategy use by children with dyslexia is currently overlooked in the literature.

The studies presented in this thesis provide a link between the research evidence and current practice in two ways. Firstly, from a research perspective, identifying and comparing the spelling strategies used by typically developing primary school children and children with dyslexia can contribute to the literature on typical and atypical spelling development and provide a possible basis for effective support.

Secondly, from a practical perspective, the aim is to provide an additional assessment tool for dyslexia specialists who perform the dual role of assessing children for the identification of dyslexia and provide intervention support in schools. The development of a Dynamic Assessment tool for spelling, grounded in evidence-based research and theory and that can be

integrated into current assessment practice, may have the potential to effectively improve the spelling difficulties of children with dyslexia.

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CHAPTER ONE: General introduction

There is little use in assessing for the sake of assessment; assessment should be carried out as part of an intervention (i.e. being assisted or dynamic in nature) and for the sake of selecting or modifying intervention. (Grigorenko, 2009 p 113.)

1.0 Dyslexia, spelling and dynamic assessment

In the current educational climate assessment plays a central role in educational accountability (Al Otaiba & Hosp, 2010; Gillies, 2014). Alongside this is a growing awareness that effective assessment should provide information that leads to targeted instruction enabling the practitioner to support the learner to move forward (Feifer, 2008; Grigorenko, 2009; Kohnen, Nickels, & Castles, 2009; Westwood, 2005).

Broadly speaking, Dynamic Assessment (DA) is a testing procedure involving interaction with the assessor that seeks to understand how the individual arrives at their answer. This is in contrast to conventional normative assessment, also termed 'static' assessment, that provides a score that compares the individual's performance with that of his/her peers. There is an extensive body of evidence demonstrating that a DA approach can contribute to the practitioner's understanding of differences between individuals (Grigorenko, 2009; van de Pol, Volman, & Beishuizen, 2010). The evidence further suggests that this information can be used to improve learners' levels of performance (Guterman, 2002).

While there is some disagreement over the level of prevalence, developmental dyslexia (henceforth dyslexia) is a specific learning difficulty that is said to occur in approximately 3% to 10% of the population (Snowling, Gallagher, & Frith, 2013). Debate exists around a specific definition of this literacy disorder making identification and support difficult. However there is considerable agreement in the literature that early identification and intervention results in the best outcomes for children diagnosed with dyslexia (Blachman, 1997; Carroll, Bowyer-Crane, Duff, Hulme, & Snowling, 2011; Hatcher et al., 2006; Snowling, Gallagher & Frith, 2013).

Although there is no universally agreed definition (Elliot & Grigorenko, 2014), it is generally acknowledged that dyslexia is a developmental disorder that is characterised by difficulties in accurate single word reading and/or spelling (Berninger, Lee, Abbott, & Breznitz, 2013; Bourassa & Treiman, 2003; Kohnen, et al., 2009). Spelling and reading have a reciprocal relationship however spelling is more difficult than reading (Ehri, 2014). When reading words in a text, children can use context as an aid to understanding thereby circumventing the need for a completely accurate retrieval of grapheme-phoneme correspondences. Correct spelling however requires not only the recall of the correct phoneme-grapheme correspondences, but this recall must be in the precise order. While reading difficulties may resolve with appropriate support, spelling difficulties can persist into adulthood (Berninger et al., 2013; Hatcher, Snowling, & Griffiths, 2002; Maughan, Messer, Collishaw, Pickles, Snowling, Yule & Rutter, 2009). Accurate spelling is important in education and spelling is considered to be a key predictor of writing composition quality (Sumner, Connelly, & Barnett, 2014). Despite this, studies centred on reading difficulties tend to dominate the research literature.

A report commissioned in the United Kingdom (UK) by the then Department for Children, Schools and Families (Rose, 2009) found that children who responded least well to classroom based literacy interventions were more likely to require intensive instruction on an individual basis. It identified the need to train a proportion of teachers as dyslexia specialists to assess and deliver intervention to children struggling with literacy. All of the recommendations in the report were accepted and consequently government funds were invested to train dyslexia specialists in all education sectors, overseen by the British Dyslexia Association. A number of tertiary providers were awarded contracts to provide post-graduate training programmes leading to the award of Approved Teacher Status (ATS) and/or Associate Member of the British Dyslexia Association (AMBDA).

The aim of dyslexia specialist assessment is to evaluate the learner's current attainments and abilities in order to gain information useful for effective support and intervention. In practice, dyslexia specialists make a distinction between assessments undertaken to provide a diagnosis for dyslexia and assessments that gather information about a learner in order to determine the support required. Despite the assertion that assessment is an interactive process between the learner and the assessor (Backhouse & Morris, 2005), there remains a focus on standardised, static, testing procedures. Current assessment practices of spelling ability by dyslexia specialists typically consist of standardised spelling tests that

compare a child's performance to that of his/her peers by providing age-related norms. These tests are typically administered using a dictation format and no further input is provided by the assessor. A binary procedure is used whereby the items are scored as either correct or incorrect and a total score is calculated. Given the complexity of the spelling task, a standardised test that provides the number of items correct or incorrect as its only outcome measure could be considered insufficient for providing information for specific support (Al Otaiba & Hosp, 2010).

A number of studies can be identified in the literature that acknowledge the complexity of the spelling process and have therefore attempted to gather further information by analysing spelling errors (e.g. Bourassa & Treiman, 2003; Bruck, 1998; Cassar et al., 2005). Error analysis (or miscue analysis as it is often termed by teachers), requires the assessor to undertake a post hoc analysis of a child's spelling errors by assigning them to a category in order to determine patterns of errors. In practice, there is no specific set of categories used for this process and the categories used may differ depending on the background and understanding of the practitioner. This form of analysis is generally not sufficiently structured or extensive enough to provide the in-depth information teachers require to develop an effective instructional programme (Al Otaiba & Hosp, 2010; Steffler, 2001). Static testing and post hoc error analysis do not provide any understanding of how the learner arrives at their spelling choice. The child's use of strategies (either weak or effective) can only be inferred from the assessment. Bourassa and Treiman (2003) identify the need to develop a spelling measure that 'goes beyond traditional classification schemes that miss a great deal of information by scoring spellings simply as correct or incorrect' (p 313).

DA offers an alternative approach to static testing and post hoc error analysis. This approach is built on the work of Vygotsky (1978) who argued that greater achievement is possible when a child learns through collaboration. This collaboration provides a more complete understanding of the child's abilities by extending their levels of performance, mirroring a response-to-intervention (RTI) model (Poehner, 2008). While there are a number of approaches to DA as will be discussed further in this thesis, the identifying feature is that it blends instruction and assessment in order to provide detailed information to support instruction.

The literature review identifies the need for a spelling assessment that provides fine-grained information about what the child can achieve, what they find difficult, and how they can best be supported (Rittle-Johnson & Siegler, 1999). Rittle-Johnson and Siegler identify that diverse strategies allow children to adapt their strategy use to solve problems by 'flexibly combining several strategies to solve a problem' (p 332). Static testing generally only provides an understanding of how many items a child scored correctly compared to same age peers. To become efficient spellers, children need to have an understanding of the components of spelling as well as a repertoire of spelling strategies that they can flexibly draw upon to produce the correct spelling (Farrington-Flint, Stash, & Stiller, 2008). The literature identifies an increased emphasis on assessment for intervention however it could be argued that static testing, with an emphasis on binary measures, fails to provide sufficient information about the underpinning cognitive strategies used to solve the task. This information is important when developing effective interventions. DA is uniquely positioned to fulfil this role. The research presented in this thesis therefore aims to explore the efficacy of a DA of spelling (DASp).

1.1 Research aims and questions

The central focus of this research study is to provide a link between assessment theory and educational practice. The study is exploratory in that it seeks to develop a proof of concept of the efficacy of using a DA approach with children with dyslexia. Specifically, it investigates if an assessment of spelling can be developed within a DA model and evaluates if it provides additional useful information for intervention.

Research Aim

1. To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

Research Questions

1. What is the current assessment practice of dyslexia specialists working in schools?
2. Given the interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?
3. If so, can a spelling assessment be developed within a theoretical framework for DA?

4. What additional information can a DA approach to spelling provide?
5. How can this information be used to support weak spellers?

1.2 Structure of the thesis

The aim of this thesis is to provide a theoretical-practical framework to link DA approaches to conventional static assessments used by dyslexia specialists. It will seek to explore if a DA procedure for spelling provides additional information that cannot be gathered by standardised testing alone. The proposed approach, using the model of Haywood and Lidz (2007), is to incorporate a DA of spelling within a traditional assessment by dyslexia specialists.

The thesis first examines the existing literature in the fields of dyslexia and spelling development, literacy instruction and specialist support in the UK and DA in order to provide a theoretical background to the studies. Four studies are then presented –

- (i) Study One – Dyslexia specialist surveys of current practice.
- (ii) Study Two – Exploring children’s verbal reports of spelling strategies.
- (iii) Study Three – Developing the Dynamic Assessment of Spelling (DASp) procedure.
- (iv) Study Four – Pilot study and evaluation of the DASp procedure.

1.3 Chapter summary

In summary, there is support in the literature for a spelling procedure that provides more information about the spelling errors that children make and why they make them as well as the strategies that they use. This thesis argues that quantitative information gained from conventional static assessment is not sufficient. Gaining an insight into the approaches used and the strategies available to the child could be important when developing an intervention programme. In addition, such information may reveal differences between the spelling approaches of typically developing children and children with dyslexia. Dynamic assessment offers one approach for eliciting this information.

CHAPTER TWO: Developmental dyslexia and spelling

2.0 Chapter introduction

This chapter provides a definition of dyslexia together with an overview of the literature relating to the core deficits found in children with dyslexia. Literacy difficulties accompanying this specific learning difficulty are explored, particularly in relation to spelling. An overview of the research investigating how children's spelling typically develops is presented in order to provide an understanding of atypical development. A review of the literature in relation to the spelling difficulties of children with dyslexia compared to typically developing children is also discussed to investigate whether children with dyslexia demonstrate fundamentally different approaches to spelling a word or if their difficulties represent a delay in relation to their typically developing peers. Understanding this has implications for assessment and effective support.

2.1 Definition of dyslexia

Dyslexia is a developmental disorder categorised in the United Kingdom (UK) as a specific learning difficulty that is characterised by word level reading difficulties and spelling. The literature identifies numerous definitions of dyslexia, making the identification of this specific learning difficulty problematic (Brooks, 2007).

The most widely accepted definition currently used in the UK by specialist teachers is provided by the Rose Review (2009) and adopted by the British Dyslexia Association. Given the focus on dyslexia specialist teachers in this thesis, dyslexia is defined as:

A learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling. Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory and verbal processing speed. Dyslexia occurs across a range of intellectual abilities. It is best thought of as a continuum, not a distinct category, and there are no clear cut-off points. Co-occurring difficulties may be seen in aspects of language, motor co-ordination, mental calculation, concentration and personal organisation, but these are

not, by themselves, markers of dyslexia. A good indication of the severity and persistence of dyslexic difficulties can be gained by examining how the individual responds or has responded to a well-founded intervention (Rose, 2009, p. 30).

Although the prevalence for dyslexia depends on the definition and criteria used, it is estimated to occur in approximately 3% to 10% of the population (Snowling et al., 2013).

There is general agreement that children with dyslexia struggle with both reading and spelling (Berninger et al., 2013; Cain, 2010; Coleman, Gregg, McLain, & Bellair, 2009; Snowling & Hulme, 2007; Treiman, Kessler, & Bourassa, 2001) and that spelling difficulties may remain into adulthood even if reading difficulties have been resolved (Berninger et al., 2013; Bruck 1990; Hatcher, Snowling & Griffiths, 2002). Several studies have identified that adults with dyslexia report that difficulties in writing, rather than reading, are their biggest concern (Burden & Burdett, 2005; Mortimore & Crozier 2006). Furthermore, spelling is a key predictor of writing composition quality (Sumner et al., 2014).

Classical theories of dyslexia identify a substantial body of evidence highlighting deficits in phonological processing and phonological awareness in children with dyslexia (Hulme & Snowling, 2009; Landerl, Ramus, Moll, Lyytinen & Leppanen, 2013; Snowling 2013; Wagner, Torgesen, Rashotte, & Pearson, 2013). However there is continuing debate in the field of dyslexia about the specific nature of the phonological deficit and if other deficits might also be implicated (e.g. Boets et al., 2013; Carroll, Solity & Shapiro, 2016; Goswami, 2015). Pennington et al. (2012) suggest that dyslexia occurs as a result of combined factors with multiple origins, an argument that is consistent with other developmental disorders. More recently, a study by Carroll and colleagues (2016) concluded that the range of nonphonological difficulties observed in studies of individuals with dyslexia, for example in auditory processing (Boets et al., 2011), motor and balance skills (e.g. Nicholson, Fawcett & Dean, 2001) and visual difficulties (Bosse, Tainturier & Valdois, 2007) fit within a multiple deficit model suggesting that reading difficulties can have multiple different causes.

Although there is growing support for a multi-deficit model of dyslexia, there remains substantial evidence that children with dyslexia are impaired in

phonological skills measured by tasks that tap phonological awareness, verbal short-term memory, and rapid automatized naming (e.g. Hulme & Snowling, 2009; Vellutino, Fletcher, Snowling & Scanlon, 2004). Phonological awareness is the ability to reflect on and manipulate the sound segments of speech (Ehri, 1987; Treiman, 1998). Substantial evidence identifies that phonological awareness is closely related to spelling performance, particularly in the early years and that it is essential for emergent spellers (e.g. Larkin & Snowling, 2008; Masterson & Crede, 1999).

2.1.1 Response-to-intervention (RTI)

Rose (2009) identifies substantial support in the literature that the earlier literacy difficulties are identified and supported, the better the outcomes for children with dyslexia. An important component of the definition of dyslexia as proposed by Rose is that the severity and persistence of the difficulties associated with dyslexia can be understood by how well the child responds to well-founded intervention. In accordance with the RTI model, Rose proposed a three 'wave' model of literacy provision, presented in Figure 2-1 below. Wave 1 consists of high-quality classroom teaching; Wave 2, additional time-limited support delivered in small groups as classroom support and Wave 3, intensive support for children who have severe difficulties delivered by a dyslexia specialist. Although more recently the terminology for each level has been changed to *universal* (Wave 1), *targeted* (Wave 2), and *specialist* (Wave 3), the level of support remains unchanged.

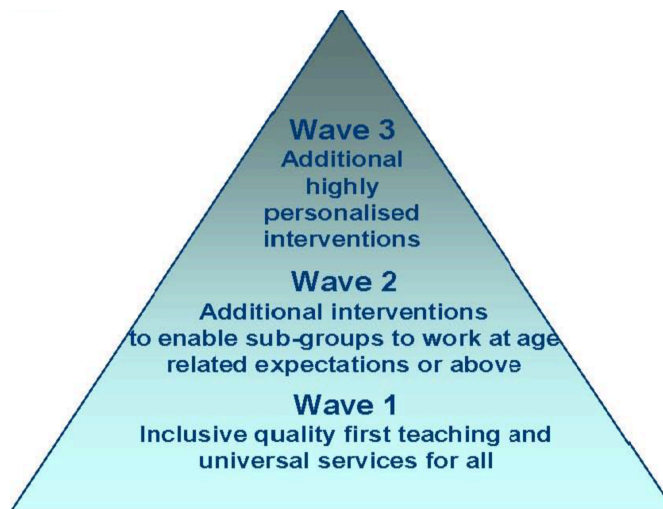


Figure 2-1: Wave model of provision as recommended by Rose (2009)

RTI is a prevention model incorporating multiple levels of interventions that are layered based on a child's individual need; the tiers of support are ideally introduced at the earliest stages of development and progress is closely monitored. The layers of intervention become increasingly intensive and specialised as in the 'wave' model of provision described previously. The presumption is that those who do not benefit from increasingly intensive intervention have a learning difficulty (Fletcher, Lyon, Fuchs, & Barnes, 2007). RTI is conceptualised as an evidence-based initiative that integrates research and practice. The intention is to address criticisms aimed at current approaches to literacy difficulties where some children are misdiagnosed as having a difficulty when in reality, they may not have had the benefit of a high-quality classroom teaching environment (Justice, 2006).

The emphasis on RTI models arose from a new focus on assessment for intervention rather than for the application of diagnostic labels. In this view, it was considered that assessment should reveal information that is 'useful in designing, implementing, monitoring and evaluating interventions' (Robinson-Zañartu, Mendoza, Mesa, & Wager, 2010, p 39).

Although the specifics of what constitute RTI differs, a general consensus identifies that it represents a framework that includes universal screening, tiered

levels of high-quality interventions, progress monitoring to determine students' levels of responsiveness to support, and data-based curricular decisions (Mellard, Mcknight, & Woods, 2009). Fletcher et al. (2007) identify that at the implementation level, RTI should be conceptualised as a process rather than a single model with variation in how the process is implemented.

The RTI model has two applications. Firstly, it can be seen as a prevention model to limit the amount of academic failure students may encounter before support is provided. Secondly, it can be used to determine if a student has a specific learning difficulty (Mellard et al., 2009). Adopting a RTI model for identification replaces the traditional achievement-attainment discrepancy model (although critics argue that it will not speed up the process of identification, e.g. Wagner & Compton, 2011). There is general agreement that adopting a RTI model for children with difficulties means that support can be provided once the difficulties are identified rather than being delayed until formal identification.

2.2 Spelling and typical development

There is less research on how children learn to spell than on how they learn to read, but a good deal is now known about spelling development (Treiman, 2017b). Spelling in an opaque language such as English, where the correspondence between phonemes and graphemes is highly unpredictable, is a complex skill and can present greater challenges than learning to read (Caravolas, Hulme, & Snowling, 2001).

Spelling is the visible representation of word-level language using written symbols in conventional sequences. Masterson and Crede (1999) identify that in order to spell accurately, children need to develop an understanding of phonology (speech sounds); orthography (the symbols that represent the speech sounds); morphology (the relationships between root words and their derivations) and semantics (word meanings). Appropriate strategies then need to be employed to determine the correct approach to spell an unfamiliar word (Holmes & Malone, 2004). Spelling can therefore be considered to be a complex linguistic process that involves far more than rote learning. In order to spell efficiently, words must be broken down into sound segments and a link made between the sounds and letters. An understanding of the orthographic conventions of the language is then required to translate spoken language to the written form. This orthographic

mapping involves making connections between spoken language at the phoneme, syllable or morpheme level and mapping these to written units that can be small (at the grapheme level) or larger units (Ehri, 2014). The formed connections can then be stored in memory and retrieved as required. Orthographic knowledge is acquired via self-teaching opportunities provided by phonological decoding (Graham, 1999).

Dual-route theory as a framework for spelling

Dual-route theory (e.g. Houghton & Zorzi, 2003; Rapp, Folk & Tainturier, 2001; Treiman, Kessler, Pollo, Byrne, & Olson, 2016) based on the spelling system in skilled adults, provides a theoretical framework to usefully explain how we can spell (and read) words that are familiar as well as generate plausible spellings for words that are unknown. Figure 2.2 outlines a version of the dual-route model (Kohnen & Nickels, 2010).

The model proposes that spelling can be achieved in two ways: either by converting phonological representations into orthographic representations (the phonological or non-lexical route) or by retrieving spellings that are stored in the orthographic lexicon (lexical route). According to this model, children first acquire the skills in mapping phonemes to graphemes and rely on the phonological route. As their abilities develop, children begin to store spellings of specific words in the orthographic lexicon, and these can be retrieved using the lexical route. For both routes, the expression of the spelling (either oral or written) is achieved via the graphemic buffer, a mechanism that maintains activation levels for the abstract sequences formulated.

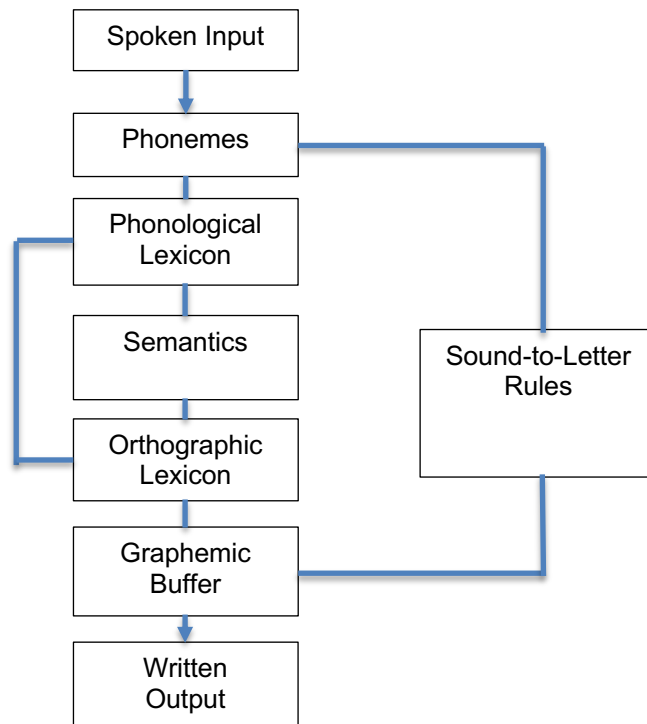


Figure 2-2: Schematic representation of the functional architecture of spelling (Kohnen & Nickels, 2010)

Support for the two strands of this model (the lexical and phonological routes) is based on the observation that some words in English cannot be produced accurately via the phonological route, for example, words like *yacht* and *friend*. In addition, sounding out words can be problematic as the pronunciation of individual letters can vary according to the surrounding letters. For example, <u> occurs in combination with other letters and is pronounced differently in a range of words such as *business*, *bury*, *cough*, *touch*, *full* and *house*. These occurrences are common in the English language. This provides evidence for a storage system (lexical route) for some words. The lexical route can be described as a 'mental dictionary' (Treiman, 2017b) that stores not only the spellings of irregular words but also regular words once they have become familiar. In this way children develop a store of memorised spellings. Kohnen and Nickels (2010) note that we can typically spell words whose meaning may not be entirely familiar. This is represented by an alternative route that circumvents the semantic element in the model in Figure 2-3. For some items, both routes might be used to produce an accurate spelling.

Accurate spelling can be a difficult task in English, a language that is characterised by a large number of inconsistent phoneme-grapheme relations (Hilte & Reitsma, 2011). In comparison to many other major writing systems such as Dutch, French and Welsh, where spellings have been regulated and standardised, English has evolved 'freely' over time (for a full review see Rastle, 2019). In English, 26 graphemes represent around 44 phonemes and words therefore vary in relation to the transparency of their phonemic components. While spelling and word decoding use the same orthographic representations, spelling requires greater attention to the orthographic representations of the words. The decoding of graphemes into phonemes for reading and the encoding of phonemes into graphemes for spelling are two different, although connected, processes (Ai Cheng Lee & Al Otaiba, 2017). In addition, while struggling readers may make use of context to support understanding, this is of less help when encoding words in spelling where automatic retrieval is unavailable (Ehri, 2000). Learning to spell is a complex cognitive process. When learning new words, children relate these to existing knowledge structures to determine if they fit the generalisations they have stored (Sumner, 2013). Given the relatively complex nature of the English language, learning to spell accurately requires an understanding of information from a number of sources.



Figure 2-3: Theoretical model illustrating the components involved in accurate spelling acquisition adapted from Masterson and Apel (2010)

Figure 2.3 provides a theoretical representation of the components involved in accurate spelling acquisition for children. At the macro-level, good quality classroom teaching provides an understanding of the building blocks of written language in English including phonological, morphological, semantic and orthographic knowledge. Children then need to develop a repertoire of spelling strategies and use them efficiently and flexibly in order to produce the correct spelling (Farrington-Flint et al., 2008). Beginning spellers internalise and organise information about spoken and written words and then use this information to develop provisional rules in a cognitive framework that is then applied to the spelling of words. The framework is developed by exposure to a range of information over time. Spellers rely on the pronunciation of words (i.e. letter-sounds) in early spelling attempts (Ehri, 2000; McGeown, Medford, & Moxon, 2013). This early strategy is replaced during development. As sight vocabulary, basic word knowledge and experience with writing words expands, the repertoire

of strategies available also expands and allows accrued knowledge to be applied to unfamiliar words. The developmental progression described here is supported by a number of studies (Greenberg, Ehri, & Perin, 2002; Kwong & Varnhagen, 2005) and theories of spelling development (Ehri, 2000). Spelling strategies can therefore be said to represent the underlying sources of linguistic knowledge required to spell successfully (Masterson & Apel, 2010). The identification of children's strategy choice may have important pedagogical implications for tailoring individual spelling intervention.

2.2.1 Theories of typical spelling development

In order to understand the spelling difficulties experienced by children with dyslexia it is important to first examine the processes that underpin spelling and its typical development. The conceptualisation of spelling development has important implications for spelling instruction (Sayeski, 2011).

Stage Models

The research literature identifies a number of theories that explain children's spelling development over time. Commonalities in children's spelling errors have enabled stage theorists to propose that children's spelling develops in a series of distinct and sequential stages or phases. A number of variations on stage and phase models have been proposed. While the terminology and number of steps in development differs between the theories, all describe a similar pattern whereby children move from an early non-phonological stage in which children do not yet have an understanding that writing represents speech (Treiman & Cassar, 1997) to a later stage of spelling mastery as their expertise develops. Early theorists described spelling development as moving through a series of fixed stages (e.g. Gentry, 1982; Read 1975). Later models (e.g. Ehri, 1987, 2014; Frith, 1986) suggested that spelling development progressed in phases rather than stages with some flexibility in strategy choice implicit in the model. Two influential models of spelling development are presented below.

Frith's (1986) model proposed a series of three progressive phases. A child at the *logographic* phase has minimal spelling experience and tends to employ basic visual strategies. At the *alphabetic* phase the child uses a developing understanding of letter/sound correspondences to spell and productions are primarily dependent on phonic skills. In the final *orthographic* phase, the child has

successfully developed abstract orthographic representations that allows them to spell automatically.

Ehri (1987, 2000) identified four steps in a phase model for spelling - *pre-alphabetic*, *partial alphabetic*, *full alphabetic* and *consolidated alphabetic*. In the *pre-alphabetic* phase, children are thought to depend on a letter name strategy where the sound is directly represented by a letter of the alphabet for example, the letter B for *bee* (Treiman & Cassar, 1997). In the *partial alphabetic* stage, developing spellers improve their understanding of phoneme-grapheme correspondences and move away from relying on a letter name strategy. They tend to match sounds and letters more accurately and begin writing them in a linear way although their knowledge of the alphabetic system remains rudimentary. It is hypothesised that at this phase the children use their knowledge to form connections in the words they have heard, for example, presenting *beaver* as BVR (Ehri, 2000). At the *full alphabetic* phase spellers demonstrate the ability to use more complete spellings, and may even insert additional unconventional letters, for example BALAOSIS for *blouses* (Ehri, 1987). In the final *consolidated alphabetic* phase, children's spellings become more complete as they retain the spellings of specific words in memory. Ehri (2000) suggests that as their knowledge base increases, earlier strategies become unnecessary.

The literature identifies that stage and phase theories of spelling development are a widely accepted approach that have been used to both understand children's spelling progression and as the basis for instruction (Ai Cheng Lee & Al Otaiba, 2017; Varnhagen & McCallum, 1997).

Overlapping Waves Model

As identified, stage/phase models describe spelling as developing in a clear linear fashion. There is substantial evidence, however, suggesting that spelling knowledge may develop simultaneously, rather than in phases or stages (e.g. Devonshire & Fluck, 2010; Rittle-Johnson & Siegler, 1999).

One example of this approach is the Overlapping Waves model (Siegler, 1996) that can be applied across all areas of cognitive development. A schematic of this approach is provided in Figure 2.4. This model conceptualises children's cognitive development in terms of variability in thinking rather than in a 1:1 relationship with age as proposed by traditional theories. Siegler argued that, 'As

the database in the field has expanded...the assumption of domain-general stage changes has become increasingly untenable. Important changes have been documented at every age'. (p.7)

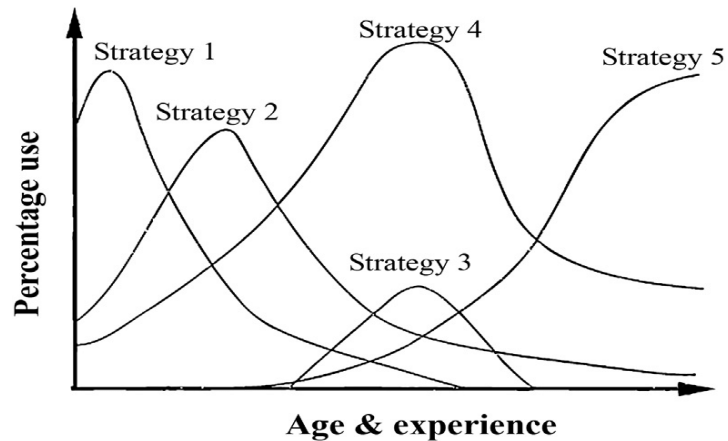


Figure 2-4: Overlapping waves model (Siegler, 1996)

Siegler contends that children think in multiple ways about different concepts throughout development and apply a variety of strategies, some of which may be adequate and others less so. In relation to spelling, the model identifies the strategies used by children as being task oriented rather than necessarily related to age or stage. According to this model, children rely on different strategies depending on the problem presented and are able to switch back and forth between more and less sophisticated strategies. What changes during development is the range of situations in which children use the strategies available to them. In contrast to the linear progression proposed by stage and phase theorists, the strategies used may not consistently fit within a developmental stage, but rather move between them (Varnhagen & Mccallum, 1997). The overlapping waves model therefore builds on earlier models of spelling development (e.g. Frith, 1986; Ehri 1987, 2000) by providing an insight into the cognitive processes that underpin development. Identifying strategy choices provides essential information when constructing a programme of tailored support that encourages the child to reflect on the strategies they use and discover more efficient methods leading to increased success (Farrington-Flint, 2015).

2.3 Spelling and dyslexia

Children with dyslexia often have difficulties with spelling that are as severe and sometimes more persistent than their reading difficulties (Cassar, Treiman, Moats, Pollo, & Kessler, 2005). Weak spelling skills are known to impact on writing; for example there is a body of evidence identifying that students who struggle with spelling may avoid using complex, multi-morphemic words (Daffern, Mackenzie, Sturt, & Wales, 2015).

Spelling difficulties for people with dyslexia are characterised by sustained difficulties with both phonologically and orthographically accurate spelling. The source of difficulty is understood to be in phonological processing (Herbert, Kearns, Baker Hayes, Bazis & Cooper 2018). Accurate reading and spelling both rely on efficient phonological skills. Research evidence suggests that typically developing children initially rely on phonological information to recognise and spell words and switch to direct visual processes for the recognition of familiar words as they develop (Bruck, 1988). Children with dyslexia characteristically have poor phonological skills that make it difficult to develop efficient links between letters and phonemes in order to spell unfamiliar words (Cassar et al., 2005). Phonological awareness skills are highly correlated with spelling ability (Bruck & Treiman, 1990; Stuart & Masterson, 1992).

In addition to these phonological difficulties, children with dyslexia also have difficulties with short-term and working memory that impact on the process of retrieving accurate spelling representations (Ehri, 2014). Working memory is conceptualised to consist of three components – the central executive (the system that regulates and controls information in working memory), the visuospatial sketchpad (responsible for holding and manipulating visual information), and the phonological loop (that holds acoustic and verbal information in memory while manipulating the information). Because children with dyslexia have difficulties in representing phonological information accurately due to a phonological awareness deficit, it is hypothesised that they may also have difficulties in holding phonological information in their short-term memory (Herbert, Kearns, Baker Hayes, Bazis & Cooper, 2018). This is likely to impact on their ability to spell unfamiliar words.

The difficulties identified in children with dyslexia will impact on the recall of correct spelling as well as on building vocabulary (Ise & Schulte-Körne, 2010). Support therefore may need to focus on alternative learning mechanisms (Graham, 1999) such as strategies to support the retention of spellings (Ehri, 2014). These strategies can be used to activate orthographic mappings to retain the word features in memory. Once the spellings have been embedded, the strategy used may no longer be needed but others may be activated as backup to confirm that the words fit the spelling and the context (Perfetti, 2007). Traditional spelling instruction and support tends to focus primarily on phonology (Devonshire & Fluck, 2010; Herbert et al., 2018) despite the fact that accurate spelling in English, as well as numerous other languages, consists of phonology, morphology and orthography.

Very few studies have examined how the children with dyslexia respond to instruction related to spelling strategies.

2.3.1 Spelling acquisition for children with dyslexia – delay or difference?

Understanding the exact nature of children's spelling difficulties allows targeted intervention to address these issues. Examining if children with dyslexia make different errors to those of typically developing children could have implications for effective teaching and intervention.

Error Analysis

Post hoc error analysis has been frequently reported in the literature as a tool for understanding difficulties in literacy to facilitate intervention (Mather & Wendling, 2017). This approach has been used extensively to examine how children approach the spelling of unfamiliar words. The analysis examines spelling errors and allocates them to specified categories, for example, phonological errors (e.g. phonetic/non-phonetic errors, substitutions, omissions, additions or reversals), graphotactic errors (i.e. knowledge of legal and illegal letter patterns) or morphological errors (i.e. misunderstandings of the relationship between root words and their derivations (Masterson & Crede, 1999).

In an early study, Bruck (1998) investigated whether children with dyslexia and typically developing children used different processes when reading and spelling

words. A group of 9 -16 year-olds with dyslexia, with an average age of 10 years, were compared with younger typically developing children matched for reading and spelling levels (mean age 7 years). Static tasks that assessed a number of aspects of literacy were administered – the use of phonological and visual information for word knowledge, their understanding of spelling-sound correspondences for word recognition, the use of context in word recognition, and the use and knowledge of phonological and visual information for spelling. Error analysis was used to classify the children’s spelling attempts into phonetic or non-phonetic categories. For example, *tutch* or *tuch* for ‘touch’ would both be categorised as phonetic errors as they could be pronounced to sound like the target word. *Bosh* for ‘both’ would be classified as non-phonetic. No evidence was found to suggest that the groups used different processes to read and spell words. Bruck concluded that the spelling errors made by children with dyslexia were appropriate given their level of reading and spelling development.

This conclusion was supported in a later study by Bourassa and Treiman (2003). Based on previous evidence that children with dyslexia compensate for poor phonological skills by employing orthographic knowledge and word-specific memory when reading, the authors explored if they use the same strategies in spelling. Children with reading and spelling difficulties, aged from 7 to 14 years (mean age 11) were compared with younger spelling-matched children aged 6 to 8 years (mean age 7). Each child spelled items derived from the word and non-word versions of the Treiman-Bourassa Early Spelling Test (Bourassa & Treiman, 2003) using an oral spelling task and a written test. The words were assessed using a number of measures including whether or not the word was conventionally correct or incorrect. Additional measures included analysis of the errors in several ways: a composite score reflecting phonological and orthographic features of the children’s spellings (to measure the overall sophistication of the spelling attempt where higher scores reflect conventional letter usage and orthographic conventions); a measure of the phonological knowledge thought to be underpinning the attempt (e.g. *drep* for ‘drip’ was more phonologically correct than *dimp*) and orthographic acceptability where a spelling was deemed correct if the grapheme sequence occurred in English. The authors concluded that the spellings of older dyslexic children were similar to those of younger typically developing children.

In a further study, Cassar et al. (2005) compared the phonological skills of

children with dyslexia with those of younger typically developing children. Children with dyslexia, aged between 7 and 15 years (mean age 11), were compared with typically developing 6 to 7 year-olds on phoneme counting and nonword spelling tasks. Error analysis was implemented to examine the two groups and found that they performed similarly on all tasks. Cassar and colleagues then measured the ability of experienced teachers to judge whether a speller was an older child with dyslexia or a younger typically developing child based solely on their spelling errors. The participants all had experience working with children with spelling and reading difficulties across a range of settings. The teachers were provided with the spellings of the children and asked to rate how confident they felt in distinguishing between the spelling errors of typically developing children and children with dyslexia and which aspects of the spelling influenced their choice. Based solely on error analysis, the teachers could not differentiate between the two groups.

Morphology

In order to investigate the source of spelling difficulties identified in children with dyslexia, a number of studies have examined children's knowledge of morphologically derived and inflected words (e.g. Bourassa, Barga, Delmonte, & Deacon, 2019; Breadmore & Carroll, 2016) and if this differs from younger typically developing children. Very little is currently known about the role of morphological knowledge in literacy impairment (Breadmore & Carroll, 2016). Given the opaque nature of the English language as discussed previously, an understanding of morphology is important as it represents one source of regularity in supporting the correct spelling among plausible alternative spellings of a word (Bourassa et al., 2019).

Breadmore and Carroll (2016) recruited 36 children with dyslexia or otitis media (a condition whereby the children have phonological difficulties but relatively good literacy skills) to examine whether a literacy or a phonological impairment affects the use of morphological root constancy. This refers to the principle that morphemes are typically spelled consistently across words (e.g. *trick, tricked, tricky, trickle*). Dyslexic children (9 years of age) and younger spelling-matched controls (7 years of age) completed an experimental task incorporating nonword items using a fill-in-the-blank spelling task placed in written sentences. The nonwords were either inflected (e.g. *feep- I feep very well and yesterday I **fept** all day*) or derived (e.g. *logic- A man who does magic is a **logician***). Root constancy

was identified where a child's spelling of the item began with the same sequence of letters as the root word presented in the sentence. They concluded that the two groups demonstrated similar sensitivity to root constancy within each of the conditions.

In a recent study, Bourassa et al. (2019) used a spelling-level matched design to compare morphological root constancy between children with dyslexia (mean age 9 years 8 months) and younger typically developing children (mean age 7 years 6 months). For this study the children were provided with a response booklet and the examiner dictated each target word, used it in a sentence and then repeated the target word. Target words were adapted from eight quadruplet sets of words taken from an earlier study by Deacon and Dhooge (2010) (e.g. *sing, singing, singer, single*). Words in the inflected, derived and control conditions were balanced for frequency of occurrence in children's reading materials. Responses were then coded by accuracy and consistency. The authors concluded that the children with dyslexia and their spelling-level matched peers utilised the principle of root constancy to a similar degree.

To date, the research evidence based on the methodology of error analysis does not support the hypothesis that the spelling performance of children with dyslexia is quantifiably different to that of younger typically developing children. In addition, the available research evidence suggests that there does not appear to be a pattern of spelling difficulties specifically associated with dyslexia (Protopapas, Fakou, Drakopoulou, Skaloumbakas, & Mouzaki, 2012). Taken together, evidence from these tasks suggests the notion of delay, rather than difference.

2.4 Strategy-use in spelling

Error analysis is one technique that can be used to investigate how children approach the spelling of unfamiliar words. This has been traditionally used in the literature to develop theories of spelling development. An alternative approach is to elicit verbal self-reports from the children about the strategy or strategies they use when spelling words. Self-report protocols allow a child to demonstrate more than the correct/incorrect answer by illustrating the metacognitive processes that support decision-making when approaching a spelling task (Critten, Pine, & Steffler, 2007). Strategy use is important in spelling. Given the complex nature of the English orthography, successful spellers need to be able to store word-

specific orthographic information and develop efficient strategies (such as analogies to other words via word patterns) to retrieve the information (Holmes & Malone, 2004). Strategies activate mappings to retain the word's features in memory (Ehri, 2014). Strategies are defined as 'sequences of mental operations that can be consciously organized to enhance performance on a specific task' (Torgesen, 1984, p 352). In order to become proficient spellers, children need to develop flexibility in choosing an appropriate strategy when spelling unfamiliar words (Steffler, Varnhagen, Friesen, & Treiman, 1998). Elicitation of children's explanations and justifications for their spelling attempts may clarify if the errors made are randomly produced or are symptomatic of difficulties in underlying representations (Critten, Pine, & Messer, 2013).

A number of studies have used self-report protocols to examine children's strategy use during spelling tasks (e.g. Critten et al., 2007; Dahl, Barto, Bonfils, Carasello, Christopher, & Davis, 2003; Farrington-Flint, Coyne, Stiller & Heath, 2008; Rittle-Johnson & Siegler, 1999; Steffler et al., 1998). These studies have identified that children as young as 6 years of age can verbalise how they approach a spelling task when prompted.

Steffler et al. (1998) administered a computerised spelling test to 93 typically-developing English speaking children between the ages of 7-10 years that consisted of a list of words of the same length that used different vowel and consonant placement. This comprised 12 CCVC words, 12 CVCC words and 12 CVCe words. The child was asked how they set about spelling the word after they had typed it into the computer. Steffler and colleagues found that the children's self-reports provided sufficient information to allow the categorisation of the strategies used. The four most frequently reported strategies were retrieval, phonetic, explicit rule and analogy. A strategy was described as retrieval where the child said they 'knew' how to spell the word; the phonetic category was applied where children reported 'sounding it out'; the category of 'explicit rule' was applied where children explicitly stated a spelling rule (orthographic convention) and 'analogy' was applied when the child compared the word to other words with a similar spelling pattern.

Rittle-Johnson and Siegler (1999) investigated the spelling strategies of 30 typically-developing children with a mean age of 6 years 10 months using a longitudinal design over two years. As part of this study the children were asked

to name a picture that illustrated the word and then to spell the word. The children were then asked, 'How did you figure out how to spell ____?' Prompts were provided where a child replied that they didn't know, for example 'did you just know how to spell it?' 'use a rule?' 'sound it out?' 'use another word to help you spell it?' The authors concluded that the children's self-reports were accurate and that six strategies could be identified. Four of these confirmed the categories identified by Steffler et al. (1998) – retrieval, sounding out, drawing analogies and relying on rules. Two further categories were added. The first, visual checking, involved writing the word, changing a letter or letters and then determining if it 'looked right'. The second was retrieve/sound out. This was applied where a combination of the two strategies was used, that is, where part of the word could be sounded out, and the other part retrieved from memory.

A self-report protocol was used by Critten et al. (2007) to explore how typically-developing children aged 5-7 years conceptualise, represent and re-define their spelling strategies over development. The examiner provided the target word with two distractors and instructed the children to point to the response that he/she believed was correct. The children were then asked to explain why they chose a response to be correct and why the other two alternatives were not. The authors demonstrated that children as young as 5 years 11 months were able to verbally self-report their approach to the spelling task. Critten et al. (2013) used a self-report protocol within a recognition task to explore whether implicit representations underlie early visual-based spelling. They found that children's self-reports provided sufficient information to allow the categorisation of the strategies used. More recently, Critten, Sheriston and Mann (2016) investigated the spelling recognition and spelling production abilities of typically-developing children aged 5-7 years using a verbal self-report procedure. They concluded that the relationship between recognition and production was strongly moderated by children's spelling experience.

Farrington-Flint et al. (2008) examined the variability and change in children's spelling strategies using a self-report protocol. Thirty-four typically-developing English-speaking children between the ages of 8-9 years completed a spelling task consisting of 45 items made up of consistent, unique and exception word items with varying rime unit frequency. The children were tested three times during a three-month period using the same items and self-report data on strategy use was gathered. They found that the children in the study adapted

their strategy use over time and moved from less efficient strategies, such as phonological strategies, to more direct methods of retrieval.

2.5 Chapter summary

This chapter explored spelling acquisition in children and identified a number of theoretical frameworks to explain how we can spell words that are familiar as well as generate plausible spellings for words that are unknown. Although a single cognitive deficit model is debated in the literature, there is substantial evidence that children with dyslexia struggle with spelling due to a phonological deficit thought to be characteristic of this population. A number of studies have investigated differences in the spelling abilities of typically developing children and children with dyslexia in order to inform support. Using error analysis methodology, the studies concluded that there was no quantifiable difference between the two groups when matched on spelling age: children with dyslexia did not produce a distinct pattern of spelling errors. An additional approach to understanding children's spelling errors is via verbal self-report. This approach has received growing interest in the literature in studies with typically developing children (e.g. Critten, Sheriston, & Mann, 2016; Farrington-Flint et al., 2008) however no studies have been found that investigate strategy use in children with dyslexia.

CHAPTER THREE: Literacy instruction and specialist support

3.0 Chapter introduction

The aim of this chapter is to provide an understanding of how literacy instruction is taught and assessed in the UK and the role of dyslexia specialists.

3.1 Literacy instruction in the UK.

Literacy instruction in the UK follows a national curriculum (Department for Education, UK, 2013) covering the subjects to be taught and the standards required. The curriculum is divided into blocks of years termed Key Stages (KS) and performance is formally assessed at the end of each Key Stage. Primary years education includes children from the age of 4 (Reception) up to age 11 (Year 6), encompassing early years education and Key Stages 1 and 2 (Table 3-1).

Table 3-1: National curriculum Key Stages for primary education in the UK

Age (yrs)	Year	Key Stage	Assessment
3-4		Early years	
4-5	Reception	Early years	Teacher assessments (optional assessment at the start of the year)
5-6	Year 1	Key stage 1	Phonics screening check
6-7	Year 2	Key stage 1	National tests and teacher assessments in English, maths and science
7-8	Year 3	Key stage 2	
8-9	Year 4	Key stage 2	
9-10	Year 5	Key stage 2	
10-11	Year 6	Key stage 3	National tests and teacher assessments in English and maths, and teacher assessments in science

Under the national curriculum, phonics instruction underpins spelling teaching at Key stage 1. Children are introduced to all the letters of the alphabet and common phoneme-grapheme correspondences. At Key stage 2 the children are introduced to concepts involving morphology and etymology including prefixes and suffixes. By Key stage 3, these concepts are expanded (Department for Education UK -DfES-, 2013).

Children who struggle with the acquisition of literacy in relation to their peers are generally first identified in the classroom and additional support may be provided using a varying level of support model similar to Rose's (2009) Wave model as outlined in Chapter Two (see Figure 2.1). This may consist of extra help from a teacher or assistant, additional work in smaller groups, or a special learning programme (DfES 2014). For children identified with dyslexia, specialist provision may be provided.

3.2 Dyslexia provision and support in the UK

Children with severe literacy difficulties can be assessed and diagnosed as having a Specific Learning Difficulty (dyslexia) by educational psychologists and more recently, as recommended by the Rose Review (2009) specialist dyslexia teachers. Although there are similarities in practice between these two groups, the information in this section focuses on dyslexia specialists. In considering the UK Government's policies relating to provision for children with dyslexia, the Rose Review recommended increased funding to train teachers to become dyslexia specialists. The aim was to increase awareness of dyslexia and provide improved access to specialist expertise for schools across all local authority areas in order to establish extended opportunities for identification and support for these pupils.

The intention was to:

... explore the definition and characteristics of dyslexia, equip participants with the expertise to select, implement, monitor and evaluate literacy interventions, train teachers to make best use of published guidance and be able to advise other teachers and support staff on delivering high quality interventions. (Rose, 2009, p. 23)

Subsequent to this recommendation, the Training and Development Agency for schools invested in a professional development programme to be delivered by a number of tertiary providers overseen by the British Dyslexia Association. This training led to the award of Approved Teacher Status and/or Associate Member of the British Dyslexia Association (Woolhouse, 2012). It was recommended that all schools should have a dyslexia specialist or access to this expertise via partnerships with other schools in the local area (Rose, 2009). The role of these dyslexia specialists as recommended by Rose is to identify children with dyslexia via a psychodiagnostic procedure and recommend appropriate intervention. The review specifies that support should be available to children whether or not they had been identified as having dyslexia.

Specialist teacher practice in the UK is overseen by two organisations, the Specific Learning Difficulties Assessment Standards Committee (SASC) and the Standardised Test Evaluation Committee (STEC). These organisations provide guidelines on the identification and reporting of dyslexia to ensure that set levels

of professional practice are maintained. National guidelines for practice incorporate a required report framework together with a list of assessments considered appropriate for diagnostic reports. A summarised version of the guidelines relating to the format for a diagnostic report is included in Table 3-2. The assessment procedure can therefore be seen as being highly structured.

Lidz (1991) identified that teachers query the usefulness of the diagnostic reports provided to schools, arguing that they lack practical and direct recommendations. One of the reasons for this perception may be that conventional static assessments have historically been developed for the classification of children for special education provision. Most assessment instruments have not been specifically developed for the purposes of guiding interventions. Quantitative information, for example how the children learn and the strategies they use, has not been considered as the primary focus (Lidz, 1991; Resing, 2013).

Table 3-2: National assessment report guidelines (SASC updated 2018)

Section	Content
Cover page	Name and age of student, date of birth, age at assessment, correspondence address, year group and school. Dyslexia specialist's details including qualifications and contact details. Assessor's statement that all tests were personally administered and interpreted. Current Practising Certificate/HPC number (applicable to Educational Psychologists).
Summary section	Main assessment findings and recommendations.
Background information	Reason for referral, student's developmental educational and family history, relevant medical information (e.g. vision and hearing).
Test conditions	Environment, comfort, interruptions, student's behaviour.
Attainments in Literacy	Reading – standardised measures of untimed single words, graded single word reading test, non-word reading, reading comprehension, fluency, oral and silent reading speed. Include qualitative analysis of errors.
	Spelling – single word standardised spelling test and free writing. To include a qualitative analysis of errors.
	Writing – should be analysed to provide information about grammar, sentence structure, coherence, use of vocabulary, writing speed and legibility of handwriting.
Underlying ability	Standardised measures of verbal and non-verbal reasoning.
Cognitive Processing	Standardised measures of phonological awareness, short term and working memory, visual processing speed.
Other Relevant Diagnostic Information	Other tests of competence in literacy and numeracy and motor control (where appropriate).
Conclusion	Include an up-to-date and accepted definition of the Specific Learning Difficulty (SpLD) in order to provide context to the diagnosis. Information from the report should be drawn together and the impact (of the results) explained.
Recommended Support	Relevant to the educational sector of the student.
Appendices	Table of results, tests used, technical terms and interpretation of scores.

In practice, two strands of assessment are undertaken by dyslexia specialists. One strand relates to diagnostic assessments as identified in the previous table. A second strand involves assessments that provide information for support. There is a growing debate in the literature around the diagnostic value of providing specific categories of literacy difficulties. For example, Elliot and Grigorenko (2014) question the efficacy of providing a definitive diagnostic label, arguing that the lack of an agreed definition makes a diagnosis questionable. In addition, they argue that there is no evidence in the literature that the teaching support provided to children with dyslexia is any different to the support for all children with literacy difficulties. Indeed most recently (2019) two local authorities in the UK (Staffordshire and Warwickshire) released new policy documents announcing a move away from assessment for diagnosis to assessment for support ("Dyslexia no longer being diagnosed," 2019). It is argued that assessment procedures should focus on 'skill-based' assessments that provide extensive student profiles (Resing, Bakker, Pronk, & Elliott, 2016).

3.3 Spelling Assessment

Implementing effective instruction for spelling should begin with the identification of specific needs in order to provide support around these needs (Resing et al., 2016). Not all children will have the same strengths and weaknesses and therefore a single approach to intervention might contain teaching targets for skills already acquired (Kohnen & Nickels, 2010).

... we need to have detailed knowledge of the skills that a particular child has acquired and the ones they have not acquired. It is this knowledge that guides the decision of what to teach. In other words, in order to target intervention appropriately and effectively, we must go beyond knowing that a child has poor spelling and understand why they have poor spelling. (p.37)

Broadly speaking, four categories of spelling assessment are currently used in primary school classrooms in the UK (Table 3-3). These include curriculum based assessment based on the standards set by the National Curriculum; criterion-referenced assessment that is typically created by the teacher to measure a child's progress against a specific criteria (for example, mastery of a particular spelling rule); qualitative 'inventories' that may be included within a literacy programme to determine placement or track progress, and standardised spelling

assessments that provide a normative measure of current attainment and/or progress (see Table 3-2). As will be identified further in this chapter, standardised assessment tools are most commonly used by specialists in the identification of children with dyslexia.

Table 3-3: Types of spelling assessments used in education in UK (adapted from Sayeski, 2011)

Assessment	What is it?	Resources in UK setting
Curriculum-based measurements	Lists of spelling words administered to students to determine instruction level. Formative assessment.	National Curriculum word lists.
Criterion-referenced spelling assessments (typically teacher-made).	List of words that reflect instruction.	Typically, teacher-made.
Qualitative inventories	Lists of progressively more difficult words level calculated using error analysis to determine 'stage' of spelling development, initial placement and formative assessment.	e.g. Units of Sound; Alpha-to-Omega; Schonell spelling lists, High Frequency word lists.
Standardised spelling assessment	List of progressively more difficult words presented to students; norm-referenced scores. Guide to error analysis and suggestions for support.	e.g. Helen Arkell Spelling Test (UK) (2012); spelling sub-test of Wide Range Attainment Test (US) (2006); Weschler (US) (2006)

Standardised tests

In the literature, standardised assessment is identified as *static* testing because it adheres to rigid administration guidelines that include strict examiner impartiality with no feedback provided during the assessment. In this procedure the emphasis is on what the child knows, not how they learn. However there have been growing levels of dissatisfaction over the reliance on this type of testing in educational settings. Conventional tests focus on the output of previous learning rather than reflecting on the individual's ability to learn (Bosma & Resing, 2008). Since information derived from assessment should be directly applicable to educational content and inform intervention, an understanding of what they know and how they learn is important (Grigorenko & Sternberg, 1998).

Dyslexia specialists and assessment

For dyslexia specialists, current assessment guidelines identify that reading and spelling are assessed using conventional static measures. Despite considerable research evidence identifying that reading and spelling involve similar cognitive processes (Ehri, 2000), the approach taken to the assessment of these two skills varies considerably. Table 3-2 identifies that the assessment of reading typically involves the examination of multiple components, for example, single word reading, reading fluency, reading accuracy and reading comprehension. Spelling is generally assessed using a single static test incorporating a graded word list and provides information regarding the functioning of whole-word components of spelling. While standardised scores identify how a child's spelling skill is developing in comparison to same age peers, few of these tests provide enough information for the dyslexia specialist to develop an appropriate programme of support. As such, outcomes from standardised spelling tests can be considered as relatively gross measures of spelling ability. Such an approach misses detailed information such as how close the error is to the target word or if multiple spelling errors occur on the same word (Kohnen & Nickels, 2010). In addition, post hoc error analysis is an approach commonly used by dyslexia specialists to further understand the types of errors made in order to inform intervention. A small number of standardised tests of spelling provide qualitative information to guide support (e.g. HAST-2, Caplan et al., 2012) based on error analysis. However it can be argued that understanding the strategies used by children when spelling an unknown word provides important additional information about the child's use of underpinning cognitive processes (see Chapter Two for a full discussion).

Detailed information is particularly important for specialists who support children experiencing spelling difficulties (Bourassa & Treiman, 2003).

Errors from the test or from samples of the child's writing are often analysed to further understand individual strengths and weaknesses. The information gathered is then used as the basis on which to construct a support programme that may be implemented by the dyslexia specialist, classroom teacher, or other educational professional. As discussed in Chapter Two, an additional approach to understanding children's spelling errors is via verbal self-report (e.g. Critten et al., 2007, 2013, 2016; Farrington-Flint et al., 2008).

Dyslexia specialists commonly support children with identified literacy difficulties in small group or one-to-one settings (Kohnen & Nickels, 2010; Rose, 2009). Children with spelling difficulties typically differ in their relative strengths and weaknesses as previously discussed and therefore dyslexia specialists require detailed information about the child's spelling abilities as well as an understanding of evidence-based teaching practices in order to support the child's progress (Kohnen & Nickels, 2010). Teacher knowledge and expertise is considered as a crucial component of successful literacy support (Birsh, 2011).

3.4 Chapter summary

In the UK, children in primary school are supported by dyslexia specialists – teachers who have received additional training in this specific learning difficulty to assess and support children with dyslexia. In practice, a distinction is generally drawn between assessment for a diagnosis and assessment for intervention. While standardised norm-referenced tests devised for diagnosis have been demonstrated to reliably classify children with specific learning difficulties, they are not specifically designed for planning intervention (Hasson, Dodd & Botting, 2012). There is growing support for the notion that assessment should focus on understanding the child's difficulties in order to provide effective intervention. Static assessment that provides information about how many words a child answers correctly is generally used to examine spelling abilities. This provides very little information from which to construct an assessment suggesting the need for a different approach to testing.

CHAPTER FOUR: Dynamic assessment

4.0 Chapter introduction

Dynamic Assessment (DA) is an assessment approach that has attracted increasing interest in the field of psychology. Lidz (2014) identifies that DA has the potential to provide instructional information that can close the gap between assessment and intervention. This could be particularly useful in over-tested populations such as children with developmental difficulties (Hasson & Botting, 2010).

The aim of this chapter is to provide an overview of the development and theoretical framework for DA. Given the extensive nature of the research base, this chapter aims to provide an overview of the theoretical perspectives related to DA with a review of the most influential approaches.

4.1 What is dynamic assessment?

DA is broadly defined as ‘an interactive approach to conducting assessment within the domains of psychology, speech/language, or education that focuses on the ability of the learner to respond to intervention’ (Haywood & Lidz, 2007 p.1).

DA developed as an alternative measure to address the limitations of traditional standardised assessments. Lidz (1991) conceptualised the difference between the two approaches as *learning processes* and *learning products*. Conventional assessment provides a quantitative measure of the child’s functioning in a particular domain – *learning product* – but fails to identify the reason for success, or lack thereof – *learning process*. Establishing how much a child knows does not identify how that child might best be taught (Haywood & Lidz, 2007). DA provides information that describes a child’s learning processes, style and potential, all of which are directly relevant to teachers (Declos, Burns, & Vye, 1993).

Various approaches to DA are identified in the literature. The common characteristic of these is the interactive relationship between the examiner and the learner (Haywood, 1992). Lidz (2014) identifies that at the most basic level, a procedure ‘would be considered within the category of DA if – intervention is *embedded* within the assessment process, and if the response of the individual *to this intervention* is of primary interest’ (p. 293). This collaboration is believed to

provide a more complete picture of a child's abilities than conventional testing by extending levels of independent performance that they cannot reach alone (Poehner, 2008). The approach provides insights into the activities and strategic actions that the child engages in during a task in order to identify relevant further support.

The field of DA has a long history and an extensive literature base. An early advocate of alternative approaches to conventional testing was Russian psychologist Lev Vygotsky (1934-1986) whose work formed the basis of DA. He argued that social interaction with others including teachers, peers, and collaborators was essential for a child's development. During this interaction, the child learns to solve a problem or complete a new task by drawing on the mediation provided by others. Primarily this is based on language during social interaction enabling the child to 'plan, co-ordinate and review actions' (Davin & Donato, 2013. p.7). It is theorised that development occurs when the assistance provided is internalised and the child can regulate the task without further assistance. The mediation however does not simply result in the child being able to complete a specific task but leads to a development in the child's conceptual understanding (Vygotsky, 1978). This change is interpreted as measuring learning potential.

For change to occur, the assistance provided must fit within the learner's Zone of Proximal Development (ZPD). This represents the distance between the child's current level and the level achieved through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978). Theoretically therefore, the instruction should be just beyond what the child can do independently, enabling them to develop a conceptual understanding to complete the task on their own once support is withdrawn. The ZPD can therefore be described as the differential between the child's performance and their performance when they are supported in a collaborative process. This concept of change is described in the literature as *modifiability*, that is, the amount of change made by the child in response to the instruction provided and the increase in the metacognitive processes relevant to solving the problem.

Collaboration between a child and a more knowledgeable peer is believed to provide a more complete picture of an individual's abilities than conventional testing (Werts & Carpenter, 2013). DA provides information on both product and process. Such an approach has the potential to provide insight into the activities

and strategic actions that the child engages in during a task in order to identify relevant further support (Poehner, 2008).

It should be noted that some researchers draw a distinction between the terms DA and dynamic testing (Elliott, Resing, & Beckmann, 2018) whereby DA is considered to be an entire process and dynamic testing as a component of the assessment. This thesis takes the approach of Stringer (2018) who argues that DA and dynamic testing are considered as part of one process and that the terms can be used interchangeably.

4.2 Approaches to dynamic assessment

Given the extensive nature of the research literature in relation to DA, the intention of this section is to discuss and compare some of the major approaches that have informed the field of DA. A summary of these approaches is presented in Table 4-1. The models that are considered directly applicable to the development of a DA of spelling will be presented in further detail.

The table identifies that in general, DA models can be categorised according to purpose (i.e. domain-general or domain-specific information), procedure (i.e. the type of interaction between the examiner and the examinee and whether it is structured or unstructured) and the information generated (i.e. qualitative or quantitative). Domain-general information focuses on the cognitive processes necessary for all learning and problem solving, whereas domain specific information refers to particular curricular domains such as reading or mathematics. Sternberg and Grigorenko (2002) identify four clusters of dynamic testing – metacognitive interventions targeted at teaching generalisable concepts and principles (e.g. Feuerstein & Jensen, 1980); learning within the test (e.g. Campione, 1989; Campione & Brown, 1987); restructuring of the test situation (e.g. Budoff, 1987; Carlson & Wiedl 1979) and training on a single cognitive function (e.g. Pena & Gillam 2000; Spector, 1992).

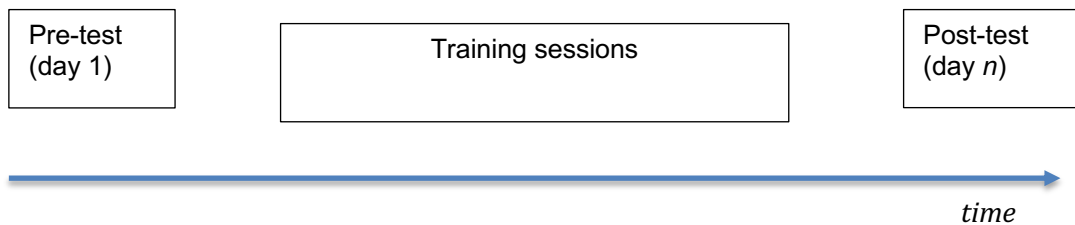
With regard to purpose, two contrasting applications can be identified – DA for the purposes of research and DA for the use of teachers and clinicians (Elliott, 2003; Stringer, 2018). DA of domain-general cognitive processes could be considered to be aligned with the purposes of researchers while teachers and clinicians are more concerned with domain-specific or curricular DA that can inform instructional intervention.

Table 4-1: Approaches to Dynamic Assessment (adapted from Elliot, 2003)

Purpose	DA Model Description (from Jitendra & Kameenui, 1993)	Procedure	Studies and information provided by the procedure
Domain general	Learning Potential	Based on a theory of 'structural cognitive modifiability'. Uses the principles of mediated learning to support change in the individual being assessed. The nature of the interaction is determined by the needs of the individual and is therefore highly flexible. Provides a list of 'cognitive deficiencies' that the examiner should look for during an evaluation and uses the resulting profile to generate ideas for intervention. Primarily focused on qualitative information about the learner.	e.g. Feuerstein et al. (1980) Qualitative information
Domain general	Test-train-test	Incorporates a test-intervention-retest approach. The first test consists of a static pre-test to establish the child's independent performance. Intervention is then provided to support learning. The amount of instruction can be varied in response to the child's strengths and weaknesses. This is followed by a retest and the two test scores are compared. The objective is standardisation and quantification of DA with a focus on analysis of the task, rather than the learner.	e.g. Budoff (1987) Quantitative information
Domain general or Domain specific	Graduated prompting procedure	Examiners provide increasingly specific clues to the correct answers with the number of necessary clues being inversely related to learning potential. The prompts may be structured or unstructured depending on the core construction being tested. Information yielded from this approach describes the efficiency of the child's learning with regard to the amount of help needed by the child rather than just the improvement made. Emphasis is on the process.	e.g. Campione (1989); Campione and Brown (1987) Quantitative information
Domain general or Domain specific	Testing-the-Limits	Involves modifications of the testing procedure within the testing situation. Uses pre-existing tests in a dynamic fashion. Emphasis is placed upon providing differing modes of test administration with a focus on the use of verbalisation and elaborated feedback.	e.g. Carlson and Wiedl (1978, 1979) Quantitative and Qualitative information
Domain specific	Domain-specific	Incorporates standardised and dynamic tests of a specific domain, (for example reading) within a comprehensive assessment. Methods of interaction may vary according to the specific domain.	e.g. Caffrey (2006); Davin, Herazo, and Sagre (2016); Lidz (2014); Spector (1992) Quantitative and Qualitative information

Dörfler, Golke, and Artelt (2009) identify that DA approaches can be broadly divided into two formats as presented in Figure 4-1 below. In the Test-Train-Test Design, assessment starts with a static pre-test which is then followed by a short period of intervention which includes the most useful strategies for problem solving. A static post-test then follows. By comparison, a Train-Within-Test Design incorporates support/intervention by providing immediate feedback (for example by providing aid in the form of prompts) if the answer is incorrect. Whilst each design incorporates intervention as identified by Lidz (2014) as an essential component of DA, it is introduced at different stages.

Test-Train-Test Design



Train-Within-Test Design

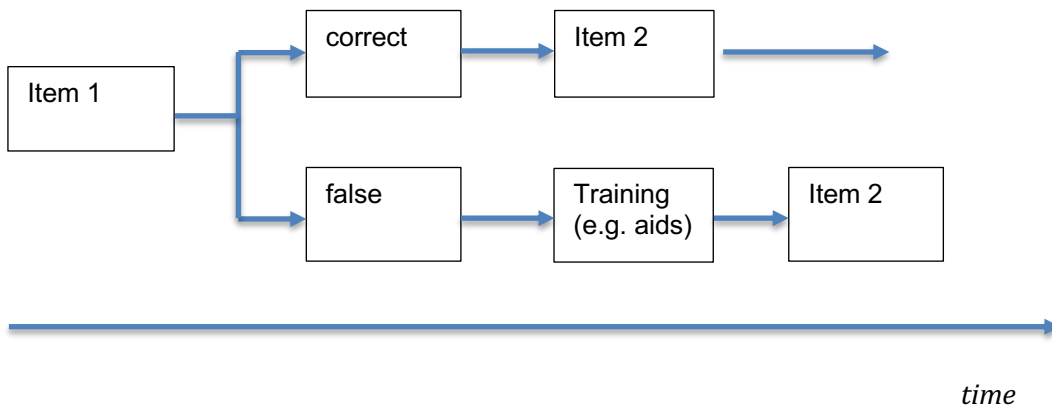


Figure 4-1: Schematic illustrating traditional formats of DA (Dörfler et al., 2009)

Feuerstein's Learning Potential Assessment Device (LPAD)

One of the earliest formalised DA approaches was the Learning Potential Assessment Device (LPAD) developed by Feuerstein, Rand, and Hoffman (1979). Feuerstein's work with low-performing children dates back to the early 1950s and has been an important catalyst in the development of the current conceptualisation of DA (Lidz, 1991). Working with a team of colleagues in Israel, Feuerstein developed the LPAD to investigate the cognitive assessment of low-

functioning adolescents. He maintained that practitioners should not accept that the learner's present ability of functioning was an absolute indicator of potential future abilities. He argued that in order to fully understand learning potential the individual should be asked to learn something during the test. This was considered a departure from the prevailing view of his contemporaries who argued for the predictive power of conventional measures of cognitive functioning (Poehner, 2008). Feuerstein believed that the identification of the learner's specific difficulties would allow practitioners to construct appropriate mediation to modify their cognitive potential. (For a full discussion of cognitive modifiability, the reader is referred to Poehner, 2008.)

The LPAD incorporates a test-train-retest model. Following this model, the learner first attempts the procedure in a traditional format. They are then shown how the problem might be solved and provided with instruction relevant to the situation and subsequently retested. One of the core concepts of the LPAD model is the concept of a *mediated learning experience* – the interaction between an experienced other (generally an adult) and the learner delivered during the instructional (intervention) component. The mediated learning experience is described as the modification of '...both the task (by adjusting frequency, order, complexity and context) and the child (by arousing him or her to a higher level of curiosity and to a level at which structural cognitive changes can occur)' (Sternberg & Grigorenko, 2002 p. 54).

The mediated learning experience therefore links directly to Vygotsky's concept of the ZPD.

Graduated Prompt approach (Campione & Brown)

In this approach, baseline scores are collected via conventional tests followed by mediated learning incorporating prompts. The prompts range from the general (e.g. *What do you have to do?*) to more concrete (e.g. *Why don't A and B belong together do you think?*). In the most specific hint, the examiner explains the solution fully to the child. In this paradigm, help is provided as and when difficulties emerge and until the child reaches a pre-specified learning criterion (e.g. two consecutive items correct). Using this approach prompts can be pre-scripted or flexible (Lantolf & Poehner, 2011). Prompts that are pre-scripted have a pre-determined number of prompts and structured hints. The prompts are arranged in a hierarchical manner (from implicit to explicit) and a numerical value

is awarded representing a position in the sequence of prompts. This permits a degree of standardisation that allows the children's responses to be compared. The number and types of prompts, as well as the child's responses, are considered as measures of learning potential and viewed as central in formulating recommendations. By comparison, flexible mediation is not scripted allowing the assessor to respond to the individual needs of the child being assessed (Pena & Gillam, 2000). In this approach no quantitative score is calculated; however, the assessor uses the information to develop a profile of the child's strengths and weaknesses (for example, the LPAD of Feuerstein and colleagues discussed previously).

Fabio (2005) used a graduated prompt approach to examine the problem-solving ability of children between the ages of 4-5 years. The children were presented with a puzzle that they were required to solve and reminded that they could ask for assistance if required. The prompts were provided in a standard sequence and scored according to the number of prompts required to provide a general modifiability index. In another study, Resing et al. (2009) compared the early math skills of groups of indigenous and ethnic minority children between the ages of 7-9 years using a dynamic assessment training paradigm that incorporated graduated prompts. The authors examined strategy changes in the children at pre- and post-test as well as investigating strategic behaviour at the beginning and end of training through the use of a graduated prompt technique. Pena and Gillam, (2000) used a graduated prompt approach to assess the phonemic awareness of kindergarten children. The goal was to determine if DA could predict responsiveness in reading. The authors found that a DA of phoneme segmentation was a better predictor of progress in reading at kindergarten than the three static measures used in the study. A Graduated Prompt approach appears promising for providing valuable information about the type and amount of instruction required as well as the strategies used by children to solve problems.

Curriculum-based DA

While DA was developed in the field of psychology to examine domain-general abilities, it has also been used in domain-specific areas including phonological awareness, mathematics and reading. According to Haywood and Lidz (2007) –

...if the results of dynamic assessment are to be relevant in

educational settings, then the information derived from the assessment must incorporate and be directly applicable to educational content. It needs to go beyond the surface characteristics of this content, but it needs to show a clear relationship. (p. 76)

Lidz (2014) provides a conceptual framework for the development of curriculum-based DA:

- Curriculum/referral question(s)
- Pre-test: knowledge base
- Rule in/out sensory-motor issues
- Process analysis: task/learner
- Intervene as appropriate to relevant processes
- Post-test knowledge base to determine response to intervention
- Recommendations
- Follow-up/monitor

The first step in the framework is to identify the area of interest to the assessor; this may incorporate normative assessment. Following the generation of this data, the assessor develops specific questions to be addressed by DA. The implementation of a pre-test is designed to determine the child's current knowledge and any sensory-motor issues that may impact on the task being examined, for example vision or hearing. Process analysis identifies the requirements of the task and the learner's skill level. This analysis informs the intervention (instructional/mediational) stage of the framework that provides the opportunity for the child to develop competence within the curriculum task identified. The role of the instructional stage is to teach appropriate strategies, principles and processes to allow the child to build mastery. At post-test the knowledge base is again examined to determine if the child demonstrates a higher level of competence providing evidence of immediate transfer. The post-test provides valuable information about what the child may or may not have learned from instruction. Recommendations for further support based on the DA outcomes can then be made and the child's progress closely monitored. Lidz (2014) argues that this framework can be used in all areas of the curriculum. The distinction between curriculum-based assessment and DA is the focus on process analysis and intervention (instruction).

Dynamic assessment and response-to-intervention

As discussed in Chapter Two, the concept of response-to-intervention is encompassed within Rose's (2009) definition of dyslexia. Grigorenko (2009) identifies that DA and RTI belong to the same family of methodologies. This view is supported by Wagner and Compton (2011) who identify parallels between RTI models and the basic assumptions of DA. While there is a substantial evidence-base that specialist intervention is effective in ameliorating literacy difficulties, there is also evidence that not all children benefit to the same extent. For children with the most severe difficulties, less intensive tiers of support may not be effective for addressing the difficulties of children with dyslexia. Therefore –

Gaining more insight into factors that can predict responsiveness to intervention in dyslexia would be very welcome as it could help us to identify non-responders at an early age and, by doing so, prevent wasting time, effort and resources on interventions that are not effective. (Aravena, Tijms, Snellings & van der Molen, 2016 p. 209).

A DA assessment of spelling, encompassing a short measure of how the child responds to the support offered, could therefore fit well within specialist assessments for children struggling with literacy by establishing a profile of strengths and difficulties. To the best of the author's knowledge, no studies have been identified in the literature that use a DA approach to investigate spelling.

4.3 Contemporary studies using DA

Numerous studies in the literature explore the use of DA approaches with a range of atypical populations particularly in the field of speech and language therapy. For example, Camilleri and Botting (2013) reported the development of a DA protocol for the assessment of receptive vocabulary for children with speech and language difficulties. Fifteen children (five typically developing children between the ages of 3;06 and 4;01 and ten children aged between 3;07 and 4;03 who had been referred to speech and language therapy) participated in the study. For this population of children, DA methodology could be particularly challenging given that the defining feature of DA is the use of language as the medium for interaction. The assessment battery consisted of a combination of static and DA tests used within a single interaction lasting approximately 35-40 minutes. The interactive phase of the Dynamic Assessment of Word Learning (DAWL) used

'conversational interactions' that assessed the child's ability to develop a match between a target word and an element in a picture. Increasingly assistive verbal support was provided to establish the link and a score was derived relating to this assistance. The semi-scripted conversational approach was used to attempt a balance between the desire for reliable outcomes and interpretations relating to the DAWL and flexibility in relation to the child's needs. The assistive levels of cueing were predetermined by the procedure. The authors reported that information about the children's vocabulary skills was provided at both the quantitative and qualitative levels, producing insights about the children's abilities that would not be revealed by static testing alone. The authors concluded that the results from the study supported the view that conventional and dynamic assessment should be viewed as complementary tools, reminding the reader that it is ultimately the professional, and not the assessment tool, that makes informed decisions about classification and support.

A further study in the field of speech and language therapy by Hasson and colleagues (2012) investigated the use of a DA for the assessment of syntax in children with language impairments. The aim of this study was to formulate a procedure that could provide useful information for planning intervention for children with language impairments. The structure of the test was an adapted graduated prompt procedure from Resing (1997). Twenty-four children between the ages of 8-10 years, identified as having language impairment, were tested on a DA of sentence structure (DASS) four times, at four monthly intervals. The assessment elicited information about the children's abilities to use strategies, less directive prompts, and to transfer learning. In addition, the information contained in the reports generated from the procedure was evaluated by speech and language therapists in the participating schools. They found that the DASS demonstrated high levels of validity and reliability and that the procedure provided access to further information about the children (for example how they approached a language task, their ability to problem-solve and self-evaluate, and their potential to learn from input from the examiner) in comparison to static testing.

Wolter and Pike (2015) administered a DA of morphological awareness (adapting the protocol of Larson and Nippold, 2007) to 54 typically developing third-grade students (mean age 9 years 1 month) in addition to a conventional static norm-referenced language and literacy battery. The authors explored how a DA of

morphological awareness may relate to and predict measures of language and literacy achievement. They concluded that the DA measure developed (Dynamic Assessment of Primary Morphological Awareness, DAPMA) was a clinically valuable tool when examining early morphological awareness abilities and that it 'provided rich linguistic insights for how best to scaffold and prompt for such a skill' (p112).

Petersen, Allen, and Spencer (2016) examined and compared the accuracy of static and dynamic pre-reading measures with 600 kindergarten students in the United States, following them to the end of first grade. It was hypothesised that DA had the potential to measure a child's ability to decode, thus allowing the measurement of this construct at an early age. The children in the study included typically developing children as well as children receiving special education services or with English as an additional language. A static assessment was administered to all children at the beginning of the academic year and no more than three weeks prior to the administration of the DA. The children were randomly assigned to two groups that received one of two DA assessments of word-level reading at the beginning of kindergarten. The DA protocol utilised a pre-test, teaching phase and post-test format. Both assessments used the same pre- and post-tests but differed on the teaching strategy used in the interaction phase. One format used an onset-rime strategy and the other a phoneme-by-phoneme strategy. Scores were derived from the total number of sounds and total number of words correct at pre- and post-test. Immediately after the teaching phase for each child, the examiners (ten graduate students trained in the use of the DA procedure) completed a Dynamic Assessment Teaching Responsiveness Scale for the child. Responses were rated on a 0-4 Likert-type scale that rated errors the child made, the confidence exhibited, disruptions and rate of acquisition. Strategy scores were also applied with the scoring rubric depending on the type of DA administered. The authors identified that overall, the DA assessments provided higher classification accuracy than the static measures, with no significant differences between the two types of DA. They concluded that DA 'appears to be a promising approach to classifying young children at risk for future reading difficulty' (p. 200).

In a more recent study, Gellert and Elbro (2018) administered traditional tests of reading along with a dynamic test of decoding to 158 Danish kindergarten children. Half of the sample were identified as being at risk of reading difficulties

on a pre-screening task while the remaining half were typically developing. The children were assessed again at the end of grade two. The average age of the children at the end of kindergarten was 6;11. The children's reading was measured again at the end of grades one and two with a DA assessment of decoding administered before and after the onset of formal reading instruction. They concluded that the DA test of decoding showed improved prediction beyond static measures of early reading and was promising in the early identification of difficulties in word reading accuracy and fluency. The authors acknowledged the added time and effort involved in dynamic testing suggesting a 'stepwise' observation and testing procedure where only children unable to demonstrate the ability to read a few words before formal instruction would proceed to further observation or testing.

4.4 Evaluations of DA in educational settings

Declos and colleagues (1993) investigated how teachers evaluated assessment reports based on DA. Forty special education teachers (with expertise in two contrasting models of education) were recruited for this study. They were provided with contrasting assessment reports based on evaluations of two pre-school children with disabilities. One report was written by an experienced school psychologist using conventional static assessments and the other by two of the authors using DA. They found that the teachers identified the report based on DA as being most appealing because they provided insights into the children's approaches to learning and response-to-intervention, as well as concrete suggestions for constructing support. This finding was supported by a later study by Bosma and Resing (2008) who asked 18 teachers to rate how helpful they found the results and recommendations of two contrasting assessment reports produced in the same way as Declos and colleagues. The teachers' rating identified that they preferred the interpretive information provided by DA over the factual information obtained from static assessment. In a UK setting, Freeman and Miller (2001) found that despite a lack of familiarity with DA methods and reports, Special Educational Needs Coordinators (SENCOs) regarded reports derived from DA procedures as more useful than those based on conventional assessments for understanding the children's difficulties. They identified that DA reports provided more information for constructing plans to improve educational attainments. Lawrence and Cahill (2014) implemented a qualitative study that considered the views of parents, teachers and children with special needs around

DA. They found that DA provided a positive assessment, teaching and learning experience that impacted holistically on the children's well-being, self-perceptions, learning, behaviour and social relationships.

4.5 Methodological challenges of DA

Despite widespread agreement of the potential of a DA model, the operationalisation of the approach attracts debate. Of major concern is that much of the interpretation of the DA data is directly dependent on the skill and experience of the examiner. Different examiners may reach different conclusions that reflect their own training and experience (Haywood & Lidz, 2007). Further, the data generated from DA cannot be used for classification by referring it to normative tables for interpretation. Another significant criticism identified is the amount of time DA procedures are perceived to take. A study by Deutsch and Reynolds (2000) identified that Educational Psychologists in the UK failed to practice DA to the extent they desired because of large caseloads, insufficient time allocated to work with children individually and the additional time required to administer DA compared to conventional static assessment.

Critics of DA argue that for it to be widely used a much stronger psychometric foundation is required. Conflicting views are identified in relation to this argument. For researchers concerned with replicable empirical studies, evidence from case study testimonials cited as supportive evidence is considered insufficient. However, for practitioners concerned with educational progress, the most valuable outcome of a DA approach is understanding how a child responds to the mediation offered. Elliot (2003) identifies that future studies need to examine DA assessments that can '...result in recommendations for interventions that are ...meaningful to and will be employed by practitioners (parents, teachers, therapists) and which ...subsequently demonstrate meaningful gains that are unlikely to have been achieved in their absence' (p. 24).

Stringer (2018) argues that while DA approaches advocated by Feuerstein, Lidz and others do not utilise psychometric standardisation they '...do offer a qualitative, process-based approach with recognisably standard procedures, founded on robust theory and principles of mediational practice' (p. 24).

The literature identifies growing concern over the value of conventional static assessment and its central purpose in classifying and categorising children

according to norms (Stringer, 2018). There is substantial support from researchers, practitioners, parents and children for a DA approach that fulfils the primary purpose of informing intervention (Lawrence & Cahill, 2014).

4.6 Chapter summary

Despite the numerous approaches to DA, a number of basic assumptions are shared (Wagner & Compton, 2011). Central to the model is that conventional assessment does not work for some children, particularly for those who may have different educational or cultural experiences. Secondly, the model emphasises that it is more educationally useful to focus on how children learn if given adequate opportunity, instead of their current attainment. The final assumption is that assessment should be directly linked to effective intervention. The underlying concepts of DA challenge the conventional view of teaching and assessment by arguing that the two components should be fully integrated rather than being seen as separate activities. Elliot (2003) identified that DA is an approach that intuitively appeals to educational psychologists but is not widely used in the field. This may be because of the perception that it takes too long to administer.

Lidz (1991) identifies that an optimal approach to DA would include '...establishment of level of performance, determination of modifiability and response to instruction within the same domain, diagnostic clues regarding potentially effective instructional strategies and indications of ability to maintain and transfer what was learned' (p. 31).

To date there have been no studies identified in the literature in the field of dyslexia that incorporate a DA approach to spelling. The DA of spelling potentially has the ability to enhance conventional assessment by producing a spelling ability profile that incorporates spelling accuracy and response-to-intervention (RTI) as well as providing an insight into the spelling strategies used thus linking assessment and intervention.

CHAPTER FIVE: Research overview

5.0 Rationale and aims of the project

The primary focus of the research undertaken for this thesis was to investigate if the incorporation of a DA approach to spelling within the assessment procedure currently used by specialists might impact on spelling outcomes for learners with dyslexia.

Research Aim

To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

Research Questions

1. What is the current assessment practice of dyslexia specialists working in schools?
2. Given the interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?
3. If so, can a spelling assessment be developed within a theoretical framework for DA?
4. Compared to static assessment, what additional information can a DA approach to spelling provide?
5. How can this information be used to support weak spellers?

5.1 Stages of the research project

Four studies were undertaken to investigate the research questions and aims.

Study One: Survey Data (2 parts) - Providing a rationale to the study

Survey One: Examining current assessment practices by dyslexia specialists across educational sectors.

Survey Two: Examining the spelling assessment and teaching practices of dyslexia specialists working in the primary sector.

The aim of study one was to address research question one by investigating the assessment practices of dyslexia specialists in order to provide an understanding of how spelling is currently assessed and to gain an understanding of additional assessment needs. The survey also collected data on how confident they felt in supporting spelling in children with dyslexia. A link to an online survey platform was sent to members of the Dyslexia Guild (formerly part of Dyslexia Action) with members invited to participate. The link was open from June to August 2013. Two hundred and ninety-seven members participated in the two surveys.

Study Two: Experimental Study - Examining verbal self-reports of children as an essential first step in using a DA procedure with children with dyslexia.

Part 1: Comparing the spelling strategies of children with dyslexia, typically developing children (CA match) and typically developing younger children (SA match), building on the work of Critten (2007), Steffler and colleagues (1998) and Rittle-Johnson and Siegler (1999).

Given the oral interaction of a dynamic assessment approach, it seemed important to first investigate if children with dyslexia could provide meaningful self-reports of how they approach the spelling of both familiar and unfamiliar words and compare this to typically developing children (research question two). In addition, this study aimed to compare children with dyslexia with spelling-age matched typically developing children to investigate whether the strategies used by children with dyslexia demonstrate a developmental delay or atypical development in relation to spelling. It is proposed that if the children's spelling strategies are different to a younger SA group then these differences could be classified as atypical. If, however, the strategies are similar and being used to a similar degree to the SA match group, this may indicate developmental delay.

Sixty-six English-speaking children between the ages of 6 years 3 months and 9 years 9 months (36 girls and 30 boys, mean age 8 years 4 months) were recruited from eight primary schools (seven in the Greater London area, and one school in the Midlands) to participate in the study.

Study Three: Examining the performance of children with dyslexia on a Dynamic Assessment of Spelling (DASp) task.

Study three investigated research questions three, four and five to determine if a spelling assessment could be developed within a theoretical framework for DA. The DASp procedure is based on the principle that DA is able to provide a more sensitive measure of a child's abilities than conventional static assessment. In line with this, the procedure was formulated to investigate three elements. The first element identified a spelling accuracy score to provide a base-line for each child's spelling ability. The second was to investigate the spelling strategies used by each child when spelling known and unknown words before and after a short training procedure. The final element aimed to quantify the study by identifying the number and breadth of the prompts required for each child to reach the correct answer using a graduated prompt procedure. Each of these elements may have implications for effective intervention.

Fifty English-speaking children (25 male and 25 female) participated in the study, drawn from seven schools in the wider London area. The children were in Years Three and Four at the time of the study with ages ranging from 8 years 0 months to 9 years 11 months, mean age of 8 years and 9 months.

Study Four: Pilot Study and Evaluation of the DASp procedure

For Study Four, a further aim was identified -

To provide an evaluation of the DASp procedure from dyslexia specialists working in schools

A sub-research question was formulated -

Do the DASp results provide additional information (compared to a standardised assessment) that can be incorporated into a five-hour literacy intervention to improve the spelling outcomes for children with dyslexia?

Part 1 - Examining the outcomes for children with dyslexia using the DASp procedure. This incorporated initial base-line testing of children by dyslexia specialists followed by the DASp procedure. The teachers then designed and implemented a five-hour intervention programme, followed by post-intervention testing.

Part 2 - Evaluation of the procedure by the dyslexia specialists.

Six dyslexia specialists and twelve English-speaking children (between the ages of 8-10 years) were recruited from four schools in the Greater London area and one in the Midlands.

CHAPTER SIX: Study One. Current assessment practices of dyslexia specialists

6.0 Introduction and rationale

As discussed in previous chapters, Rose (2009) identified that children who responded least well to classroom-based literacy interventions were more likely to require individual support. To meet this goal, the UK government invested in a professional development programme delivered by tertiary providers and overseen by the British Dyslexia Association (Woolhouse, 2012). The role of these dyslexia specialists is to identify children with dyslexia via a psychodiagnostic procedure to recommend (and often deliver) appropriate intervention.

Chapter Three identified that current assessment should adhere to a structured set of national assessment report guidelines (see Table 3-2) for dyslexia specialists. As part of these guidelines spelling is assessed using a conventional static measure that provides the number of words spelled correctly or incorrectly as the outcome measure. In addition, the guidelines identify that a post-hoc qualitative analysis of errors should also be included whereby the examiner makes assumptions about the cause of the errors and where misunderstandings might occur. Teacher expertise and knowledge can therefore be considered as crucial to effective intervention development (Fresch, 2003). Although a number of studies have examined the literacy practices of teachers (e.g. Johnston, 2001; Pressley, Ranki & Yokoi, 1996) few have looked specifically at the assessment and support of spelling (Fresch, 2003). In addition, and to the best of the author's knowledge, no study has specifically examined the assessment and literacy practices of dyslexia specialists in the UK.

Previous chapters have raised the prospect that a DA of spelling may provide additional insight by examining the underpinning cognitive strategies that the children bring to the task. In order to investigate this possibility, it was considered important to examine current practices to determine if an additional spelling assessment could make a useful addition to a dyslexia specialist's tool kit. Further, understanding the level of spelling knowledge by dyslexia specialists is of importance to this thesis since the core component of DA is verbal interaction, including spelling instruction, between the assessor and the individual being

assessed. If the specialist does not have a secure knowledge of the elements involved in supporting spelling, they cannot be considered a 'well-informed other' an element identified as an essential component in a successful DA interaction (Feuerstein, Klein & Tannenbaum, 1994).

The intention of the four research studies included in this thesis is to create a link between theory and practise in the field of spelling assessment and support. In line with this the first study in this research project gathered information on the current assessment and teaching practices of dyslexia specialists working in the education sector. Dyslexia specialists were identified as appropriate participants for this study as they are familiar with administering psychometric assessments as well as using this information to construct and deliver programmes of support in educational settings.

Research Aim:

The primary research aim for this thesis was -

To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

In line with this the primary research question was -

1. What is the current assessment practice of dyslexia specialists working in schools?

Given that dyslexia specialists also construct and deliver programmes of support in educational settings, a sub-question was formulated -

- 1A. What is the level of dyslexia specialists' knowledge in relation to the support of spelling?

To address these aims, two survey instruments were developed and distributed via the mailing list of the Dyslexia Guild UK (now part of Real Training UK).

Survey One: Examining current assessment practices in the field of dyslexia

This survey took a broad investigative approach by inviting dyslexia specialists from all educational stages (including primary, secondary, further education and higher education) to identify their approach to assessment. The focus of the data

collection was on the assessment tools most used by dyslexia specialists (standardised and non-standardised assessments) and how useful they found them in relation to constructing support.

Survey Two: Examining assessment and support practice specifically related to spelling by specialists in the Primary Sector.

Building on the work of Fresch (2003), a second survey was distributed to explore the practice of dyslexia specialists working in the primary sector. This was of specific interest as the intention of the research project was to investigate the efficacy of developing a DA approach to spelling that could be used with primary-aged children. Fresch carried out a national survey of spelling instruction in the United States to investigate teachers' beliefs and practices. Using randomised sampling, 335 teachers responded to a mail survey that captured participant demographics, current spelling instructional practices, theoretical orientation to the teaching of spelling (for example whether students should self-select some of the words to study, or if a common word list for all students was effective) as well as any educational issues or concerns they identified in the teaching of spelling. She found that many of the respondents identified a need for further materials to help provide more detailed instruction that considered different settings and individual differences. This survey did not differentiate between teachers working with typically developing children or children with specific learning difficulties. Building on this work, Survey Two was developed to investigate dyslexia specialists' practices in relation to the assessment and support of spelling in primary school children with dyslexia.

6.1 Methodology

The data was collected via Survey Monkey (see Appendices A and B) with invitations to participate distributed to the membership of the Dyslexia Guild UK. The link was left open for three months, from June to August 2013. The Dyslexia Guild (formerly part of Dyslexia Action) is a professional body with open membership. This organisation provides ongoing professional training for dyslexia specialists (including Clinical and Educational Psychologists) as well as support for parents of children with dyslexia. It is currently part of the Real Training Group following the closure of Dyslexia Action in 2017.

The questionnaire was primarily a fixed design with a choice of responses offered. Participants were also given the opportunity on a number of items to expand on their answers. Survey One consisted of ten multiple-choice response items. Items 1-5 captured demographic information such as years of experience as a specialist, primary role in their educational setting, professional qualifications, educational sector (for example, primary/early years or higher education). These items were designed to provide an understanding of the level of experience and training of the respondents as this may impact on individual approaches to assessment.

Items 6-8 requested specific information on assessment practices and how useful they found the resulting information. Participants were again given the opportunity to expand on their answers. Item 9 related to how often dyslexia specialists attended Continuing Professional Development events (CPD). CPD is defined as:

...all organised systematic education and training activities in which people take part in order to obtain knowledge and/or learn new skills for a current or future job. (Collin, Van der Heijden, & Lewis, 2012 p. 155)

Attendance at CPD events was used as a proxy to elicit an understanding of how open the respondents might be to making changes in their assessment practice. The final item (item 10) asked if the participant would be interested in participating in further research relating to the development of a DA of spelling.

A second survey (see Appendix C) was conducted to investigate how dyslexia specialists used the information gained from assessment to construct and implement support programmes for spelling. The survey was again distributed via the Dyslexia Guild, however this time it was only open to dyslexia specialists working in the primary sector. Prior to recruiting respondents both surveys were developed through several pilot stages and revised accordingly.

6.2 Participants

For Survey One, 222 responses were received representing 37% of membership. This response is similar to other online survey response rates cited as 32.6% (Nulty, 2008). Sixty-eight percent (151) of the respondents reported that their

main activity was assessment for dyslexia. Of the remaining respondents, 23% (52) identified support teaching as their main activity while 9% (19) identified their role as 'other' (this included parents, occupational therapists and retired practitioners).

To identify spelling practices in the younger years, Survey Two was distributed to dyslexia specialists in the primary sector only. Seventy-seven responses were received. All of the participants reported that assessments were part of their role, with 62% (48) identified as dyslexia specialists, 26% (20) as Special Education Needs Co-ordinators (SENCOs) while 12% (9) reported that they fulfilled the dual role of dyslexia specialist and SENCO in their school. This could be considered a good response rate given the diversity of the membership.

6.3 Results: Survey One

6.3.1 Item Response Rate

A summary of the response rate by item is provided in Table 6-1 below. Items 2 and 9 were completed by 100% of the participants while the minimum response rate recorded was for the item relating to the professional qualifications held (92.3%). Overall the item response rate was considered to be very good.

Table 6-1: Survey One: summary of response rates

Question	Response rate %
Years working as dyslexia specialist	100
Most useful information for making recommendations	100
Teaching setting	99.5
Primary role	98.6
Identification of standardised assessments used	98.6
Further research participation	98.6
Identification of non-standardised assessments used	98.6
CPD events attended per year	98.2
Number of assessments per term	97.7
Professional qualifications	92.3

6.3.2 Demographics

The primary role of the participants was identified as both assessing and supporting individuals with literacy difficulties while a smaller percentage conducted assessments only. The largest group had more than 10 years of

experience and all held professional qualifications relevant to the field. There was an equal representation of specialists working in primary and secondary education (the largest percentage) with smaller, although also roughly equal, numbers of participants identifying that they worked in further or higher education. The number of responses for this item (exceeding 100%) reflects the fact that dyslexia specialists often worked in more than one sector simultaneously. Slightly less than half of the participants (41.9%) administered less than five assessments per term with equal numbers administering between 6-10 and more than 15 each term. Attendance at CPD events was broken down by education sector with the largest group of respondents in each sector identifying that they attended one to two events each year.

Table 6-2: Survey One: background information

Characteristic	Category	Percentage
Primary role	Diagnostic Assessments	12.3
	Support Teaching	22.4
	Both	56.6
Experience	0-5 years	30.6
	5+ -10 years	26.6
	> 10 years	42.8
Professional Qualifications	APC ¹	51.7
	AMBDA ²	53.2
	ATS ³	19.5
	Other (educational psychologists)	0.9
Setting	Primary/Early years	47.5
	Secondary	46.6
	Further Education	28.1
	Higher Education	22.6
	Other ⁴	1.3
Assessments per term	0-5	41.9
	6-10	23.5
	11-15	11.1
	> 15	23.5
CPD ⁵ – Primary/Early Years	Never	11.5
	1-2 per year	59.6
	3-4 per year	15.4
	> 4 per year	13.5
CPD – Secondary	Never	5.8
	1-2 per year	61.9
	3-4 per year	14.7
	> 4 per year	17.6
CPD – Further Education	Never	2.9
	1-2 per year	64.8
	3-4 per year	14.7
	> 4 per year	17.6
CPD – Higher Education	Never	0.0
	1-2 per year	60.9
	3-4 per year	17.4
	> 4 per year	21.7

¹ *Assessors Practising Certificate (APC)- certification is renewed every 3 years*

² *Associate Member of the British Dyslexia Association (BDA)*

³ *Approved Teacher Status (ATS)*

⁴ *Charitable foundation; privately-run centre*

⁵ *Continuing Professional Development (CPD)*

Note: Totals may not equal 100% due to rounding of percentages or multiple response items for some categories. For items 3 and 4, for example, dyslexia specialists may hold more than one professional qualification or work across more than one teaching setting.

6.3.3 Assessment of Spelling

Table 6-3 illustrates the standardised assessments used by the specialists. The most commonly used assessment used to measure spelling was a subtest taken from the Wide Range Achievement Test (WRAT 4) (Wilkinson & Robertson, 2006). This assessment provides norms for ages 5 years to 94 years and 11 months. It consists of three reading subtests (letter knowledge for children aged 7 years or younger only, a single word reading task, and a reading comprehension task), a mathematical subtest and a single-word spelling task. For the spelling subtest, children aged 7 or younger first complete a letter-writing task followed by a spelling test that follows a standard dictation format. Participants older than 8 years complete only the spelling task which consists of 42 words. The discontinue point is 10 consecutive incorrect answers. All of the assessments identified by the respondents, with the exception of the non-word spelling task, follow a similar dictation format. Raw scores are based on the number of correct items achieved and then transformed into standard scores based on chronological age.

Table 6-3: Survey One: spelling assessments used by specialists across settings

<i>Assessment*</i>	<i>Percentage</i>
Wide Range Attainment Test (WRAT 4) Spelling subtest	79.2
Weschler Individual Achievement Test (WIAT – II-T)	38.1
Single Word Spelling Test (SWST)	22.3
Diagnostic Spelling Test	2.7
Helen Arkell Spelling Test (HAST-2)	2.2
Vernon Spelling	2.2
Spelling and Reading Tests (SPAR)	1.8
Woodcock Reading Mastery Test Spelling subtest	0.9
Dyslexia Portfolio	0.9
Non-word Spelling task	0.9
Schonell spelling	0.9

**Respondents could identify more than one.*

Table 6-4: Survey One: information considered useful by specialists when developing interventions for spelling across settings

<i>Category*</i>	<i>Most useful %</i>
Spelling error analysis	86
Conversations with the learner	70
Observation of free writing	68
Standardised scores from static assessments	46

* Respondents could identify more than one

Respondents were asked to identify the sources of information that they found helpful when making recommendations for specialist support teaching and to provide an explanation.

Table 6-4 identifies that participants identified that spelling error analysis provided the most useful information in relation to constructing support programmes while standardised assessments provided the least. Respondents were invited to explain their choice. A sample of the participants' responses to this item are presented below to illustrate the general themes.

Several comments related to the fact that error analysis provided more insight to the learner's spelling abilities. This was often combined with observations of free writing. For example:

Error analysis is more useful than scores. The types of spelling, writing and reading errors help inform my recommendations for support.

The pupil's own work especially in English... give a better sense of the impact of the SpLD on the pupil's learning – tests alone are two-dimensional.

Participants provided a broader range of responses relating to the general theme of conducting conversations with the learner:

Interaction with the child is more useful.

Discussion and background information adds invaluable information.

It is important to consider the child's strengths and weaknesses profile, how does he/she best learn?

I discuss different strategies with students; this is very enlightening.

Discussions with pupils and students as quite often they are aware of what support and strategies have been previously successful and unsuccessful.

Standardised scores were considered an important component of an educational assessment, however the limitations of these tests in relation to support was identified:

Standardised tests provide a benchmark but contribute very little to meeting the child's needs.

One participant identified that the focus of the assessment report was not on support:

My recommendations are usually very general and rarely include specific suggestions for teaching.

6.4 Results: Survey Two

Survey Two consisted of 10 questions designed to provide a closer analysis of the practices of primary dyslexia specialists in relation to spelling. As for Survey One, items 1-4 were designed to collect background information about the respondents including experience, qualifications, the key stage they worked in and whether the purpose of the assessment was to inform support, provide a diagnosis or as evidence for access arrangements. Item 5 examined the assessments used for measuring spelling. Items 6-8 sought to explore the possible different uses for data in an assessment report and an intervention programme. The final items, 9 and 10 (adapted from Fresch, 2003) investigated dyslexia specialists' understanding of spelling theory and future training needs.

6.4.1 Item Response Rate

Seventy-seven dyslexia specialists working in the primary education sector responded to Survey Two. Items 1-5 were completed by 100% of the participants and the remaining items (items 6-10) were completed by 87% of participants.

6.4.2 Demographics

Table 6-5 provides background information about the respondents. The largest percentage of respondents worked as dyslexia specialists with a smaller number as SENCOs. A large percentage of the respondents worked with both KS1 and KS2 and had up to five years of experience. The largest percentage of dyslexia specialists identified that the primary purpose for undertaking assessments was to inform support.

Table 6-5: Survey Two: background Information

Characteristic		Response %
Job Role	SENCo ¹	25.97
	Dyslexia specialist	62.34
	Both	11.69
Qualifications ²	APC ²	25.97
	AMBDA	80.51
	ATS ³	19.48
Experience	0-5 years	44.16
	5+ - 10 years	19.48
	>10 years	36.36
Key stage ^{4,5}	KS 1	63.64
	KS 2	76.62
Assessment purpose	Access arrangements	36.36
	Inform support	93.51
	Diagnosis	27.27

¹Special Educational Needs Co-ordinator

²Respondents may hold an Assessor's Practising Certificate (APC) and Associated Member of the British Dyslexia Association (AMBDA) concurrently.

³Accredited Teacher

⁴Key stages refer to the stages of education in the UK. Children in KS 1 are between 5-7 yrs and KS 2 between 7-10 yrs

⁵ Respondents could choose more than one

6.4.3 Assessment of spelling

Table 6-6 presents the assessment category (standardised/non-standardised assessments) and the specific assessments used. More than half of the dyslexia specialists used a combination of standardised assessments and informal assessments of spelling to collect information. The most commonly used assessments reported by the respondents were the Single Word Spelling Test (SWST) (Sacre & Masterson, 2000) and the Wide Range Achievement Test (WRAT 4) (Wilkinson & Robertson, 2006). Both assessments follow a standard dictation format with items marked as correct or incorrect. A raw score is calculated and transformed into a standard score.

Table 6-6: Survey Two: spelling assessments used by specialists in primary settings

Assessment type	Name	Response %
Assessment tool	Standardised tests of spelling	25.98
	Informal (non-standardised) tests	11.69
	Both	62.33
Standardised	Single Word Spelling Test (SWST)	68.0
	Wide Range Achievement Test (WRAT 4) Spelling	60.0
	Weschler Individual Achievement Test (WIAT-II) Spelling	9.3
	Helen Arkell Spelling Test (HAST-2)	8.0
	Spelling and Reading Test (SPAR)Spelling	2.7
	Dyslexia portfolio	2.6
	Diagnostic Spelling Test	1.3
	Salford Reading Test	1.3
	Young's Parallel Spelling Test (1998)	1.3
Non-standardised	Free Writing	13.0
	Vernon Spelling Test	5.2
	High Frequency words	2.6
	Phonic words	2.6
	Catch-up Literacy test	1.3
	Alpha to Omega assessment for support	1.3
	Lucid Literacy Screening	1.3
Hickey manual	1.3	

*Respondents could identify more than one assessment used.

Usefulness of the information gathered from assessments

Respondents were asked to identify how useful they found a range of sources of information when developing a spelling support programme. The question was presented using a Likert scale with five categories ranging from very useful to not at all useful. Responses are presented in Table 6-7. Approximately 80% of respondents identified that various metrics from the output from standardised testing (i.e. standard scores, percentiles and spelling age equivalents) were very useful, while a slightly higher percentage (83%) felt that miscue analysis was also very useful, with observations of the learner and conversations with the learner were similarly useful (68% and 70% respectively).

Table 6-7: Survey Two: information considered useful by specialists when developing interventions for spelling in primary settings.

Item	Very Useful (%)	Quite Useful (%)	Neutral (%)	Not very useful (%)	Not useful (%)
Standardised scores	46.27	29.85	14.93	4.48	4.48
Percentiles	20.69	29.31	32.76	6.90	10.34
Spelling ages	13.11	29.51	26.23	14.75	16.39
Miscue analysis	83.36	9.09	6.03	1.52	0.00
Observations	68.18	22.73	9.09	0.00	0.00
Conversations with the learner	70.15	20.90	8.96	0.00	0.00

6.4.4 Teaching

Table 6-8 presents the specialists' understanding of elements involved in teaching spelling as drawn from the literature discussed in Chapter Two. Respondents felt most confident in their understanding of phonology, spelling strategies and spelling families (teaching by analogy). They reported that they felt least confident in their understanding of morphology and etymology. Table 6-9 illustrates how the specialists supported spelling. Two of the items referred to the *how* of teaching spelling (i.e. by spelling patterns or rules), while the remaining items referred to *what* was taught.

Table 6-8: Specialists understanding of elements involved in teaching spelling

Item	Very Confident %	Neutral %	Not Very Confident %
Spelling development	47.76	47.76	4.48
Morphology	40.30	46.27	13.43
Phonology	79.01	19.40	1.49
Spelling rules	62.69	35.82	1.49
Spelling strategies	74.24	24.24	1.52
Spelling families	70.15	26.87	2.99
Etymology	24.24	54.55	21.21

Table 6-9: How specialists support spelling

Item	Always %	Most of the time %	About half of the time %	Not very Often %	Never %
By spelling patterns	26.87	49.25	19.40	4.48	0.00
By spelling rules	19.40	40.30	29.85	10.45	0.00
Year level word list	7.81	28.13	26.56	28.13	9.38
Curriculum areas	1.56	28.13	31.25	34.38	4.69
Student suggestions	15.38	38.46	15.38	27.69	3.08
Student writing	31.82	43.94	16.67	7.58	0.00
Errors from assessment	67.56	27.92	4.52	0.00	0.00

The results identified that the largest percentage of dyslexia specialists used examples from errors made in the children's writing as a basis to support spelling. This was primarily done by teaching analogies (spelling patterns). While 61% of the dyslexia specialists identified that they incorporated specific subject-related words from curriculum areas into their teaching programmes at least some of the time, 39% did this rarely or not at all. The participants noted that they used a range of techniques at different times; however, a small percentage identified that they never used Year level word lists, with an even smaller percentage stating that they never used subject specific words or suggestions from students. The *other* category included the use of published spelling programmes such as *No-nonsense spelling*, *Alpha to Omega* and the *Dyslexia Institute Literacy Programme (DILP)*.

Statements

Item 9 asked the respondents to read a series of six statements and identify the response that reflected their beliefs ranging from strongly agree to strongly disagree using a Likert scale. The results are presented in Table 6-10.

1. My training as a dyslexia specialist provided me with a very good understanding of how to support students with spelling difficulties
2. Students should be encouraged to self-select some of the words used in their support
3. Students should be encouraged to 'sound out' unknown words for spelling
4. Spelling is best taught when integrated with writing

5. I felt very confident in designing/delivering effective individualised spelling support
6. In my school setting there is a greater understanding of how to support reading difficulties than spelling difficulties.

Table 6-10: Specialists beliefs related to the teaching of spelling

Statement	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %
1	43.28	38.81	10.45	5.97	1.49
2	50.00	40.91	9.09	0.00	0.00
3	26.15	30.77	38.46	4.62	0.00
4	48.44	35.94	10.94	4.69	0.00
5	33.33	45.45	18.18	1.52	1.52
6	41.27	30.16	23.81	1.59	3.17

Just over 82% of dyslexia specialists either strongly agreed or agreed that their training provided them with a very good understanding of how to support students, while just over 90% of respondents either strongly agreed or agreed that students should be encouraged to self-select some of the words used in support. The largest percentage of respondents to statement four identified that they were neutral, in that they neither agreed nor disagreed that spelling is best taught when integrated with writing. Eighty four percent of dyslexia specialists strongly agreed or agreed that spelling support should be integrated with writing, with 79% feeling confident in designing and delivering effective support. Seventy one percent of respondents either strongly agreed or agreed that in their school setting, there was a greater understanding of how to support reading difficulties than spelling difficulties.

Learning needs

The final question in the survey related to the training needs of the specialists in relation to assessing and supporting spelling. The responses are presented in Table 6-11. The largest percentage of respondents identified that their most important learning need was to understand how they could best help learners to develop effective spelling strategies, followed by technology to support spelling and evidence-based tools. Fifty-two percent of respondents wanted to learn more about how to assess spelling for support, while a smaller percentage wanted training on morphology. Responses provided by the participants and included in

the 'other' category included training on spelling rules, dyslexia and spelling and why some children struggle to spell.

Table 6-11: Learning needs identified by specialists

Item*	Response %
Helping learners develop effective spelling strategies	68.66
Technology that supports spelling	67.16
Evidence-based tools to support spelling	62.69
Assessing spelling to inform support and error analysis	52.24
Morphology and how it can support spelling	47.76
Other	35.82

* Respondents could identify more than one

6.5 Discussion and conclusions

Information presented in the literature review provides a theoretical justification for the development of an assessment procedure for spelling that provides information that goes beyond that provided by a standardised spelling test. The intention of the study reported in this chapter was to investigate if the theoretical justification was supported by the practical requirements of dyslexia specialists in the education sector. Two survey instruments were developed to explore this possibility – Survey One took a broad approach by including dyslexia specialists working in a wide range of educational settings, while Survey Two looked more closely at dyslexia specialists working in the primary sector. It was felt that it was important to collect information from all educational settings to enable a thorough examination of practices. Given the theoretical background to DA and the studies cited in the literature that incorporated curriculum-based DA with younger children, it seemed appropriate to investigate the teaching and assessment practices of dyslexia specialists in the primary sector in further detail.

In practice, an informal distinction is identified between completing an assessment with a child for the purposes of providing a diagnosis of dyslexia and gathering information to construct effective support. This division is partly in response to the education sector in which the specialists operate. This particularly applies in higher education where a formal diagnosis of dyslexia, along with other learning difficulties, may lead to support in the form of the Disabled Students' Allowance (DSA). However, as the second survey in Study

One demonstrated, a small percentage of the assessments carried out by the specialists in the primary sector were diagnostic in nature with the majority of assessments undertaken for the purposes of informing support and/or as evidence for access arrangements for examinations. In the UK, the term 'access arrangements' refers to an adaptation of the exam conditions in some way for individuals with disabilities and includes arrangements such as additional time to complete the exam, the use of a scribe or reader during the exam or the inclusion of rest breaks.

The research question formulated for this study was to examine the current assessment practices of dyslexia specialists working in schools. A sub-question was also formulated to investigate the level of dyslexia specialists' knowledge in relation to the support of spelling. As identified in the introduction to this study, determining the level of spelling knowledge by dyslexia specialists is important since the core component of DA is verbal interaction, including spelling instruction, between the assessor and the individual being assessed. If the specialist does not have a secure knowledge of the elements involved in supporting spelling, they cannot be considered a 'well-informed other'. This is understood to be an essential component in a successful DA interaction (Feuerstein, Klein & Tannenbaum, 1994).

Survey One included dyslexia specialists working in a variety of educational settings and identified that, in many cases, they worked across age-ranges in different settings. Survey Two was restricted to specialists working in the primary sector. Across both surveys, all respondents held industry-recognised qualifications and had a range of teaching experience. The surveys therefore reflected the expertise of both newly-qualified specialists (reflecting the most current training) and practitioners with more than ten years of experience working with students with dyslexia.

In line with the literature, the specialist teachers primarily used standardised tests to assess spelling that incorporated a dictation task with the number of words correctly spelled counted and then transformed into a standardised score. This is not surprising because standardised tests are approved by the Standardised Test Evaluation Committee (STEC) and dyslexia specialists carrying out assessments are required to follow these recommendations (for a full discussion see Chapter Three, Section 3.2). In the majority of cases, the specialists also administered

informal tests to enhance their understanding of the child's strengths and weaknesses in order to construct an intervention programme. When asked to explain further, dyslexia specialists felt that while standardised tests provided a benchmark for progress measured against their peers, the information was insufficient for intervention purposes and needed to be supplemented with further information. This supports the view reported in the literature that static assessments are relatively gross measures of spelling that do little to inform support (e.g. Kohnen & Nickels, 2010). Specialists working in the primary sector reported that they had a good level of knowledge with regard to the teaching of spelling although they would be interested in learning more about how to help learners develop effective strategies.

6.6 Chapter summary

The primary research question for this first study was to determine the current assessment practice of dyslexia specialists working in schools. These professionals were considered to be appropriate participants for this study as they administer psychometric assessments as well as construct and deliver support programmes. The findings from this study support the information reported in the literature review that while conventional static testing is considered useful, it does not provide an understanding of the learner's strengths and difficulties in relation to spelling. In order to gain further information dyslexia specialists use additional informal assessments such as those listed in Table 6-6. Error analysis was the most commonly cited source of additional information while conversations with the learner and observations of free writing were all considered to be more informative than static test results. Encouragingly, for the potential development of a DA approach to spelling, a number of participants reported that discussing strategies and approaches with the students was very useful.

CHAPTER Seven: Study Two. Exploring verbal reports of spelling

7.0 Introduction and rationale

As identified in Chapter Four, the essential component of DA is that it blends instruction/intervention with assessment via verbal interaction with the assessor. It is argued that this allows access to detailed information to devise instructional approaches to support the children's learning. A number of studies can be identified in the literature that use a verbal self-report protocol to investigate spelling in typically developing children. However, no comparable study could be found with children with dyslexia. Study Two was therefore designed to explore if children with dyslexia are able to verbally interact with an assessor in the same way as typically developing children.

Please note that sections of this study have been published – Donovan, J. L., & Marshall, C. R. (2016). Comparing the verbal self-reports of spelling strategies used by children with and without dyslexia. *International Journal of Disability, Development and Education*, 63(1) 27-44.

7.1 Verbal self-report and spelling

Verbal self-report protocols have been used in a number of studies in the literature (an overview can be found in Chapter Two). The study reported in this chapter sought to build on the study by Critten and colleagues (2007) who demonstrated that children as young as 5 years 11 months can verbally report their approach to the spelling process in a way that allows the information to be meaningfully classified into categories. In the study by Critten and colleagues (briefly discussed previously in Chapter Two, section 2.4), the authors used a verbal self-report protocol to explore how typically developing children conceptualise and represent their spelling strategies and re-define them over development. In addition, they examined how these representations were consciously accessed and verbalised to others. The authors recruited 51 typically-developing children from two schools between the ages of 5 years 11 months and 7 years 4 months (Experiment 1) and 44 children between the ages of 5 years, 7 months and 6 years, 6 months (Experiment 2) and administered a

number of tasks. In the first task for Experiment 1, the children were given a static spelling test in their year groups consisting of 20 words. Five words, identified by the class teacher as 'easy', were included to ensure each child experienced a degree of success (but were not included in the analysis). The remaining 15 words were adapted from an earlier study by Nunes, Bryant, and Bindman (1997) and focused on inflectional morphemes. Five words from each of three categories were included – regular past-tense verbs, irregular past-tense verbs, and non-verbs ending in /d/ and /t/. The words were presented to the children in random order to prevent patterns from being apparent.

The second task for experiment 1 used a Recognition Test – Spelling alternative task and was administered on a 1:1 basis over one week after the spelling test. For this task, the same children were presented with a set of 15 words containing three spelling alternatives of the target word of which only one was correct. All of these words had been included in the static spelling test. The examiner provided the target word and instructed the child to point to the response that he/she believed was correct. The children were then asked to explain why they chose a response to be correct and why the other two alternatives were not. For Experiment 2, a group of younger typically developing children were presented with the same format as Experiment 1, however this time, the Recognition Test – Spelling alternative task was presented on touch-screen software connected to a Macintosh laptop. The children were presented with one practice set and nine tested sets of spelling alternatives, three from each of the word categories previously identified. As before, each set contained three spelling alternatives with only one correct (for a full discussion of Experiment 2, the reader is referred to the original paper).

Critten and colleagues analysed the results by first comparing performance across the two tasks. Consistent with previous studies they found that the children performed better on the spelling recognition task than the spelling production task. Analysis of the data was two-fold; words from the spelling production task were analysed using the procedure from Nunes et al. (1997) – (a full report of this analysis can be found in the 1997 paper). Verbal self-reports from the spelling recognition task were then analysed using the conceptual framework of the Representational Redescription (RR) model (Karmiloff-Smith, 1992) first proposed by Steffler (2001) in the domain of spelling.

The RR model proposes that humans learn by forming new representations of knowledge already stored in the mind; the representation is redescribed with additional input over time, moving to more explicit understanding. Critten and colleagues (2007) used an adaptation of this model in an attempt to identify the nature of the representations that underlie spelling development. The RR model identifies four levels of representation ranging from level one (implicit representations) to three levels of increasingly explicit representations (described as E-1, E-2 and E-3). Steffler (1991) proposed using the RR model as a framework for spelling development. The level of Implicit representation is described where a learner is successful in the task but has an absence of understanding of why the answer is correct. At Explicit level 1 (E1) some understanding is evident, but it is still vague and incomplete and rules tend to be overgeneralised; at Explicit level 2 (E2) responses demonstrate increased understanding but not complete accuracy. The final level in the model – Explicit level 3 (E3) – is characterised by the ability to generate the correct answer with a full understanding of the spelling convention that is being applied together with a recognition of the exceptions to the rules. (For a detailed discussion of these levels and how they map onto Karmiloff-Smith's RR model, the reader is referred to Steffler, 2001).

Critten and colleagues concluded that the results from this study with typically-developing children demonstrated that verbal self-reports from both experiments could be used to identify children's spelling development in the context of Karmiloff-Smith's (1992) RR model as well as providing support for Siegler's (1996) overlapping waves model (see Chapter Two, section 2.2.1). They argued that '...we believe explanations to be a powerful component in distinguishing among differing levels of explicit knowledge and going beyond not just what a child can do but what the child understands as he or she is doing it.' (p 220)

Rittle-Johnson and Siegler (1999) used a verbal self-report procedure to investigate whether the overlapping waves model (see Chapter Two for a discussion) could account for strategy choices in spelling. Thirty typically-developing first-grade children (mean age 6 years 10 months) were recruited for this study and spelled words under two conditions (23 of these children were re-tested a year later). In the first condition (allowed condition) the children were permitted to use explicit backup strategies to spell the word. For this study, Rittle-Johnson and Siegler defined backup spelling strategies as 'explicit, controlled,

step-by-step methods of constructing the sequence of letters' (p334). They argued that backup strategies are generally slower than retrieval (see Chapter 2 for a full discussion). In the second condition (prohibited condition) they were told to write the first spelling that came to mind when hearing the word, without the use of backup strategies (i.e. retrieval). Each child was tested individually. Fifteen words were taken from the beginning, middle and end of a first-grade spelling book. For the children re-tested a year later (second grade), the list contained 24 words consisting of 15 new words and 9 words from the earlier list. In the allowed condition the children were asked to explain the strategy they used after they spelled each word – "How did you figure out how to spell _?" If the child replied that they didn't know, the researchers asked "Did you know how to spell it? Sound it out? Use another word to help you spell it? Use a rule? Do anything else?" The aim was to identify the strategies that the children used, how often and how accurately they used them, if they chose adaptively among the strategies and if strategy choice changed over time. All strategies were assessed in two ways: observations of ongoing behaviour while spelling words and immediate verbal reports of strategy use. By comparing the children's responses in the two conditions (allowed and prohibited) the authors established the validity of the verbal reports of strategy use and identified that the children used six strategies: retrieval, sounding out, retrieve/sounding out, drawing analogies, relying on rules and visual checking. The authors concluded that for typically developing children, verbal reports appear to be an accurate reflection of their spelling strategies. In addition, they concluded that children in both first and second grade used spelling strategies adaptively, consistent with Siegler's (1996) overlapping waves model.

As outlined in Chapter Four, a core characteristic of DA methodology is to determine the level of ability that may be achieved with support from a more knowledgeable peer. This is generally achieved via verbal interaction. In order to investigate the efficacy of verbal self-report for children with dyslexia within the domain of spelling, it is therefore crucial to determine if this population of children are able to verbally self-report the strategies they use when approaching the spelling task, in the same way as typically developing children. While a number of studies have been identified in the literature that examine the verbal self-reports of typically developing children, none have been identified with children with dyslexia.

Research Aim:

The primary research aim for this thesis was -

To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

In line with this the primary research question was -

1. Given the interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?

Three sub-questions were identified –

1A. Can children with dyslexia provide a verbal self-report that enables the researcher to classify their understanding and approach to spelling in the same way as typically developing children of the same age, as well as younger children?

1B. Can typically developing children and children with dyslexia correctly recognise more words than they can correctly generate and are there any differences between the groups?

1C. Are the spelling strategies used by children with dyslexia quantitatively different to those of typically developing children of the same age, as well as younger spelling age matched children?

7.2 Methodology

This study adapted procedures from the two studies presented in the previous section. The aim was to investigate the ability of children with dyslexia to verbally self-report their approach to spelling unknown words. The ability to self-report is integral to the design of a DA procedure for spelling. The term 'meaningful' is defined for this study as the ability to provide verbal self-reports that enable the researcher to classify responses according to 1. the spelling levels identified in Critten et al. (2007) drawing on the RR model (Karmiloff-Smith, 1992), and 2. the categories of strategy use identified by Rittle-Johnson and Siegler (1999).

Three groups were recruited to explore the spelling levels and strategies of children with dyslexia in relation to chronological and spelling-level controls. A spelling-level control group was included to investigate if the children's spelling difficulties were a product of developmental delay or atypical spelling development. It is proposed that if the children's spelling difficulties, including their strategic approach to unfamiliar spelling words, demonstrate qualitatively different errors to a younger spelling-age group then these differences could be classified as atypical. If the errors are similar to the spelling-age match group, this may indicate developmental delay (Larkin, Williams, & Blaggan, 2013). Identifying this difference may have implications for intervention.

7.2.1 Participants

Sixty-six English-speaking children between the ages of 6 years 3 months and 9 years 9 months (36 girls and 30 boys, mean age 8 years 4 months) were recruited from eight primary schools (seven in the Greater London area, and one school in the Midlands) to participate in the study. Children were recruited by asking schools to nominate five children either identified with dyslexia or who they considered to have reading difficulties (dyslexia group) and five children whom they considered to be typically developing (typically developing CA match). An additional younger group of typically developing children was identified, matched to the spelling age of the dyslexia group (typically developing SA match). All groups were matched on gender. The intake to these schools varied considerably thus the sample covered a wide range of socioeconomic backgrounds. All the children in the study had been taught in the English school system for a minimum of three years and were considered fluent English language speakers. Children identified by the school with co-morbid difficulties such as ADHD, were not included in the study.

Parental permission was sought and full consent provided to participate in the study (see Appendices D and F). Permission was provided from each of the participating schools (Appendices E and G). Each child was initially assessed using a range of materials to identify reading and spelling levels, measure the accuracy of teacher judgement, and determine the allocation of the children into the subgroups. Children were then allocated to each group.

7.2.2 Group Allocation

Children were allocated to the dyslexia group if they either had received a formal diagnosis of dyslexia or achieved a standard score of 85 or below on the composite score of the Test of Word Reading Efficiency – 2nd edition (TOWRE 2) (Torgesen, Wagner, & Rashotte, 2012). Although a brief measure, using a standard score of reading less than 85 is consistent with other literacy studies (e.g. Bourassa & Treiman, 2003; Hulme & Snowling, 2009). Twenty-two children were allocated to the dyslexia group (12 girls, 10 boys, mean age 8 years 10 months). The typically developing CA group (standard score above 85 for reading) was matched pairwise to the participants in the dyslexia group, within a maximum of four months (12 girls, 10 boys, mean age 8 years 11 months). The typically developing spelling age group (12 girls, 10 boys, mean age 7 years 6 months) was recruited by individually matching younger children to the spelling age of the children within a maximum of four months. The Helen Arkell Spelling Test (HAST-2, Caplan, Bark, & McLean, 2012) was distributed to whole classes and those children who performed similarly to children with dyslexia on spelling age were recruited for further study. An independent *t* test indicated no significant age difference between the dyslexia and CA groups ($t(42) = .842, p = .610$).

7.2.3 Measures

Reading

Both the sight word (Sight Word Efficiency) and non-word (Phonemic Decoding Efficiency) subtests of TOWRE 2 (Torgesen, Wagner & Rashotte, 2012) were administered and a Total Word Reading Efficiency score recorded. This is a timed oral reading task and is used within the assessment battery as an indicator of reading difficulties. Raw scores were converted to standard scores ($M = 100$, $SD = 15$). The mean Test-Retest reliability coefficient for this test is .95.

Expressive Vocabulary

Several research studies identify that if general language skills are poor, spelling may be affected (e.g. Torgesen et al., 2012). Given the verbal nature of the recognition test-spelling alternative task, it seemed appropriate to administer a measure of expressive language in order to rule out any co-occurring language difficulties that may impact on the research results. Participants therefore completed a measure of expressive language using the *Formulating Sentences*

subtest taken from the *Clinical Evaluation of Language Fundamentals – 4th Edition 2006 (CELF-4)* (Semel, Wiig & Secord, 2006). For this measure, the children were shown a stimulus (picture) and orally provided with a target word. They were then asked to formulate a sentence about the picture, using the target word. Raw scores were converted to scaled scores ($M=10$, $SD=3$).

Spelling

The Helen Arkell Spelling Test, 2nd Edition (HAST-2) (Caplan, Bark & McLean, 2012) is a standardised test of single word spelling to use with individuals from 5 years to adult. It provides standardised scores and age equivalents using a dictation task. Form B was administered. Raw scores were converted to standard scores ($M=100$, $SD=15$) and age equivalent scores. The Test-Retest reliability coefficient for this test is .91.

Experimental Measure

A Recognition Test-Spelling Alternative Task was adapted from the procedure described by Critten et al. (2007, 2013). Within the context of Study Two, spelling recognition is defined as the ability to identify correct orthographic representations from three minimally different alternatives. It is acknowledged that the task of identifying misspelled words is different from that of formulating spellings. However, when combined with interaction with the assessor and verbal self-report from the learner about what they understand, it can provide a rich source of information on which to build an intervention (Masterson & Apel, 2010).

The procedure from Critten et al. (2007) was utilised for the experimental task, however the items used were chosen from the HAST-2 (alternate Form B). Items were chosen in order to elicit a range of approaches and strategies as identified in the literature, including phonological, morphological, orthographic and semantic strategies. This is in contrast to Critten et al's study that included only inflectional morphemes. Fifteen items were administered with the children on a 1:1 basis with the researcher in a quiet room allocated by the school. Items for the experimental task are presented in Table 7-1. All of the 15 words had been presented in the original spelling test. The items included were chosen from four categories – irregular high frequency, irregular low frequency, exception words and homophones. In order to elicit a full understanding of the spelling strategies used by children, this range of words required the children to draw on a wider

range of phonological, morphological, orthographic and semantic skill, thus extending Critten et al.'s (2007) study.

Each item was presented as a set, on separate cards, approximately 11cm x 15cm, with the correct spelling and two alternative spellings of the word. The alternative spellings were derived with reference to common errors identified in the spelling of young children (e.g. Nunes et al., 1997) and from the professional experience of the researcher. All of the alternatives were either orthographically or phonologically plausible. Examination of the errors made in the standardised spelling task motivated the choice of foils for the task. The position of the correct spelling within each set was randomly allocated in order to prevent a positional bias in the responses.

The task began with the examiner explaining that they would hear a word and see some alternative spellings of that word on a card. The card was then presented to the child and the examiner said the word and then put it into a sentence taken from the original standardised spelling task. They were then asked to identify the alternative they believed to be correct by either pointing to the answer they believed to be correct or by identifying its position (e.g. first, second, third or top, middle or bottom). Answers were recorded and the child was then asked to explain why the other responses were not correct. Finally, the child was asked to turn to the reverse of the card where the correct spelling was supplied in order to elicit an understanding of the spelling strategies used in the task. If the child's response was incorrect they were asked how they might learn the correct spelling and were encouraged to discuss strategies that they felt might be effective. If the child was correct, they were asked how they might teach other children to remember the correct spelling and again encouraged to identify specific strategies that they thought could be helpful. The children were thanked for their contribution and returned to their classes. Responses were audio recorded, transcribed and analysed.

Table 7-1: Alternative word sets presented in the recognition test – spelling alternative task

1	have	haf	hav
2	ligt	lyte	light
3	structure	struchsa	stucture
4	opend	opened	ohpened
5	siming	swiming	swimming
6	autum	autumn	ortumn
7	tomatos	tomates	tomatoes
8	wreath	reath	wreaf
9	fuj	fudge	fuge
10	throu	through	threw
11	klown	cloun	clown
12	because	bicause	becors
13	patients	pashience	patience
14	spred	spead	spread
15	cack	crack	crak

7.3 Procedure

Data collection was divided into two 30-minute sessions, approximately one week apart. The reading task (TOWRE 2) and experimental task (Recognition Test – Spelling Alternative) were administered in one session. The language task (CELF- 4) and standardised spelling task (HAST-2) were administered in the second session. The experimental task and standardised spelling task were presented in separate sessions to reduce any practice effect between the tests.

7.3.1 Standardised Tests

Standardised tests were administered and scored according to the manual instructions with appropriate discontinue points observed. However, to allow comparative analysis between the standardised spelling task and the 15 items chosen for the experimental task, children who reached the discontinue point prior to completing the items were encouraged to continue until these items were included. Four children in the dyslexia group did not attempt the items and discontinued prior to completion. These responses were therefore recorded as

incorrect attempts for purposes of analysis. A raw score was calculated and a standardised score derived. For the standardised spelling task, a spelling age range was identified for all of the groups.

7.3.2 Scoring and Coding

Experimental Measure

The number of correct responses for the experimental measure was calculated for all three groups. Where a child gave an incorrect response, but then self-corrected before turning over the card, the self-corrected response was accepted. Responses were transcribed by identifying the material that addressed the research aims. The data was analysed in two ways – the first according to the levels of the RR model (Karmiloff-Smith 1992) and the second according to the strategies reported by Rittle-Johnson and Siegler (1999).

Coding of Responses using RR Model

Karmiloff-Smith (1992) identified four levels, starting at the implicit level (accurate identification but with no understanding) and moving towards a more explicit level of understanding (Levels E1, E2 and E3 with the latter demonstrating complete understanding of the spelling with an improvement in accuracy from the previous level). Critten et al. (2007) expanded these categories to include E1A and E1B. In their study they found that the initial E1 category was too broad; the new category of E1A described children who were not at an implicit level as they could discuss their spelling, but only at a purely phonological level. E1B was used to describe children who had moved beyond the implicit level and had an abstracted knowledge of the spelling rule involved (-ed in Critten et al.'s 2007 study).

In the current study it also became apparent that the Implicit level was too broad. This category was expanded to three levels – Implicit level 1A, Implicit level 1B and Implicit Level 1C.

Level 1A was allocated where a child was unable to identify the correct alternative, either choosing the incorrect alternative or being unable to decide between the alternatives offered. In addition, they were unable to offer an explanation for any of the alternatives. This included responses where the children identified that they had guessed the answer. For example,

Is it the middle one?

I am guessing it is that one?

I have got a funny feeling it is the middle one but it could be the top one...

Level 1B identified a response where a child was unable to identify the correct alternative but could provide an explanation for the reason behind their choice. For example, when looking at the word *autumn*,

I think it might be this one because it doesn't have an extra 'n' on it.

... I sounded it out and you can hear 'or' at the beginning.

Responses were coded at level 1C if children were able to identify the correct alternative but were unable to justify their choice or explain why the other two alternatives were not correct. For example, when identifying the word *fudge* (researchers prompts are noted in italics),

Because in Toby Carvery (a restaurant) they have it on the menu.

The middle one, definitely. I do know it quite well. (*Why?*) I don't know why.

Unlike Critten et al's 2007 study, this study did not find justification for expanding the E1 category. This was therefore retained and used to describe children who could identify the correct answer and could discuss their spelling approach demonstrating some knowledge although incomplete and not always used correctly. For example, when discussing the word *fudge*,

The middle one (correct answer). (*Why?*) Because you can hear the 'd' in 'fudge'.

It is that one (correct answer). I know there is a 'd' in it.

E2 was used where the child's response demonstrated an understanding of the phonological, orthographic or morphological rule that applied, but was not completely accurate. For example, when discussing the word *opened*,

Because when you add -ed you have to have both ('e' and 'd') not just 'd'. (*Always?*) Umm...? not always. I'm not sure.'

...because 'opened' has -ed and this is a sound, but just -d isn't a sound.

The bottom one is wrong because it shouldn't have an 'h' in it, and the top one doesn't have an 'e'. (*Does it always have to have an 'e'?*) Well, mostly but sometimes it doesn't. It is a long 'o' so it has to have a magic 'e'.

E3 was allocated to a response where the child was able to identify the correct spelling of the word and provide a full explanation of why the response was correct and the other responses were not correct. For example, when discussing the word *swimming*,

...if you want to put this into the past tense, and there is a vowel and a consonant you put the -ing on the end and double the consonant'.

...if it ends with 'm' and you add -ing you need to double it.

A summary of the coding used for this study is presented in Table 7-2.

Table 7-2: Summary of coding for RR model (adapted from Karmiloff-Smith 1992)

Representational Level	Explanation
1A	unable to identify the correct alternative, either choosing the incorrect alternative or being unable to decide between the alternatives offered.
1B	unable to identify the correct alternative but could provide an explanation for the reason behind their choice.
1C	able to identify the correct alternative but unable to justify choice, or explain why the other two alternatives were not correct.
E1	identify the correct answer and discuss spelling approach demonstrating some knowledge although incomplete and not always used correctly.
E2	response indicated an understanding of the phonological, orthographic or morphological rule that applied, but was not completely accurate.
E3	able to identify the correct spelling of the word and provide a full explanation of why the response was correct and the other responses were not correct.

Coding of Spelling Strategies

The strategies identified in the verbal self-report task were analysed. The strategies used were elicited by asking the children the following questions during the recognition task -

Which spelling choice is correct and why?

Where the answer was incorrect, the child was asked -

How could you learn the correct spelling?

Where the answer was correct, the child was shown the correct answer and asked -

How could you teach other children to learn that word?

Categories of strategies used to learn/teach from verbal self-reports were adapted from the strategies identified by Rittle-Johnson and Siegler (1999). These were expanded to include a further three categories (identified in italics).

- Retrieval – automatic
- *Retrieval – using strategy*
- Sounding out
- Retrieve/sound out
- Drawing analogies
- Relying on rules
- Visual checking
- *Semantic knowledge*

Retrieval was used where children provided an automatic response (whether correct or incorrect) and could not explain the strategy they used. For example,

Some of them I just have to remember...

I remember this from Year One.

I know it is right because I read a lot of books at home.

Alternatively, the child used retrieval and was able to identify a strategy for retrieving the answer, for example using mnemonics, or a memory trigger. For example,

Sometimes I can make a sentence... big elephants can't always use small exits...

I know this one... it is the name of my grandma's dog.

Sounding out was allocated where the child identified using sounds, or saying the word aloud. For example,

I think it is this one...it does sound like that.

Because it has a 'sh' and 'sh' makes that sound.

Retrieve/sound out was used in line with the definition provided by Rittle-Johnson & Siegler (1999) where the word was partly retrieved and the remainder sounded out. For example,

I think it could be like 'swim' and 'ing'.

Drawing on analogies was identified where the child provided references to other words with a similar pattern, or identified words within words. For example,

The bottom one. 'gh' makes the 'i' stand longer. In fight, that makes a capital 'i' so it makes it longer. There's light and sight...

(How could we teach other children to remember?) Umm, spread has got 'read' in it.

Relying on rules refers to orthographic rules, where the child refers to a particular spelling rule or convention. For example,

Because normally in teaching they say if you want to make a word the past tense, you add on an -ed.

Because I know how to spell it. It needs a 'c' and a 'k' at the end, those two go together. (Do they always go together?) Mostly.

Visual checking included any strategies where the child used a phrase that indicated they were using a visual approach to identify the correct word. For example,

I have seen it before...

It looks right...

The longest one...

Semantic knowledge was an additional category as two of the words in the recognition task were homophones *patience/patients* and *through/threw*. A response was allocated to this category where they identified an understanding of this. For example,

There are two types of patients/patience... one type is the one at the doctors. The other one is to have patience...

So the bottom one is when you 'threw the ball' and the middle one is when you go 'through the door'.

A summary of the coding used for spelling strategies is presented in Table 7-3.

Table 7-3: Summary of coding for spelling strategies (adapted from Rittle-Johnson & Siegler 1999)

Strategy	Code	Explanation
Retrieval - automatic	1A	automatic response and not able to explain the strategy used
Retrieval – using strategy	1B	retrieval and able to identify a strategy for retrieving the answer (e.g. using mnemonics or other memory trigger)
Sounding out (phonetic)	2	identified using sounds, or said the word or sounds of the word visibly or audibly
Retrieve/sound out	3	part of the word was retrieved and the remainder sounded out
Drawing analogies	4	reference to other words with a similar pattern, or identification of words within words
Relying on rules	5	reference to a particular spelling convention or rule
Visual checking	6	a phrase used that indicated the use of a visual approach to identify the correct word
Semantic knowledge	7	explanation identified an understanding of different spellings of homophones

Interrater reliability

The self-report transcripts from 6 of the 66 children (2 from each group) were independently coded for strategies by another researcher with extensive experience in coding. A coding manual with examples was supplied. The interrater reliability (Cohen's Kappa) on the samples blindly coded was .85 and reliability of the coding can therefore be considered as having a high level of agreement. Following discussion, interrater agreement was 100%.

7.4 Results

Standardised Measures and Recognition Test-Spelling Alternative Task

Results of the standardised tests and Recognition Test-Spelling Alternative Task are presented in Table 7-4. As expected, the dyslexia group (DD) had significantly lower standard scores compared to the typically developing groups

for both reading and spelling. On the Total Word Reading task, a one-way ANOVA revealed a significant effect of group $F_{(2, 65)} = 46.49, p < .001$ ($\eta^2_p = .596, p\beta = 1.00$). Post hoc pairwise comparisons (Bonferroni-corrected) revealed that the dyslexia group scored lower than both the CA and SA groups, $p < .001$ for both, but that there was no significant difference between the CA and SA group, $p = 1.000$. For the standardised spelling task, there was also a significant effect of group, $F_{(2, 65)} = 40.86, p < .001$ ($\eta^2_p = .565, p\beta = 1.00$). Again, the dyslexia group scored lower than the CA and SA groups, $p < .001$ for both. This time, the CA group also scored significantly higher than the SA group, $p = .001$. For standard scores on the language measure (i.e. the formulating sentences subtest of the CELF), the effect of group was also significant, $F_{(2, 65)} = 3.59, p = .033$ ($\eta^2_p = .102, p\beta = 6.45$), with the children in the CA group scoring higher than the dyslexia group, $p = .034$. However, all of the children in the study, including those with dyslexia, scored in the average/above average range. None of the children in the dyslexia group appeared to have comorbid expressive language difficulties that would impact on their ability to produce full sentences. For the Recognition Test-Spelling Alternative task, a one-way ANOVA revealed a significant effect of group, $F_{(2, 65)} = 14.88, p < .001$ ($\eta^2_p = .321, p\beta = .999$). Post hoc pairwise comparisons (Bonferroni-corrected) revealed that the CA group scored higher than both the dyslexia and SA groups, $p < .001$. However, there was no significant difference between the dyslexia and SA groups, $p = 1.00$.

Table 7-4: Means and standard deviations for the standardised measures and recognition - spelling alternative task all groups

Variable	Dyslexia Group (DD) n=22		Chronological age (CA) match n=22		Spelling age (SA) match n=22	
	Mean	SD	Mean	SD	Mean	SD
Chronological age (yrs mths)	8;10	.50	8;11	.60	7;5	.90
Spelling age (yrs mths)	7;6	1.2	11;6	1.70	7;7	1.2
Recognition Test – Spelling Alternative Task	10.63	2.71	13.95	1.36	10.54	2.73
TOWRE 2 SWE – raw score	42.30	9.19	68.05	9.56	50.46	14.76
TOWRE 2 SWE – standard score	75.31	13.53	106.73	11.93	109.95	13.93
TOWRE 2 PDE – raw score	17.40	6.82	39.64	8.95	25.87	9.56
TOWRE 2 PDE – standard score	81.81	8.10	108.41	11.37	108.32	11.78
TOWRE 2 TWRE – standard score	75.31	13.53	106.73	11.94	109.96	13.94
HAST 2 – raw score	26.00	7.51	42.50	4.78	25.73	7.49
HAST 2 – standard score	86.20	12.11	114.72	8.34	102.23	10.69
CELF 4 – scaled score (mean 10 SD 3)	10.31	2.32	12.04	1.84	10.81	2.43

Key: TOWRE = *Test of Word Reading Efficiency*; SWE = *Sight Word Efficiency*; PDE = *Phonemic Decoding Efficiency*; TWRE = *Total Word Reading Efficiency (composite score)*; HAST 2 = *Helen Arkell Spelling Test*; CELF 4 = *Formulating Sentences subtest taken from the Clinical Evaluation of Language Fundamentals*.

Representational Levels

The response for each of the 15 items for each of the groups was coded individually and it was possible to allocate each of the responses to a level of the RR model consistent with Critten et al. (2007). This suggests that children with dyslexia are able to respond in a way that enables them to be allocated to a representational level (although not at the same levels) in the same way as both CA matched typically developing children, and younger typically developing children of the same spelling age. Analyses of the individual responses for each item identified that all responses could be allocated to one representational level on an item-by-item basis. The number of responses that could be allocated to each level is illustrated in Table 7-5.

Table 7-5: Distribution of responses for representational levels, per group, per word

RR Level	1A			1B			1C			E1			E2			E3			TOTAL
Item	CA	DD	SA	CA	DD	SA	CA	DD	SA	CA	DD	SA	CA	DD	SA	CA	DD	SA	
have	0	1	0	0	2	0	12	1	6	1	6	15	8	10	1	1	2	0	
light	0	3	0	0	1	0	3	4	9	1	6	13	13	8	0	5	0	0	
structure	0	1	2	0	2	2	5	4	6	5	8	12	11	7	0	1	0	0	
opened	0	2	7	2	4	6	2	1	0	3	6	6	3	8	3	12	1	0	
swimming	1	2	1	1	3	3	3	0	7	1	11	9	9	5	2	7	1	0	
autumn	0	3	5	5	9	7	5	2	7	1	4	3	9	4	0	2	0	0	
tomatoes	1	1	5	5	9	4	4	3	7	0	4	6	7	5	0	5	0	0	
wreath	1	3	7	4	6	4	5	4	6	4	5	4	4	4	1	4	0	0	
fudge	0	2	4	0	9	3	10	2	9	4	4	5	5	4	1	3	1	0	
through	1	3	3	1	3	2	2	1	7	2	3	6	13	11	4	3	1	0	
clown	0	1	0	0	2	2	7	4	7	6	8	11	7	7	2	2	0	0	
because	0	0	0	0	0	1	7	2	10	2	4	10	13	13	1	0	3	0	
patience	1	10	8	0	6	7	3	0	4	7	4	3	5	2	0	6	0	0	
spread	0	3	3	2	4	10	3	3	2	3	8	5	10	4	2	4	0	0	
crack	0	0	1	0	2	0	4	3	4	3	9	10	14	7	7	1	1	0	
TOTAL	5	35	46	20	62	51	75	34	91	43	90	118	131	99	24	56	10	0	990

An analysis of the item responses was then made in an attempt to allocate an overall representational level using the same criterion as Critten et al. (2007). The 2007 study defined the overall representational level as the level that was allocated to the participant most, out of the 15 sets. Although the range of words presented, and the level of knowledge required differed in this current study from that of Critten and colleagues, the same criterion was applied to explore if an overall representational level could be identified.

Using the analysis of the 15 items presented the level that occurred most often (mode) was identified as the overall level. Using this criterion, 16 of the participants from the dyslexia group could be allocated to an overall level. In the group of CA matched typically developing children, 21 could be identified with an overall level, while in the SA matched typically developing group, 21 children could also be allocated to an overall level within the RR model. The results are presented in Table 7-6.

Table 7-6: Number of participants in each group allocated to an overall representational level

	Dyslexia Group	CA Match	SA Match
Representational Level	Frequency of allocation	Frequency of allocation	Frequency of allocation
1A	1	0	7
1B	3	0	0
1C	0	0	2
E1	5	4	11
E2	7	14	1
E3	0	3	0
TOTAL	16	21	21

Spelling Production and Spelling Recognition Task

Results from these tasks are presented in Table 7-7 (group) and Table 7-8 (by participant). As expected, all groups were able to recognise more words correctly than they could spell. On the production task, a one-way ANOVA revealed a significant effect of group $F_{(2,65)} = 55.08, p < .001 (\eta^2 = .636)$. Post hoc pairwise comparisons (Bonferroni-corrected) revealed that the dyslexia group scored lower than the CA group, $p < .001$, but that there was no significant

difference between the dyslexia group and the SA group, $p = 1.000$. Again, as expected, there was a significant difference between the CA group and SA group, $p < .001$. For the recognition task, the analysis also showed a significant effect of group $F_{(2,65)} = 19.29$, $p < .001$ ($\eta^2 = .380$). Post hoc pairwise comparisons (Bonferroni-corrected) again revealed that the dyslexia group scored lower than the CA group, $p < .001$, but not the SA group, $p = 1.000$.

Table 7-7: Means, standard scores and range of scores on the production and recognition task by group

Group	Min	Max	Mean	SD
Dyslexia - production	1	10	4.68	2.85
Dyslexia - recognition	6	15	10.23	2.47
CA match-production	7	15	11.77	2.67
CA match-recognition	11	15	14.14	1.13
SA match-production	0	11	4.23	2.49
SA match-recognition	4	15	10.41	3.05

Table 7-8: Number of correct responses for production and recognition task by participant

Participant	Dyslexia Group		CA Match		SA Match	
	Production	Recognition	Production	Recognition	Production	Recognition
1	10	15	11	15	3	13
2	7	10	10	11	2	8
3	2	10	8	14	2	6
4	5	9	11	13	5	12
5	7	14	7	13	3	10
6	3	12	12	15	4	12
7	8	11	15	15	3	9
8	8	10	15	15	4	11
9	7	11	14	15	8	14
10	7	12	8	15	6	15
11	3	11	15	14	3	6
12	2	7	14	14	2	13
13	6	8	11	15	8	11
14	1	6	12	12	3	13
15	5	9	9	14	0	4
16	9	12	14	15	3	7
17	2	14	15	15	3	9
18	3	6	12	14	4	11
19	2	7	13	15	7	14
20	4	10	8	14	5	9
21	1	10	10	13	11	14
22	1	11	15	15	4	8
TOTAL	103	225	259	311	93	229

Strategies Used

All groups of children were able to identify a strategy or a number of strategies that they used to approach the Recognition Test-Spelling Alternative task. Strategies were identified and coded on a per item basis and then as a percentage of the overall responses (see Tables 7-9 to 7-12). Participants in each group reported multiple strategies for a number of the items presented.

Table 7-9: Number of times each strategy was used calculated as a percentage of strategies reported within each group

	Dyslexia Group (n=22)	CA match (n=22)	SA Match (n=22)
Strategy	% (from 388 responses)	% (from 484 responses)	% (from 406 responses)
Retrieval – automatic	11.11	17.56	26.85
Retrieval – with strategy	8.27	9.50	12.32
Sounding out (phonetic)	43.93	21.28	22.41
Retrieval/sounding out	1.29	1.65	4.43
Drawing analogies	3.62	9.71	1.23
Relying on rules	9.04	13.22	6.65
Visual checking	20.67	19.01	23.65
Semantic knowledge	2.07	8.06	2.46

A series of chi-square tests of homogeneity were performed to determine whether the groups differed in their strategy selection. Effect sizes were calculated using phi ϕ where a value of <0.1 is considered a weak effect, <0.3 a modest effect, <0.5 a moderate effect, <0.8 a strong effect and ≥ 0.8 a very strong effect (Muijs, 2011). The observed frequency of each strategy for the children with dyslexia differed significantly from the CA group, $X^2(7, N = 871) = 71.14, p < .001, \phi = .286$. The observed frequency of each strategy for the children with dyslexia also differed significantly from the younger SA matched children, $X^2(7, N=793) = 70.43, p = .001, \phi = .276$. These results show that the three groups are drawing on the eight strategies to differing extents, and that the effect size is modest in each case.

Responses were further examined to determine whether a predominant strategy could be identified for each child based on the strategy that they used most frequently (see Tables 7-13 to 7-15). Adopting this criterion, 21 of the 22 children in the dyslexia group could be identified as using a predominant strategy. Fifteen of these children relied on a sounding out (phonetic) strategy, while three used visual checking and three used automatic retrieval predominantly and were unable to explain their answer. By comparison, 17 children in the CA group were identified as having a predominant strategy; four of these used a phonetic approach, three reported using visual checking, one used analogies predominantly and four used a reliance on spelling rules. A further five children reported using automatic retrieval and were unable to explain their responses. From the SA match group, 19 children were identified with a predominant strategy. Seven children from this group used automatic retrieval as the predominant strategy, one retrieval with a reported strategy, five a sounding out (phonetic) strategy and six visual checking.

Table 7-10: Strategy use by item – dyslexia group

	have	light	structure	opened	swimming	autumn	tomatoes	wreath	fudge	through	clown	because	patience	spread	crack	TOTAL
1	1A	7	6	5	3	1A	1A	6	1B,4	1B,7	1B	1A	1A	4	1B	17
2	1A	1A	1A	2,6	6	3	3,6	1A	2	6	6,2	6	2	2,6	2	19
3	6,2	6	2	5	6,2	2	2	1A	1A	7	1A	1B	2	2	6	17
4	1B,2	5	2	1A	5	6	2	2	2	1A	2	1A	2	2,5	2	17
5	2	2	2	5,2	2,5,7	1A	6,2	1A	2	1A	2	6	2	6,2	5	20
6	5	6	5,2	5	2	6,2	6	2	1A	4	2	6	2	2	2	17
7	6	6	2	2	5	1B	5	6	6	7	6	1B	2	6	2	15
8	2	4,5	2	2	2	2,6	5	2	6	6	6	2	6	2	4,2	18
9	2	1A	2	5	5,2	6	1B	6,2	2,6	1B	1A	2	2	2	5,2	19
10	1B	6	2	2	6,2	6,2	6	1B	2	6	2	1B	1B	2,6	6	18
11	1A	6	2,6	5	1A	1A	6,2	1B	1A	1A	4	1B	1B	4	4	17
12	2	2	2	1A	6	2	2	2	2	6	2	1B	2	2	2	15
13	1A	6,2	2	5	2	2	2	1B, 2	1B,	2	2	1B	2	2	2	17
14	5,2	4	2	2	2	2	2	2	2	2	2	1B	2	2	5	16
15	1A	2	2	2	2	2	5	2	2	6	3	1B	2	4	2	15
16	1A	6,4	2	1A	1A	2	2	1B, 2	1A	7	1A	1A	6	6	4	17
17	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	15
18	6	6	2	2	5	2	2	2	2	1B,7	6	1A	2	2	2	16
19	2	4	2,6	5,2	1A	2	1A	2,6	2,1B	2	1B,2	6	2	1B,2,4	1A	22
20	2,5	2	2,6	5	2	2	1B	6	2	6	1A	1B	7	2	2	17
21	5,2	1A	2	2,5	5,6,2	1A	2,5	1A	2	2	2	1B	2	2	2	20
22	2	2,5	2	2,6	2,3	2,6	2,6	2,1B	2	2	2,5	1B	2	2,5	2,5	24
Coding: 1A=retrieval auto; 1B=retrieval with strategy; 2=phonetic; 3=retrieval/sound out; 4=analogies; 5=relying on rules; 6=visual checking; 7=semantic knowledge																388

Table 7-11: Strategy use by item – CA match

	have	light	structure	opened	swimming	autumn	tomatoes	wreath	fudge	through	clown	because	patience	spread	crack	TOTAL
1	1A	4	3	5	5,6,4	1A	5,6	1A	1A	7,4,6	5	2	7,2	1A	1A	21
2	6	2,6	2	1A	1A	6	6	2	6	6,7	1A	1A	2	1A	1A	17
3	1A	6	6	5	2,5	2	1A	6,2	1B	2,7	6	3	7	2,6	4	19
4	6	1A	6,2	5,6	6,7	1A	4,6	2	1A	1A	1A	4	2	2,4	2	20
5	1A	1A	6,2	2,6	6	6	1A	2,7	1A	1A	1A	1A	2,7	2	5	19
6	1A	4,6	2,6,7	5,2	1B	6	1A	4,6	2	6,7	6	1B	1A	1B	1B	21
7	5,2	2	2,6	5	5,4	4	5	5,6	5,2	7,6	4	2,6	7	6,2	5	23
8	5,6,7	4,5	1B,6,2	5	2,5	6,2	5,4	4,2	1A	1A	1A	1B,5	7,2,6	1A	2,5	28
9	2,1B	6,1B	6	4,6	6	6	2,6	4	6	6,7	2	1B	6	6	6	20
10	6	4,5	2,6	5,2	5,2	1A	2,6,1B	6	2	7	6,5	1B,2	4,7	1B	6	24
11	2	4	1A	5,2	1A	1A	5,2	4,2	6,2	7,1B,5,2	1A	6,4,1B	2,7	2,5	1A	26
12	1A	6	6,2	1A	1A	1B	5,4	1A	1A	7,6	1B,2	1B	7,5	2,5	5,6	22
13	2,6	1A	2,6	5,2	6,7	1B,6,2	6	7	1A	7	1A	1B,6	7,1B	2,1B	5,6	25
14	1A	1B,4	1A	2,5	5,6	1B,2	5,6	2	1B,6	7,2	1A	1A	7,1B,2	1A	1A	24
15	1B	5	6,2	2	1B,6	6,2	1A	2	1A	4,6	1A	1A	7,1B	2	1B,2	21
16	1A	1B,4	1A	5,4	5,7	1A	2,5	1A	1A	1A	1A	1A	7,2	4,6	5,2	22
17	1A	6,2	2,6	1A	6,2	6,2	1A	2	1A	7,1B,2	2,6	1A	7,2,5	2,6	2,5	26
18	1A	1A	2	5	2,5	1A	4,5	1B	2,4	7,6	1B	1B	1A	5,6	5,4	21
19	1A	4,5, 2	1A	4,2,5	2,5	1A	1A	1B,2,4	1B,6	7	5,3	1A	7	2,4	2,5	26
20	1A	4	4	4,5	4,5	6	3	6	3	7	2	1A	1A	1B	2,3	18
21	1B	4,1B	2,1B	2,4	1B	6	6,3	4	1A	7	4,2,1B	1B	7,4	2	5,4	23
22	1A	5	1A	1A	5	4,2	6	2	2,1B	4	7,6	5	7	3	5	18
Coding: 1A=retrieval auto; 1B=retrieval with strategy; 2=phonetic; 3=retrieval/sound out; 4=analogies; 5=relying on rules; 6=visual checking; 7=semantic knowledge																484

Table 7-12: Strategy use by item – SA match

	have	light	structure	opened	swimming	autumn	tomatoes	wreath	fudge	through	clown	because	patience	spread	crack	TOTAL
1	1A	1A	6,3,2	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	17
2	1B,2	1A	1A	2	6,5	6	6,3	3	6	6	2	1B	2	3	5	18
3	6	5	6,2	1A	6	6	3	6	1A	2	6	6	1A	5,6	5	17
4	2	3	6	6,5	6	6	6	1A	6	6	1A	1A	2,6	5	5	17
5	1A	1B	2	1B	1B	1B	3,2	1A	6,2	1A	1A	1A	1B	2	2	17
6	5	1A	1A	6	6,1B	1A	6	1A	1A	7	1A	1A	2	1A	1A	16
7	6	6	6,2	1A	1A	1A	1A	1A	1A	6	6,2	1B	2	2,1B	6,2	19
8	1B,6	1B,6	6	1A	1A	6	3	1A	6	7	6,1B	1A	1A	3	1A	18
9	1A	1A	1B,2,6	3,1B	3,1B	6,1B	1A	6,2,1B,7	6	7	1B	1A	6	6,3	1B	24
10	6	4,5	6,2	6,2	1A	1A	1B,6	1A	1A	7,6	6	6,1B	6	6,1B	6,1B	23
11	2,6	2	2,6	6	2	2	2	1B	2	6	2	6	2	1A	2	17
12	5	5	2	6	6,5	2,6	2,1B	2	1	7,2	1B	2	1B	5,2	2	20
13	1A	1A	1A	1A	6,2	1A	1A	1A	1A	1A	1A	1A	1A	1B,6,	6	17
14	2,6	2	1B,6	6	1A	1A	1A	6	5	1A	5	1B	1A	6,2	1A	18
15	6,2	1A	1A	1A	1A	2	2	2	2	6	6	2	2	6	5	16
16	1B,2	1B,2	2,6	2	2	2	2	1A	2	2	2	1A	1A	2	2	18
17	6	6	2,6	6	6	2	6	2	2	1A	6	1B	2	2	6,2	17
18	6,5	5	2	1A	2	1A	2	1A	6,5	7	1B	1A	1A	5	1B	17
19	6	2,5	2,6	2	6,4	1A	6	1B,6	6	7,6	4	1B	1A	5	5	20
20	5	6	2	2	2,6	1B	1A	1B	1A	1B	1A	1A	1A	1A	5	16
21	6,2	2,1B	2	1A	1A	1B	6,3	1B,3	1A	1A	1A	1A	1B,7	2	5,4	20
22	2,1B	2,5	2,1B	1B	5	2,1B	2,3,1B	1A	6	1A	2	1B	1A	2,5,6	4,6	24
Coding: 1A=retrieval auto; 1B=retrieval with strategy; 2=phonetic; 3=retrieval/sound out; 4=analogies; 5=relying on rules; 6=visual checking; 7=semantic knowledge																406

Table 7-13: Frequency count of spelling strategies used by children in the dyslexia group

Child	Retrieval – automatic	Retrieval – using strategy	Sounding out	Retrieve/sound out	Drawing analogies	Relying on rules	Visual checking	Semantic knowledge	Multiple strategies
1	5	4	0	1	2	1	2	2	2
2	4	0	6	2	0	0	7	0	4
3	3	1	7	0	0	1	4	1	2
4	3	1	9	0	0	3	1	0	2
5	3	0	10	0	0	3	3	1	4
6	0	0	8	0	1	3	5	0	2
7	0	2	4	0	0	2	5	1	0
8	0	0	9	0	2	2	5	0	3
9	2	2	9	0	0	3	3	0	4
10	0	4	7	0	0	0	7	0	3
11	5	3	2	0	3	1	3	0	2
12	1	1	11	0	0	0	2	0	0
13	1	3	11	0	0	1	1	0	3
14	0	1	12	0	1	2	0	0	2
15	1	1	9	1	1	1	1	0	0
16	6	1	4	0	2	0	3	1	2
17	0	0	0	0	0	0	15	0	0
18	1	1	9	0	0	1	3	1	1
19	3	3	10	0	2	1	3	0	6
20	1	2	8	0	0	2	3	1	2
21	3	1	11	0	0	4	1	0	3
22	1	1	14	1	0	4	3	0	9
TOTAL	43	32	170	5	14	35	80	8	56
Predominant	3	0	15	0	0	0	3	0	

Table 7-14: Frequency count of strategies used by children in the CA match

Child	Retrieval – automatic	Retrieval – using strategy	Sounding out	Retrieve/sound out	Drawing analogies	Relying on rules	Visual checking	Semantic knowledge	Multiple strategies
1	6	0	2	1	3	4	3	2	3
2	6	0	4	0	0	0	6	1	2
3	2	1	5	1	1	2	5	2	4
4	5	0	5	0	3	1	5	1	5
5	7	0	5	0	0	1	4	2	4
6	3	4	3	0	2	1	6	2	4
7	0	0	6	0	3	7	5	2	9
8	4	2	6	0	3	7	4	2	10
9	0	3	3	0	2	0	11	1	5
10	1	3	6	0	2	4	6	2	8
11	5	2	8	0	3	4	2	2	8
12	5	3	3	0	1	4	4	2	7
13	3	4	5	0	0	2	8	3	9
14	6	4	5	0	1	3	3	2	8
15	4	4	6	0	1	1	4	1	7
16	8	1	3	0	3	4	1	2	7
17	5	1	10	0	0	2	6	2	9
18	4	3	3	0	3	5	2	1	6
19	5	2	6	1	4	5	1	2	8
20	2	2	2	3	4	2	2	1	3
21	1	6	4	1	6	1	2	2	7
22	3	1	3	1	2	4	2	2	2
TOTAL	85	46	103	8	47	64	92	39	135
Predominant	5	0	4	0	1	4	3	0	

Table 7-15: Frequency count of strategies used by children in the SA match

Child	Retrieval – automatic	Retrieval – strategy	Sounding out	Retrieve/sound out	Drawing analogies	Relying on rules	Visual checking	Semantic knowledge	Multiple strategies
1	14	0	1	1	0	0	1	0	1
2	2	2	4	3	0	2	5	0	2
3	3	0	2	1	0	3	8	0	2
4	3	2	2	4	0	0	5	1	2
5	5	5	5	1	0	0	1	0	2
6	9	1	1	0	0	1	3	1	1
7	6	2	5	0	0	0	6	0	3
8	6	3	0	2	0	0	6	1	3
9	4	7	2	3	0	0	6	2	6
10	4	4	2	0	1	1	10	1	8
11	1	1	10	0	0	0	5	0	2
12	1	3	8	0	0	4	3	1	5
13	13	0	1	0	0	0	3	0	2
14	6	2	3	0	0	2	5	0	3
15	4	0	7	0	0	1	4	0	1
16	3	2	12	0	0	0	1	0	3
17	1	1	7	0	0	0	8	0	2
18	5	2	3	0	0	4	2	1	2
19	2	2	3	0	2	3	7	1	4
20	6	3	3	0	0	2	2	0	1
21	8	2	3	2	1	1	2	1	4
22	3	6	7	1	1	3	3	0	7
TOTAL	109	50	91	18	5	27	96	10	66
Predominant	7	1	5	0	0	0	6	0	

Multiple Strategies

The literature review identified that more proficient spellers used multiple spelling strategies and therefore the use of multiple strategies between the groups was investigated for differences. Results are presented in Table 7-16. This category was identified where the response indicated the use of more than one strategy, for example –

I sounded it out, but it also looks right...

Because you can hear all the sounds... and you can't just put the /c/ on the end of the word...it has to have the /k/ as well.

Table 7-16: Multiple strategy use all groups

	Dyslexia Group	CA Group	SA Group
Mean	2.55	6.14	3.00
SD	2.09	2.45	1.95

The dyslexia group reported fewer multiple strategies than both the CA and SA groups. A one-way ANOVA revealed a significant effect of group $F_{(2,65)} = 17.78$, $p < .001$ ($\eta^2 = .361$). Post hoc pairwise comparisons (Bonferroni-corrected) revealed that there was a significant difference between the dyslexia group and the CA group, $p < .001$, but not between the dyslexia group and the SA group, $p = 1.000$

7.5 Discussion and conclusions

Given the nature of the DA procedure as outlined in the Literature review, the rationale for this study was to determine if children with dyslexia are able to interact with the assessor to discuss their understanding of spellings in a meaningful way compared to typically developing children. This was considered to be an essential first step in developing a DA approach to the assessment of spelling.

Research Aim:

The primary research aim for this thesis was -

To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

In line with this the primary research question was -

1. Given the verbal interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?

Within this, three sub-questions were identified –

1A. Can children with dyslexia provide a verbal self-report that enables the researcher to classify their understanding and approach to spelling in the same way as typically developing children of the same age, as well as younger children?

1B. Can typically developing children and children with dyslexia correctly recognise more words than they can correctly generate and are there any differences between the groups?

1C. Are the spelling strategies used by children with dyslexia quantitatively different to those of typically developing children of the same age, as well as younger spelling age matched children?

The findings of this small-scale study suggest that children with dyslexia are able to verbally self-report their understanding of the approaches they use when identifying a correct spelling choice from a number of alternatives. While Critten et al. (2007) utilised target words with the past tense morpheme *-ed*, the current study expanded this to include monomorphemic words, morphologically irregular words, and words with a variety of inflectional morphemes, requiring the children to draw on a wider range of phonological, morphological, orthographical and semantic skills. This was considered important in the development of a DA of spelling where the aim is to provide a detailed profile of spelling ability for children who are struggling with spelling. All of the target words were taken from the HAST-2 (alternative Form B) spelling test (Caplan et al., 2012), which is considered to have good levels of reliability and validity. All of the fifteen words chosen had been presented in the original spelling test and included irregular high frequency, irregular low frequency, exception words and homophones. By including these categories, the children were required to draw on a wider range of spelling strategies than those identified by Critten and colleagues. These would be described as backup strategies within Rittle-Johnson and Siegler's (1999) study and enabled a comparison of a full range of spelling strategies to be made between the groups. Strategies are defined as 'sequences of mental operations

that can be consciously organized to enhance performance on a specific task' (Torgesen, 1984, p 352). In order to become proficient spellers, children need to develop flexibility in choosing an appropriate strategy when spelling unfamiliar words (Steffler, Varnhagen, Friesen, & Treiman, 1998). Elicitation of children's explanations and justifications for their spelling attempts may clarify if the errors made are randomly produced or are symptomatic of difficulties in underlying representations (Critten, Pine, & Messer, 2013).

For all groups of children, single-item responses could be allocated to a level of Karmiloff-Smith's RR model as in Critten et al. (2007). None of the children in the dyslexia group appeared to have comorbid expressive language difficulties that would impact on their ability to produce full sentences. Since the key principle of a DA approach to the assessment of spelling is the ability of children to be able to verbalise their responses in interaction with the assessor, this is a positive finding and provides a basis on which to consider a dynamic assessment procedure for children with dyslexia.

Further analysis was undertaken to allocate an overall representational level. Using Critten et al.'s methodology, 21 children in the CA matched group could be allocated to a predominant category with the same number of children allocated from the younger, SA matched group. However only 16 of the children in the dyslexia group could be allocated to an overall representation level. This difference in outcome between the typically developing groups and the dyslexia group raises an interesting distinction and may contribute to the discussion around whether the errors made by children with dyslexia represent a delay or a difference. The research literature to date suggests that the spelling errors made by dyslexic children are similar to those made by typically developing younger children. The results of this study however would suggest that there may be a difference between these groups in their ability to form representations over time. Despite the primary objective of allocating the responses of the children with dyslexia to the RR model being to determine if their verbal self-reports were meaningful in the same way as typically-developing children, this is an intriguing finding that could be explored further. The results extend the work of Critten et al. (2007) by including children with reading difficulties.

The current study did however reveal some differences between the groups. Unlike in Critten et al.'s (2007) study, a small number of the children were found

to be at the implicit level overall (seven children in the typically developing SA match group). On the item analyses there were a number of children who also produced isolated responses. This most likely reflects the wider range of items presented. Children in the dyslexia and CA match groups were most commonly allocated to the level E2 that indicated that they had some understanding of the phonological, orthographic or morphological rule that applied, but that it was not completely accurate. While this was more dominant in the typically developing group (66% of the children who could be allocated to an overall representation level were allocated to this group) this was also the case with the children in the dyslexia group (44% of the children who could be allocated to an overall representation level were allocated to this group). By comparison, children in the younger SA matched group were most commonly allocated to the E1 group (52%) whereby they could identify the correct answer and discuss a spelling approach demonstrating some knowledge, however this was incomplete and not always used correctly. This could be expected from this younger group of children. While the results raise some interesting issues that could be explored in future research, it is positive for the development of a DA of spelling in that it identifies that children with dyslexia can provide meaningful verbal self-reports in the same way as typically developing children.

A second sub-question developed for this study was to identify if typically developing children and children with dyslexia could correctly recognise more words than they could correctly generate and if there were any differences between the groups. This has implications for understanding if the difficulties associated with spelling in children with dyslexia can be categorised as difference or delay. Differences between these populations could have implications for effective teaching and intervention.

The responses from the 15 items in the recognition task were compared with the responses from the spelling production task. Results identified that all groups of children performed better on the spelling recognition task than the spelling production task. While the element of chance should be noted – children may produce the correct answer simply by guessing, which is much less likely in a production task – this is consistent with previous studies of typically developing children (e.g. Masterson & Apel, 2010). It therefore supports the view that all groups of children were able to recognise more words than they can correctly produce.

The final sub-question for the study investigated if the spelling strategies used by children with dyslexia are quantitatively different to those of typically developing children of the same age, as well as younger spelling age matched children. A review of the literature identified that the strategies used by children when approaching the task of spelling (in contrast to examining only what they can produce correctly or incorrectly) may add important information to the development of effective support programmes. The strategies used by the children were elicited by expanding Critten and colleagues' task to probe how they might learn an unfamiliar spelling, or how they might help another child to learn an unfamiliar spelling.

The data collected from the groups were analysed on both a per-item basis and then for a predominant strategy. On a per-item basis, children in all groups were able to identify one or more strategies that they used to learn/teach unfamiliar spellings for the words presented. In each group, a percentage of responses indicated automatic retrieval, where the child provided an automatic response (whether correct or incorrect) and could not explain the strategy they had used. Of interest to this study is that the children in the dyslexia group were least likely to report this (11.11% frequency of allocation) compared to 17.56% for the typically developing CA match and 26.85% for the typically developing younger children. This may be for a number of reasons. It could be that for the CA children, with a higher number of correct spelling responses in the identification task, their understanding of the word was implicit; it had been so well learned and transferred to memory that retrieval was automatic without having to rely on an underpinning strategy. By comparison, the lower frequency of allocation to the category by the children in the dyslexia group appears to reflect an over-reliance on a phonetic strategy that was not useful for many of the words included in the study. However, for the typically developing younger children the answers were more likely to be a guess and they were unable to provide an explanation of why they chose the particular response.

Overall, the results suggest that the children in the CA group were more likely to use the full range of identified strategies when approaching the spelling alternative task and often more than one on a per-item basis, to arrive at the correct answer. That is, they seemed to be able to utilise a number of the strategies available to them and be able to verbalise more than one approach.

This is reflected in the overall number of responses – 484 – when compared to the dyslexia group where 387 responses were provided. The younger typically developing children produced 406 responses, exceeding those of the older children with dyslexia in the study and suggesting access to a wider range of spelling strategies, although these were not always appropriate. This supports the view of previous research (e.g. Bourassa & Treiman, 2003; Bruck, 1988; Cassar et al., 2005) that diverse strategies can allow children to adapt to the demands of the task and allows them to approach a problem with the flexibility of strategy choice.

By contrast, the children in the dyslexia group were more likely to use a sounding out strategy (phonetic) in isolation when identifying the correct spelling from a choice of alternatives. The children in the group were therefore not always successful in identifying the correct spelling of the target word – they could identify the sounds but showed difficulty in recalling the exact letters or letter patterns of the word. This is consistent with other studies that report that poor spellers have difficulties remembering word-specific information (e.g. Fayol, Zorman, & L  t  , 2009). Data from younger typically developing children identified that the most commonly occurring strategy was automatic retrieval, where the child was unable to explain why they had made a particular spelling choice.

The results from this study suggests that strategy use for both typically developing children and children with dyslexia provides evidence for Siegler’s (1996) overlapping waves model rather than developmental stage theory. Stage/phase models propose that children pass through a sequence of stages in (for a full discussion see Chapter Two). In early spelling development, children rely on a letter-sound (phonetic) strategy; this strategy is replaced during development as vocabulary, basic word knowledge and experience with writing words expands in a linear progression (Ehri, 2000; McGeown et al., 2013). By contrast, the overlapping waves model proposes adaptive strategy choice and gradual change. According to the model, children’s strategy choices in domains such as arithmetic are calculated on the basis of speed and accuracy where automatic retrieval is unavailable (Rittle-Johnson & Siegler, 1999). In the context of spelling, the model identifies the strategies used by children as being task oriented rather than necessarily related to age or stage. In this study all groups of children demonstrated the ability to rely on different strategies depending on the problem presented and to switch back and forth between more and less

sophisticated strategies, thus supporting a task oriented approach to spelling. The fact that the children with dyslexia in the study relied more heavily on a phonetic backup strategy than both groups of typical developing children could reflect a lack of accurate orthographic mappings required for the correct retrieval of spelling representations. This appears to be consistent with the literature that identifies that the difficulties seen in children with dyslexia may impact on the process of retrieving accurate spelling representations (Ehri, 2014). Siegler (1996) further postulates that speed and accuracy may not be the sole basis for the use of backup strategies identified in spelling such as sounding out or drawing analogies. Siegler suggests that a child's persistence in using an ineffective strategy such as sounding out, for example for irregular words like *yacht*, may reflect their desire to do something plausible when automatic retrieval is unavailable, even when the result is inaccurate. Although incorrect, it may provide a closer approximation of the correct answer. This does seem to be the case for the children with dyslexia in this study who, while demonstrating the ability to use both retrieval and backup strategies, reverted to a phonetic strategy when confronted with a more difficult word. A further explanation for the sounding out (phonetic strategy) for all groups may be the focus on quality phonics teaching in UK schools in recent years (Fayol et al., 2009). It is possible that this has influenced the strategy choice for all children. The data suggests, however, that while typically developing children are able to use this strategy as appropriate, and combine this with other strategies, children in the dyslexia group are more likely to persist with sounding out, even when unsuccessful, and appear to either have a narrower choice of strategies available to them or feel less confident in using them. Steffler et al. (1998) identified that back-up strategies become more effective for typically-developing children from second grade to fifth grade, however this may not be the case for children with dyslexia. One implication of this is that it may be useful to explicitly teach a range of strategies to all children, and particularly to children with dyslexia, when supporting them with their spelling.

It is promising that all children in the study were able to provide verbal self-reports that could be categorised to a particular strategy, thus providing in-depth qualitative information as a foundation for developing target support and moving beyond a binary analysis of children's spellings as correct and incorrect. This provides a good basis on which to proceed with the development of a DA approach to spelling. Previous research studies have demonstrated that even

very young children are able to meaningfully self-report the strategies they use when approaching spelling tasks (e.g. Walker, Bartlett, Betts, Sainsbury, & Mehta, 2013). The results from the younger typically developing children who took part in this current study (mean age 7 years 5 months) were broadly in line with this finding, however the children were not able to demonstrate this on all of the items. Of the 406 responses verbalised, 26.85% of these were allocated as automatic retrieval where the children were unable to explain their choice (and were often incorrect). This difference in outcome is most likely due to the expanded categories of words used that required a more varied knowledge base. Critten et al.'s (2007) study consisted exclusively of target words with the past tense morpheme *-ed* while the items in the current study included monomorphemic words, morphologically irregular words, and words with a variety of inflectional morphemes, requiring the children to draw on a wider range of phonological, morphological, orthographic and semantic skills.

It is acknowledged that a spelling recognition task is not the same as a spelling production task and that children in this study can recognise more words than they can correctly produce, consistent with the literature (Masterson & Apel, 2010). However, the results from the spelling recognition task in this study do support the fundamental principle that 8/9 year-old children – both typically developing and children with dyslexia – are able to produce meaningful verbal self-reports of the strategies used. When combined with interaction with the assessor and verbal self-report from the learner, spelling recognition can provide a rich source of information (Masterson & Apel, 2010). It does therefore seem feasible that this positive finding can provide a basis on which to develop an interactive DA procedure that elicits information on which to develop a targeted intervention programme.

7.6 Chapter summary

The results of this study provide evidence that children with dyslexia are able to provide a meaningful verbal self-report that allows them to be allocated to a level of spelling development on a per item basis. By extension, this supports the view that an interactive assessment procedure for spelling, drawn from the principles of DA, does seem plausible. Had the children in the study been unable to verbally self-report their approach to spelling and the strategies they used, this procedure would not be feasible. Thus, the results are encouraging. The next step in this

thesis will be to develop and pilot a replicable procedure for the DA of spelling in children with dyslexia.

CHAPTER Eight: Study Three. Developing a dynamic assessment of spelling

8.0 Introduction and rationale

Study Two, outlined in the previous chapter, identified that children with dyslexia were able to provide verbal reports of strategy use in a spelling recognition task in the same way as typically developing children. This created the possibility of developing a DA approach to the assessment of spelling. The results also revealed that in contrast to their typically developing peers, children with dyslexia relied on a phonetic strategy to spell unfamiliar words. It was hypothesised that this may be partially explained by the focus on quality phonics teaching in UK schools in recent years. The study raised the possibility that children with dyslexia may need explicit instruction in spelling strategies to support their spelling.

This chapter outlines the development of a curriculum-based DA assessment tool for spelling – the Dynamic Assessment of Spelling (DASp). As discussed in Chapter Three (section 3.3) conventional static assessment that scores spellings as correct or incorrect provides limited information about a child's spelling knowledge. While an understanding of the strengths and weakness in relation to spelling is helpful for all children, this could be considered particularly important for weaker spellers. Understanding the strategies that these children use and how they respond to explicit instruction could provide additional information for support. The intention of this study therefore was to develop an assessment tool that captures information about how children approach a spelling task. It is intended that this might be used alongside a standardised spelling test as part of a dyslexia specialist's toolkit. The principal aim of the DASp is to provide an assessment that evaluates current performance, guides intervention and supports progress.

Research Aim:

The primary research aim for this thesis was -

1. To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

In line with this the primary research question was -

Research Questions:

1. Can a spelling assessment be developed within a theoretical framework for DA?
2. Compared to static assessment, what additional information can a DA approach to spelling provide?
3. How can this information be used to support weak spellers

A further sub-question was identified for Study Three:

- 1A. Can 8-9 year-old children with dyslexia provide verbal reports of the spelling strategies they use in a spelling production task in the same way as a spelling recognition task?

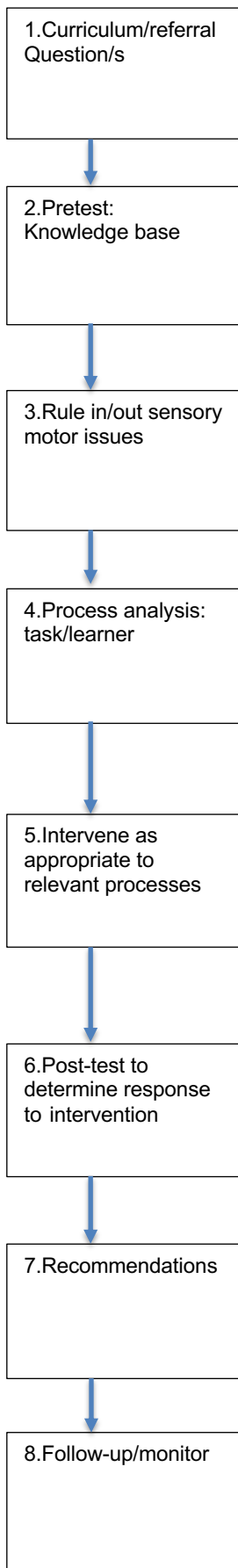
8.1 Development of the DASp procedure

Theoretical Framework

The DASp was developed using the theoretical framework identified by Lidz (2014). (See Chapter Four for a discussion).

- Curriculum/referral question(s)
- Pretest: knowledge base
- Rule in/out sensory-motor issues
- Process analysis: task/learner
- Intervene as appropriate to relevant processes
- Post-test knowledge base to determine response to interventions
- Recommendations
- Follow-up/monitor

Theoretical Framework for Curriculum based DA (Lidz 2014)



DASp Framework

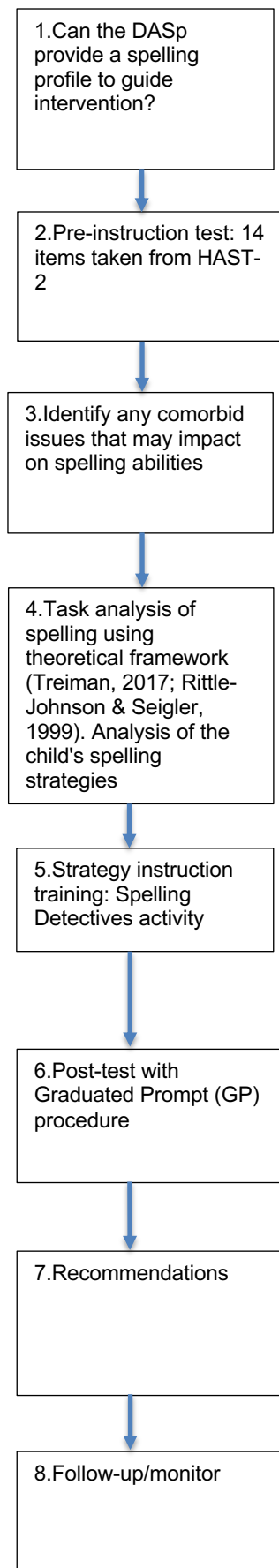


Figure 8-1: Theoretical framework for DASp

The steps in the curriculum-based DA framework and how the DASp fits this framework are outlined in Figure 8-1. Given the research evidence identifying that spelling difficulties can continue into adulthood in children with dyslexia (Berninger et al., 2013; Hatcher et al., 2002; Maughan et al., 2009) the curriculum question formulated (step one) was to determine if the DASp can provide spelling profiles for each of the children in order to guide effective intervention. Step two involved a pre-instruction test of 14 items taken from the HAST-2. Comorbid issues that might impact on spelling abilities (step three) were identified and excluded at baseline testing. Process analysis (step four) incorporates two components – task analysis and learner analysis. Task analysis utilised the spelling framework of Treiman (2017), informed by the work of Rittle-Johnson and Siegler (1999) on children’s strategy use in spelling (Chapters Two and Seven provide a full discussion). Learner analysis was achieved by eliciting the strategy/strategies used during the pre-instruction test. This information was then used to inform the content of a short intervention (step 5) using spelling strategy instruction. A post-test (step 6) was administered to gather measures of response-to-intervention. The data was then examined to hypothesise relevant recommendations (step 7). The final step of follow-up and monitoring (step 8) was not included in this study but is included in Study Four (see Chapter Nine).

DA procedure

The final version of the DASp was developed using a combination of established procedures drawn from the literature (see Chapter Four for a detailed review). The approach incorporated a pre-and post-instruction test format with strategy instruction (the mediation stage as defined by Feuerstein et al., 1979) included at the end of the pre-instruction test session. To reduce the effect of immediate recall at post-test, a phonological activity was inserted directly after strategy instruction. This allowed the researcher to collect data relating to the phonological awareness abilities of the children.

The pre-instruction test consisted of 14 words taken from the HAST-2 standardised spelling test. Each word was dictated, placed in a sentence to clarify meaning and then repeated. There was no time restriction and the child could ask for the word to be repeated or clarified. Strategies used in the spelling production task were elicited by a probe from the researcher - *What did you do when you spelled that word? Or How would you teach that to other children?* (see Chapter Seven).

Strategy instruction was delivered after the pre-instruction test. Treiman (2017a) describes strategy training for writing as a procedure that directly and explicitly teaches the student to independently use more sophisticated processes. In this study, the children were provided with a short period of spelling strategy instruction that built on their existing knowledge. More information on the instructional component is further explained in the Procedure section of this study.

The post-instruction test incorporated a graduated prompt (GP) scoring procedure to provide some quantitative information against which progress can be measured both within the learner as well as in comparison to peers. Both test stages included verbal report of the strategies used by the children thereby gathering qualitative information about each child and any changes made in response to the instruction provided.

The GP procedure provided a quantification of the number of prompts required by each participant to spell each word correctly, with a maximum of three prompts. If the final answer was still incorrect the researcher modelled the correct answer. Given the multi-dimensional functions involved in spelling and the variability in spelling errors made by children (Rittle-Johnson & Siegler, 1999), the delivery of the graduated prompts for each child incorporated a flexible approach. The number of prompts was standardised; but administration was flexible with cues delivered in an individualised mediational style to reflect the difficulties that the child displayed in their written response and subsequent explanation. Rittle-Johnson and Siegler (1999) found that scripted prompts were not always appropriate and that more flexible forms of mediation were necessary for less predictable errors. This approach allows the assessor to individualise the prompts beyond those permitted when using scripted prompts. The prompts provided in this study therefore took the form of 'instructional conversations' (Davin & Donato, 2013) directing the child to consider the range of spelling strategies discussed during strategy instruction. Interaction with the researcher/teacher during the DASp procedure provided an insight into the knowledge and strategy-use of the child.

Part A: Pre-Test and Instructional Training

A spelling test consisting of 14 words was administered using a standard dictation format. After each word, the child was asked to identify the strategy that they had

used to spell the word. At the conclusion the child was asked to identify the words that they believed were correct, those that they believed were not correct and any words that they were unsure of (using green, red and yellow pens) to gain an insight into how confident they felt about the spelling they had produced. The child was then provided with a list of the correct answers and asked to self-correct each word, letter by letter and identify any errors made. The children were then introduced to the concept of the *Spelling Detectives* activity as the basis of the strategy instruction training session, and with the support of the researcher, they identified five words that they would like to 'investigate'. Further information about this activity is included in the Procedure section of this study.

Phonological Activity

The three subtests of the CTOPP 2 – “Let’s play a word game...” were administered. This was included so that there was a short break between strategy instruction and Part B in order to mitigate the impact of immediate recall.

Part B: Post-Instruction test with Graduated Prompts.

An alternative word list was administered using a standard dictated format as for Part A. Immediately after the administration of each word the child was asked to identify the strategy that they had used and identify if they felt the word was correct or incorrect. Where the word was correct, the child was praised, and the examiner moved on to the next word. Where the word was incorrect, the researcher would praise the attempt and provide a prompt to support the child with the correct spelling. The child was then asked to make a second attempt. The procedure was repeated if the answer was still incorrect. A maximum of three increasingly explicit prompts were provided. After three prompts, if still incorrect, the teacher modelled the correct answer for the child to copy. Although the time taken for this step varied depending on the number of spelling errors made, the session lasted approximately 45 minutes.

8.2 Methodology

8.2.1 Participants

Fifty children fitting the inclusion criteria, drawn from eight schools in the Greater London area participated in the study (25 male and 25 female). The children were in Years 3 and 4 at the time of the study with ages ranging from 8 years 0 months

to 9 years 11 months (mean age 8 years and 9 months). The intake to these schools varied considerably and the sample therefore covered a wide range of socioeconomic backgrounds. All the children in the study had been taught in the English school system for a minimum of three years and were therefore considered to have satisfactory fluency in the English language.

8.2.2 Inclusion and exclusion criteria

Children participating in the study were initially identified by the participating schools and were required to have either a formal diagnosis of dyslexia or achieve a score of 85 or less on a standardised score of reading. Children identified with other co-morbid conditions such as ADHD were excluded from the study.

8.2.3 Measures

Measures for reading (TOWRE 2, Torgesen et al., 2012), spelling (HAST 2, Caplan, et al., 2012) and expressive language (CELF 4, Semel et al., 2006) were repeated as for Study Two. (Detailed information about these measures can be found in Chapter Seven). A phonological awareness measure was added for this study. The experimental measure was adapted from Study Two. Both measures are described below.

Phonological Awareness

Three age-appropriate subtests from the Comprehensive Test of Phonological Processing (CTOPP-2) (Wagner et al., 2013) were administered – Elision, Blending Words and Phoneme Isolation. A practice element is included for each task. Tasks become increasingly difficult as the test progresses. In all cases, the discontinue point for the subtest is three consecutive incorrect responses. For each subtest, the number of correct responses provides a raw score that is then converted to a scaled score ($M = 10$, $SD = 3$). The scaled scores from the subtests are then summed and converted to a composite score for phonological awareness. The composite score is reported as a standardised score ($M = 100$, $SD = 15$).

The Elision task requires the child to manipulate the sounds in a series of words provided orally. The child is asked to repeat the word provided by the examiner

and then asked to repeat the word again with a small modification, for example *seat* without the /t/.

Blending Words requires the child to combine two sounds together to orally produce a new word, for example *b-ă-d*. The sounds provided orally by the examiner become increasingly complex.

The Phoneme Isolation task requires the child to correctly identify individual sounds in words. The examiner orally provides a word and then asks the child to identify a sound, for example, *the first sound in pan*. The mean Test-Retest reliability for the Phonological Awareness Composite is .72.

Experimental measure: Spelling Production Task

The procedure for the Spelling Production task was adapted from Donovan and Marshall (2016) (see Chapter Seven for a full explanation). Two word sets of 14 words were developed. One set of items was taken from the HAST-2 (alternate Form B) and chosen in order to elicit a range of approaches and strategies as identified in the literature, including phonological, morphological, and orthographic strategies (Treiman, 2017a). The second set of words were matched to the first set based on word type or spelling pattern. The Children's Printed Word Database (Masterson, Stuart, Dixon & Lovejoy, 2010) was used where multiple options were available to determine the closest frequency match possible. The printed word database is a comprehensive database of the vocabulary in reading materials used by 5-9 year-old children in the UK. To explore the overall reliability of the spelling production task in this study, Cronbach's α was calculated ($\alpha = .751$) indicating the spelling scales for the two lists had acceptable reliability. The word lists are presented in Table 8-1.

Table 8-1: Word frequency list A and list B

List A	Frequency per million	List B	Frequency per million
cat	1187	hen	241
because	611	have	3746
miss	449	kiss	43
should	376	could	1901
opened	333	worked	141
swimming	154	running	265
light	306	fright	241
clown	138	frown	11
wrote	73	wrong	173
fact	70	object	11
spread	54	head	703
crack	51	back	2299
hedge	51	fudge	3
note	35	bite	43

8.3 Procedure

Each child in the study worked with the researcher on a 1:1 basis over two sessions. In the first session, standardised tests of reading (TOWRE 2), spelling (HAST-2) and expressive language (CELF 4) were administered to gather baseline information and to determine that inclusion criteria were reached. The timing of the session varied according to the skill levels of the children and on average took approximately 45 minutes.

The second session was conducted approximately one week later. Parts A and B of the DASp were administered together, as well as 3 sub-tests taken from the CTOPP-2. Again, the timing of the session varied according to the skill levels of the children but also took approximately 45 minutes. An overview is provided in Figure 8-2.

SESSION ONE	Base-line measures- TOWRE-2 CELF- 4 HAST-2
SESSION TWO DASp Procedure Parts A and B (approx. 45 - 50 minutes)	<p>PART A Pre-instruction test and Instructional Training</p> <p>Static spelling test (14 words taken from HAST 2)</p> <p>Child explains strategy used after each word</p> <p>Child indicates words correct, incorrect or not sure using coloured pens (unaided by researcher)</p> <p>Child self corrects using correction procedure</p> <p>Child identifies words for training procedure</p> <p><i>Spelling Detectives</i> Metacognitive Strategy Instruction (intervention) (approx. 15-20 minutes)</p>
	<p>Gap Activity</p> <p>Phonological Awareness assessment – ‘Let’s play a word game’ (approx. 15 – 20 minutes)</p>
	<p>PART B Post-instruction test with Graduated Prompts</p> <p>Spelling test (14 words alternate form – counterbalanced by group)</p> <p>Child explains strategy used after each word</p> <p>Child indicates words correct, incorrect or not sure using coloured pens (unaided by researcher)</p> <p>If correct, the next word is administered. If incorrect – examiner administers graduated prompt procedure (approx. 15 minutes)</p>

Figure 8-2 : Overview of the DASp procedure

Experimental Spelling Task

The children were randomly divided into two groups and the order of the two lists was counterbalanced across participants. Group A received List A at pre-test, followed by List B at post-test, while group B received List B at pre-test, followed by List A.

Mediated Strategy Instruction- Spelling Detectives

A discussion between the researcher and the child identified five words to be examined. The conversation was designed in order to increase the child's engagement (Graham, 1999). The researcher then provided a short training session incorporating strategy instruction for approximately 15-20 minutes. Explicit instruction was limited to the knowledge, skills and strategies most likely to yield a high rate of success and was therefore adapted to the specific needs of the learner. This is consistent with Graham et al. (2008) who noted that this was of particular importance when working with children with literacy difficulties. The instructional training was presented in the form of a game (adapting a design used by Elleman, Compton, Fuchs, Fuchs, & Bouton, 2011). During strategy instruction the children were invited to become 'Spelling Detectives'. It was explained to the child that good spellers have a range of tools that they can use to help them spell words. Using picture cues (see Figure 8-3) to minimise working memory demands, the assessor explained each of the strategies and how they could be used to support spelling. The child was then invited to identify any strategies they already used in the words they just spelled.



SPELLING DETECTIVES

WHAT CLUES DO YOU HAVE TO FIND THE CORRECT ANSWER?





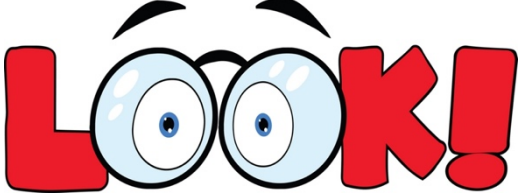
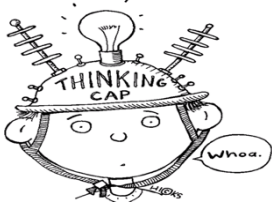
<p>Can you <i>sound</i> it out?</p>	
<p>Do you already <i>know</i> some of it and could you <i>sound out</i> the rest?</p>	
<p>Do you already know the spelling of a word that sounds <i>similar</i>?</p>	
<p>Do you know any <i>spelling rules</i> that might help?</p>	
<p>Does the spelling <i>look</i> right?</p>	
<p>Can the <i>meaning</i> of the word help?</p>	

Figure 8-3: Picture cues for strategy instruction

The researcher then asked the child what strategy/strategies could be applied to each of the five nominated words, in turn. The children were referred back to the picture cues as required.

A transcript from a typical instructional training session (Child 19) is included below –

Researcher: *Good spellers look for clues in words that they can use to help them remember how to spell words – they are like Spelling Detectives. Would you like to learn how to be a Spelling Detective?*

Child: (looking at the pictures presented) *Is that why there is a picture of detective on there?*

Researcher: *Yes, shall we look at the other pictures - what do you think that he is doing?* (the researcher points to the first picture for sounding out).

Child: *Is he saying the word and listening to the sounds? That's what that says...*

Researcher: *Yes, that's right. I think that you said that was something you do already? What about this one?* (points to the second picture).

Child: *Umm... he is putting a picture together... a bit like a jigsaw puzzle...*

Researcher: *Yes! Sometimes you can see words that you can already spell, within other words. Let's look at how we could do that with some words. Here is one – spread –* (the researcher writes the word on a mini white board). *What is this word?*

(Child reads the word spread). *Yes. Look what happens when I take away the 'sp' at the beginning – what word do we have left?* (Child says read). *Yes! So if you can spell the word 'read' what do you have to do to spell 'spread'?*

Child: *You have to add the 'sp' at the beginning... you can hear that...*

Researcher: *Yes, that is exactly right. That can work with lot of words. Let's have a look at the next one...*

Child: *Oh, they are from Dr Seuss! I know those pictures!*

Researcher: *Yes, they are... Another clue that a Spelling Detective can use is to see if you can think of a word that you can spell that sounds similar and then use that to help you. Let's have a try. Do you know how to spell 'hiss'?* (the child writes the word correctly). *Yes, that is right. Do you know any other words that sound like 'hiss'?*

Child: *Umm...miss?*

Researcher: *That's right – how would you spell that? (the child writes the word correctly). Absolutely, well done. The next one is about spelling rules – do you know what I mean when I talk about spelling rules? (the child doesn't respond). Spelling rules are like patterns that you can rely on to help you spell some words.*

Child: *Do you mean like 'oh u lucky duck'...? That is how I remember how to spell 'could'...*

Researcher: *Yes, and there are other 'rules' too. We can have a look at those when we look at the words you have picked out...What do you think the picture of the big eyes means?*

Child: *(laughs) They are really big! I think it means that you should look at the spelling word and make sure it is right.*

Researcher: *And it means that when you are trying to learn the spelling of a word you could colour in the letters that are a bit difficult, we might try that one in a minute and see if it helps... What do you think about this last one?*

Child: *umm...I'm not really sure...is he thinking?*

Researcher: *Yes, he has his thinking cap on. Sometimes knowing what a word means can help you remember the right way to spell it. So for example, threw – as in 'I threw the ball' (researcher writes the word - threw) and through – 'He went through the door' (researcher writes the word - through). They sound the same but they mean different things, so understanding that could help you. You can use the meaning of the word as a clue... Shall we see if we can use some of these clues to help with the words you got wrong before? Which ones shall we investigate?*

Child: *these ones... (the child identifies should, swimming, clown, spread and hedge).*

Researcher: *Ok, that's great. What clue could we use to help us spell the first one – should (spelled as SHOUD). What did you get wrong, it was only a small mistake wasn't it...*

Child: *I missed the 'l'...*

Researcher: *Do you remember before when you told me a special sentence that helped you remember how to spell 'could'?*

Child: *oh u lucky duck...*

Researcher: *Show me how that works (the child writes 'could' repeating oh u lucky duck). Well done, do 'should' and 'could' sound the same?*

Child: *Yes...*

Researcher: *Can you spell 'should' again using your special clue? (Child writes 'should' correctly). Well done! Can you think of any other words that sound the same?*

Child: 'would'?

Researcher: *Yes, can you spell that? (Child writes the word correctly). Fantastic X, that is brilliant. You have solved the first one!!! Which word will we do next?*

Child: *umm...this one. 'swimming' (spelled as SWIMING).*

Researcher: *Ok, well I can tell you a spelling rule that might help with this one. See if you can see what it is. (Researcher writes the word 'hop' and then 'ing' separately. Then 'hopping'). What happened when I did that?*

Child: *you put an extra 'p'.*

Researcher: *Yes, I did. Have a look at this one. (Researcher writes the word 'sit' and then 'ing', then 'sitting'). What happened when I did that?*

Child: *oh...I know, you put an extra letter....*

Researcher: *So, you try – what if we have 'swimming'?*

Child: *Two m's!!! (The child writes down the word).*

Researcher: *Yes! Well done. You solved that very quickly. What will we do next?*

Child: *'clown'. (Spelled as CLOUN).*

Researcher: *Ok, what clue could we use to remember this one do you think. Have a look at the pictures again. (Child looks at the picture cues).*

Child: *umm... I got the middle bit wrong...I could make it different colours?*

Researcher: *Yes, you did but you got lots of letters right as well. Why don't we give that a try – I have some different coloured pens here. (Child writes 'clown') That really stands out doesn't it? What special detective clue have you used from the cards?*

Child: *That one - LOOK*

Researcher: *Good, let's try something. Have a really good look at what you have written, then I am going to cover it up and see if you can spell it. Are you ready?*

Child: *Yes. (Researcher covers up the word and the child spells 'clown' correctly).*

Researcher: *You did it!*

Child: *Yes, I remembered it, it was easy...*

Researcher: *Ok we have two more words to look at, which one do you want to do next?*

Child: *'spread'... but I know what to do with this one... we talked about it before. (Child writes the word 'spread' correctly). It is 'read' with an 'sp' on the end.*

Researcher: *Oh well done X, you are being a great Spelling Detective. Try this one, how do you think you would spell 'bread'?*

Child: *Easy... (child writes the word correctly). It is 'read' like before but this time it has a 'br' at the beginning...you can hear it.*

Researcher: *Ok, this is the last one I think – 'hedge'. What could we do with this?*

Child: *this one is quite hard....*

Researcher: *what is the hard bit?*

Child: *...the end bit...*

Researcher: *... the 'dge'?*

Child: *Yes...*

Researcher: *so, what special clue could we use from these (Researcher points to the picture cues)...would any of them help?*

Child: *Maybe we could colour in the letters?*

Researcher: *Yes, we could, should we try that? (the child writes hedge). Do you want to see if you can do it now if I cover it up?*

Child: *ok (child writes 'hedge' correctly).*

Researcher: *Is it right? (Researcher uncovers the word)*

Child: *Yes!!! Yay!!!*

8.3.1 Scoring and coding

Standardised Tests

The standardised tasks were scored according to the manual instructions. A raw score was calculated and a standardised score derived.

Spelling Production Task

The number of correct responses from the two 14-word lists used in Part A and Part B of the DASp procedure were calculated to produce a spelling accuracy score at two time points.

Strategy Use

The strategies used by each of the participants were recorded, transcribed and coded then independently coded by a second researcher trained in the method of strategy allocation used in this study. Coding manuals were supplied. The reliability of both coders' decisions was established on 10% of the sample. The interrater reliability (Cohen's Kappa) on the samples blindly coded was .71 and reliability of the coding can therefore be considered as a good level of agreement. Following discussion, interrater agreement was 100%.

Categories of strategies used to produce the child's written response were taken from Study Two (adapted from the strategies identified by Rittle-Johnson and Siegler, 1999). An overview of the codes used, with examples of responses, is reproduced in Table 8-2 for the reader's convenience.

Table 8-2: Summary of coding for spelling strategies

CODE	NAME	EXPLANATION	EXAMPLE
1A	Retrieval	Automatic retrieval	'I just know it'.... 'I learned this in grade 1'.... 'I don't really know'
1B	Retrieval with strategy	Child retrieves the answer using a strategy	Uses mnemonics such as 'o u lucky duck' (for the letters in words such as SHOULD, COULD, WOULD) or 'I know this one, it is the name of my grandma's dog'....
2	Sounding out (phonic decoding)	Child demonstrates a sounding out strategy	Child sounds out the letters while writing (as noted by the researcher) or replies 'I sounded it out'...
3	Retrieve/Sound out	The child knows part of the word and sounds out the rest	'I think it could be SWIM and ING'
4	Drawing analogies	The child uses word patterns to support the spelling of a word	Where the child uses a word with a similar spelling as support, for example using LIGHT to spell FRIGHT
5	Relying on rules	The child demonstrates the use of a spelling rule	'It has to have an 'e' on the end or it would be BIT... 'When you put ING on the end you have to put two m's....
6	Visual checking	Child uses a visual approach to identify if the spelling is correct	'I think it is right, it looks right'....
7	Semantic Knowledge	Child uses the meaning of the word to support spelling	'They sound the same but one is NIGHT and the other one is a KNIGHT who fights dragons...'

Graduated Prompts

A GP procedure was included to provide a quantification of the number of prompts required by each participant to spell each word correctly (Chapter Four provides a full discussion).

Prompts were recorded by the total number of items requiring prompts. A weighted score was then applied to reflect the level of the prompt required (Olswang & Bain, 1996). A maximum of three prompts was provided to each item. The scoring metric developed for the DASp reflects the number of attempts made–

- Where the spelling was correct without any prompts, the item was awarded 0 points.
- Where one prompt was required to produce the correct spelling, the item was awarded 1 point.
- Where two prompts were required to produce the correct spelling, the item was awarded 2 points.
- Where three prompts were required to produce the correct spelling, or where the child's response was still incorrect, 3 points were awarded. Where the child was unable to provide a correct spelling, the researcher modelled the correct answer for the child to copy.

The prompt scores for each item were then combined to give a total raw score (GP) and total weighted score (GPW). Within this scoring metric the more prompts (support) required by the child per item, the higher the score.

Transcripts from a number of participants demonstrating the use of the GP procedure with varying levels of prompting are included below -

One prompt

Target word - OBJECT (Spelled OBGECT)

Researcher: Good try, how did you go about spelling this word?

Child: I spelled 'ob' and then 'gect'...

Researcher: That's a good strategy and it is almost exactly right but what other letter could you use, instead of the /g/ to make the 'j' sound? (**PROMPT ONE**)

Child: /j/?

Researcher: Why don't you write it down...

Child: *Child writes OBJECT...*

Researcher: What do you think, does that look right?

Child: Yeh...

Researcher: It is, very well done.

Two prompts

Target word -WORKED (Spelled WORCK)

Child: I think that is right...

Researcher: It is very close but not quite right...How did you go about spelling it?

Child: I put WORK but it should be WORKED...

Researcher: Do you need the /c/ and the /k/ on the end of this word?

Child: Ummm... I think so...

Researcher: Well what if I told you that you only need a /k/ for this word because there is a consonant /r/ there to 'protect' the vowel... do you remember when we talked about that? (**PROMPT ONE**)

Child: Oh...child writes WORKT...

Researcher: That's good, I can see what you are doing there... but the sound on the end isn't a 't'... Do you remember when we did OPENED? (**PROMPT TWO**)

Child: Oh yeh!... child writes WORKED...

Researcher: That's it X, well done!

Three prompts (correct)

Target word - FUDGE (Spelled FUJ)

Child: Child sounds aloud as he writes FUJ.

Researcher: What do you think, is that right?

Child: I don't think so...

Researcher: So how can we work this one out... do we know any other words that sound like that?

Child: Umm... Maybe HEDGE?....

Researcher: So the /f/ and the /u/ are right we just need to work out how the 'dge' part is spelled. I'll give you a clue, it has 3 letters and the first one is /d/...

(**PROMPT ONE**)

Child: Oh... child writes FUJDE...

Researcher: Good try but what could we use instead of the /j/ in this word?

(PROMPT TWO)

Child: I remember now... child writes FUGDE..

Researcher: Well done X, you have all of the correct letters but one of them is in the wrong place. **(PROMPT THREE)** What do you think? You almost have it..

Child: Child writes FUDGE...

Researcher: That is brilliant, you worked that out so well!

Three prompts (incorrect)

Target word COULD (Spelled COOD)

Researcher: So tell me what you have written?

Child: Umm... it is 'c' and 'ood'

Researcher: So you used the sounds to help you?

Child: Yes...

Researcher: That's a good start.. It isn't quite right though because you can't hear all the letters (teacher repeats the word). Do you remember earlier, when we thought about how to learn the word SHOULD?

Child: Sort of...

Researcher: How were we going to remember it? I think we made a sentence to help us remember...**(PROMPT ONE)**

Child: Umm... oh... was it u lucky duck ? Child writes CULD

Researcher: Yes, that is very close... But there is one letter still missing. Think about the sentence again? **(PROMPT TWO)**

Child: Child repeats ... oh u lucky duck... and writes COOLD

Researcher: Good! You have added the /o/ this time and it is almost right. Let's think about the sentence again with the /u/ this time.

Child: Umm... oh u lucky duck....

Researcher: Yes! Well remembered, there is a /u/. Why don't you try it again...**(PROMPT THREE)**

Child: Child writes COOULD...

Researcher: That is so close! I am going to write it for you and you tell me if you can see how your answer is different ...**(researcher writes COULD)**

(CORRECTION)

Child: I put an extra /o/...but I was almost right!

Researcher: Yes, you were, excellent work!

8.4 Results

8.4.1 Standardised Measures – All Participants

The mean scores on standardised measures of spelling, reading and phonological awareness were all in the below average range and the mean score on a test of expressive language was in the average range confirming that on average, the children in the study showed literacy difficulties but no expressive language difficulties. This confirmed their eligibility for inclusion in the study. The mean age of the children was 8 years and 9 months. Means and standard deviations are presented in Table 8-3.

Table 8-3: Means and standard deviations for age and standardised measures by group

Variable	All children		Group A		Group B		t value	p value
	Mean	SD	Mean	SD	Mean	SD		
CA (yrs;mths)	8;90	.52	8;73	.57	9;08	.39	2.54	.014
HAST 2-raw	22.92	7.01	24.69	6.27	21.00	7.38		
HAST 2 *	80.76	12.22	84.81	11.43	76.38	11.72	2.83	.007
TOWRE 2 SWE -raw	40.02	11.19	39.77	9.24	40.29	13.19		
TOWRE 2 SWE *	74.02	10.19	75.96	9.88	71.92	10.31		
TOWRE 2 PDE – raw	13.34	6.08	14.58	5.96	12.00	6.04		
TOWRE 2 PDE *	75.88	8.60	78.46	8.79	73.08	7.61		
TOWRE 2 TWRE *	73.70	9.06	76.27	8.87	70.92	8.59	2.61	.012
CTOPP 2- Elision – raw	15.72	2.96	15.73	2.60	15.71	3.37		
CTOPP 2- Elision **	6.28	1.32	6.50	1.18	6.04	1.46		
CTOPP 2 Blending Words -raw	20.40	3.52	20.23	4.06	20.58	2.92		
CTOPP 2- Blending Words **	7.84	2.28	7.81	2.58	7.88	1.96		
CTOPP 2 – Phoneme Isolation – raw	15.94	6.54	14.62	6.42	17.38	6.51		
CTOPP 2 - Phoneme Isolation **	5.62	2.32	5.58	2.42	5.67	2.26		
CTOPP 2- PA standard score*	78.86	9.45	79.35	10.24	78.33	8.71	.375	.709
CELF 4 – raw	42.94	4.59	42.23	4.64	43.71	4.50		
CELF 4 **	9.78	1.64	9.77	1.75	9.79	1.56	.022	.470

*standard score, mean 100, SD 15

** scaled score, mean 10, SD 3

Key: HAST = *Helen Arkell Spelling Test*; TOWRE = *Test of Word Reading Efficiency*; SWE = *Sight Word Efficiency*; PDE = *Phonemic Decoding Efficiency*; TWRE = *Total Word Reading Efficiency*; CTOPP = *Comprehensive Test of Phonological Processing*; CELF 4 = *Formulating Sentences* subtest taken from the *Clinical Evaluation of Language Fundamentals*.

8.4.2 Standardised Measures – Group

Participants were randomly assigned to Group A and Group B. The children allocated to group A were slightly younger (mean age 8 years 7 months) than the children in group B (mean age 9 years 1 month). There were no significant differences between the two groups on standardised measures of phonological awareness or expressive language. Significant differences were however

identified between the groups on standardised measures of spelling and reading indicating that Group A participants were significantly better on both tasks.

Spelling

The children allocated to Group A (mean score 84.81) scored higher than the children in Group B (mean score 76.38) on a standardised measure of spelling and this difference was significant. While the mean spelling score for the overall sample (mean 80.76) was in the below average range (< 85) individual scores ranged from a standard score of 60 (well below average) to 105 (average).

Reading

Measures of sight word efficiency and phonemic decoding efficiency were collated and a composite standard score was derived (mean score 73.70 for the group). The children allocated to Group A (mean score 76.27) scored higher than the children in Group B (mean score 70.92) and this difference was significant. Analysis identified a large correlation between the reading and spelling scores $r(48) = 0.72$, $p < .001$ where a correlation between 0.1 – 0.3 is small, 0.3 – 0.5 moderate and >0.5 is large (Cohen, 1988). This accords with the literature on the relationship between reading and spelling where correlations between 0.50 – 0.90 are reported (Graham, Harris & Chorzempa, 2002).

Phonological Awareness

Measures of phonological awareness (PA) consisting of three subtests - elision, blending words and phoneme isolation - were collected for each participant and then combined to provide a composite measure. As expected, the children in the study scored in the below average range overall on the composite measure (mean 78.86), identifying weak phonological abilities. The children in Group A scored slightly higher (mean score 79.35) than the children in Group B (mean score 78.33) but this difference was not significant. Phonological awareness is considered to be an important building block in the spelling process and poor phonological abilities are considered to be a core weakness for children with dyslexia (see Chapter Two for a discussion). The relationship between the children's PA scores and spelling was significant with a moderate effect size ($r(48) = 0.38$, $p = .007$).

8.4.3 Experimental Task – Group

Mean scores for all participants at pre/post-instruction for spelling accuracy and change scores are provided in Table 8-4. Overall there was a change in spelling accuracy between pre/post-instruction testing and this was significant ($t(49)=7.30, p < .001$). At post-instruction the children spelled an average of two more words correctly than they had pre-instruction.

Table 8-4: Pre/post-instruction spelling accuracy and change scores

Test n=50	Mean (SD)
Pre-test	6.60 (3.08)
Post-test	8.76 (3.29)
Change scores	2.16 (2.09)

Individual scores for the two groups on HAST-2 spelling baseline scores, pre/post (strategy instruction) spelling accuracy and change scores are provided in Table 8-5 (Participants in Group A achieved a higher score at pre-instruction on the production task (List A) than the participants in Group B (List B). This is not unexpected given the difference between standardised spelling test scores (HAST-2) of the two groups. A 2(test score: pre-test, post-instruction) x 2(group: A, B) repeated measures analysis of variance (ANOVA) revealed a significant main effect of test score, $F(1,48)=45.59, p < .001, \eta^2_p = .482$, indicating higher scores post-instruction compared to pre-test; a main effect of group, $F(1,48)=8.30, p = .006, \eta^2_p = .147$, reflecting better test performance for Group A; but no significant interaction between test score and group $F(1,48)=1.33, p = .254, \eta^2_p = .027$, indicating that the two groups did not differ in the amount of improvement in test scores. In other words, although the children in each group started at different baseline levels as measured by a standardised spelling test, both groups increased their scores by a similar amount. To investigate further, an analysis of covariance was applied to the data to adjust for baseline spelling ability (dependent variable - post- instruction, fixed factor - group, and covariate - baseline HAST-2) and revealed no significant difference between the two groups on post-instruction spelling accuracy, $F(1, 47) = 1.46, p = .233 \eta^2_p = .030$.

Analysis of the results at pre-instruction identified that in general, children who achieved higher scores on the HAST-2 baseline spelling test also achieved higher scores on the pre-instruction test regardless of which list of words they

were presented with (List A or B). At post-instruction, 80% of the children achieved higher scores when compared with the pre-test scores ranging from one point (13 children) up to six points (1 child). Five children (participants 2, 12, 20, 40 and 47) showed no change in score, while a further five children (participants 18, 27, 32, 43 and 50) achieved lower scores at post-instruction.

Table 8-5: Pre/post instruction spelling accuracy and change scores by participant

Group	Child	HAST-2 Baseline (raw)	HAST-2 Baseline (standard)	Pre- instruction (no. correct) Max (14)	Post- instruction (no. correct) Max (14)	Change
Group A N=26	1	23	82	6	9	3
	2	24	91	8	8	0
	3	28	90	5	11	6
	4	19	82	5	9	4
	5	19	77	4	10	6
	6	29	96	8	11	3
	7	36	100	9	10	1
	8	35	93	13	14	1
	9	35	93	10	13	3
	10	18	70	2	5	3
	11	23	72	8	9	1
	12	31	88	13	13	0
	13	17	69	5	6	1
	14	16	65	3	6	3
	15	19	77	10	14	4
	16	24	86	6	11	5
	17	25	84	7	11	4
	18	28	90	11	8	-3
	19	24	91	8	13	5
	20	17	70	8	8	0
	21	23	82	9	13	4
	22	20	84	5	9	4
	23	20	72	5	6	1
	24	23	81	7	8	1
	25	29	99	9	11	2
	26	37	105	13	14	1
		Mean(SD)	24.69 (6.27)	84.81 (11.43)	7.58 (2.98)	10.00 (2.42)
Group B N=24	27	14	63	5	3	-2
	28	13	60	3	4	1
	29	16	77	2	4	2
	30	30	86	8	10	2
	31	26	83	6	9	3
	32	15	64	4	3	-1
	33	18	70	5	8	3
	34	27	87	6	10	4
	35	23	81	7	10	3
	36	32	96	9	13	4
	37	30	92	10	11	1
	38	12	60	3	4	1
	39	24	83	8	10	2
	40	20	72	4	4	0
	41	17	70	3	8	5
	42	29	88	5	6	1
	43	19	74	6	5	-1
	44	36	98	10	13	3
	45	21	77	3	10	7
	46	15	65	4	5	1
	47	29	88	13	13	0
	48	15	67	3	7	4
	49	13	72	4	5	1
	50	10	60	5	3	-2
		Mean(SD)	21.00 (7.37)	76.38 (11.72)	5.62(2.81)	7.42 (3.41)

8.4.4 Strategy Use

The results are firstly presented by all participants (Groups A and B) and by time (pre-instruction and post-instruction test). All of the children were able to verbally report the strategy or strategies that they used when producing the target word, enabling the response to be classified according to the spelling categories developed. For each group, strategy use by item; the total number of strategies used; frequency of multiple strategy use; the number of different categories (NDC) of spelling strategies used (i.e. how many of the eight strategies identified in the coding were used by each child) and frequency counts comparing the two groups are presented in Tables 8-6 to 8-9. For both groups, the overall minimum number of strategies used by each child was 14 (one strategy per item). For Group A, the maximum number of total strategies reported (where the child identified multiple strategy use on individual items) was 25. For group B, the maximum number of total strategies reported was 28. The smallest number of different categories of spelling strategies (NDC) used for both groups was one and the largest was seven.

Table 8-10 provides a summary of the strategies used by each participant at pre- and post-instruction and includes the total number of times each strategy was used (including in a multiple strategy response), the total number of overall strategies and NDC.

Table 8-6: Strategy use by item pre-test group A

Child code	cat	because	miss	should	opened	swimming	light	clown	wrote	fact	spread	crack	hedge	note	Total (number)	Total (NDC)*
1	1A	1B,2	2	2	2	2	1B	1A	2	1B	2	1B	2	2	15	3
2	2	1B	1A	1B,2	1A	5	2	1B	2	3	2	2	2	1A	15	5
3	1A	1B	2	3	3	6,2	2	6	2	1B	2	2	2	5	15	6
4	1A	1B	2	2	2	2	2	1A	2	2	1A	2	2	1B,2	15	3
5	1A	2	6	2	2	1A	6,2	1A	2	2	2	2	2	2	15	3
6	2	1A	1A	2	1B	1A	2,6	1A	2	4	2,6	2	2	1A	16	5
7	1A	1B,6	1A	2	2	1B,4	1A	2,4	2	2	1A	2,3	2	2,4	19	6
8	1A,	1A,	1A	1B	1B,5	1B,3	1B	1A	6	6	5,6	2	2	1B,5	18	6
9	2,6	1B	1B,2	1B	1B,2,5	5	6	3	4	2,6,7	2	5	2,5	1B	21	7
10	1A	1B	1B,2	2	1A	2	2	2	2	2	2	2,6	2	2	16	4
11	2	1B	1B	6,2	2	2	1B	1B	2	2	2,6	5	2	5	16	4
12	2	1B	1A	3	1B	1B	4	2	1A	1B	6,2	1A	1B	1A	15	6
13	1A	1B	2	2	2	2,6	1A	2	2	1A	2	2,5	2	2	16	5
14	1A	1B	2	2	2	1B	2	2	6,2	6	2	2	2	2	15	4
15	1A	1B	1A	1B	3	1A	1A	2	2	1A	2	1A	6	1A	14	5
16	1A	1B,2	1A	1B	6	2	5	1B	2	2	2	2	2	1A	15	5
17	2	1B	1A	1A	6,2	1A	1B	6	6	2	2	2	2	1B	15	4
18	2	1B	1B,2	1A	2	6	6	1A	2	2	1A	1A	2	2	15	4
19	2	1B	2	2	1B	2	1B	2	1A	2	2	6	2,6	1B	15	4
20	1A	1B	1A	2	2	1B	1A	1B	2	2	2	6	2	1A	14	4
21	2,6	1B	2	4,2	2	2	1A	2	2	1A	1B	2	1A	4	16	5
22	2	1B,2	1B	2	2,6	2	2,6	1B	2	2	2	1B	2	2	17	3
23	6	1B	2	1B,2	2	2	6	2,6	2	1A	2	2	2	5	16	5
24	2	2	2	1B	1B	2	1A	2	2	1A	2	1A	2	2	14	3
25	2	1B	2	1B,2	1A	1B	1B,6	6	2	6	1B	6	2	1B	15	4
26	1B	1B	1B	4	6	1B	1B	1B	1B,6	1B	1B	1B,6	1B,6	1B	17	3

*NDC – number of different categories of spelling strategies used

Table 8-7: Strategy use by item post-test group A

Child code	hen	have	kiss	could	worked	running	fright	frown	wrong	object	head	back	fudge	bite	Total (number)	Total (NDC)*
1	2	1A	2,4	2,3	2	1A	2,4	1B	1B	2	1A	1B,5	2	1A	18	5
2	1A	1A	4	4,2	1A	1A	2,4	1A	2,4	2,4	4	4,5	4	6,2	20	5
3	1A	1A	2,4	2,4	2,3	4,5	2,4	1A	1A	1B,2	1B	1B	1B	1A	20	6
4	2	2,6	2,4	1B,4	2	2,5	4	2,4	2,4	2	2,4	1A	2,4	1A	22	6
5	2	1A	2,4	2,4	1A	2,4	4	4	4,2	4,2	6	2,4	2,4	5	21	5
6	2	1A	2,4	2,4,1B	4,5	1A	2,4	2,4	2,4	2,1B	2,4	2,4	2,4	1A	25	5
7	6,2	1A	4,1B	4,1B	3,1B	5,6	6,4	1A	1A	1B,2	1B,3	3,5	2,4	2,5	25	7
8	1A	1B	1A	1B	1B,4	1B,4,5	1B,4	1B	1A	1B,6	1B,4	1B,5	2,6	2,5	23	6
9	1A	2,6	1B,2	2,4,1B	5,2	2,5	4,2	3	2	1A	5	5,2	2,5	4,2	24	7
10	1A	1A	2	1B	2,4	2,4	2	2	2	2	2	4	2	2	16	4
11	1A	1A	1A	4	1A	4,5	4	2,7	2,7	1A	1A	5	2	5	17	5
12	1A	1A	1A	1B	1B,2,4	4,5	1A	2	1A	1B,2	1A	1B,4	1B	1B,4,5	21	5
13	1A	2	1A	1B	2,5,4	2,6,5	2,4	1A	2	2	1A	5	2	2,5	20	6
14	1A	1A	1B	2,4	2,4	4,5	6	4	2,4	6,2	4,2	2,4	2	2	21	6
15	1A,	1A	1A	1B	3,4	1B	1A	4,2	1B	2	2	2,5	2,4	5	18	6
16	1A	1A	1A	1B	5,2	5	5,2	4	6,2	1A	4	4	6,2	1A	18	6
17	2	6	6	1A	2	4	4	4,2	2,4	1A	1A	4,2	2,6	1A	18	4
18	1A	1A	2,4	1B,6	2,3	4,5	4	1A	4,2	2,6	1A	1A	2,4	4	21	7
19	1A	1A	1B,2	5,3,2	3,4	1A	1A	1A	1A	2,6	1A	5,4	1A	1A	20	7
20	1A	1B	1A	4	4,1B	5	6	2	4	6	3	1A	3,4	1B	16	7
21	1A	1A	4	1B	2,4	2,4	1A	2,6	6	2	2	4	4,6	4	18	5
22	1A	1B	1A	1B	5,2	5	4	1A	4,2	1A	4	4	1A	4	16	5
23	1A	1A	4	1B	5	5,6	2,6	4	4	2,4	1A	2	2	4	17	6
24	2	5	2	5,4	4	5	6	4	6	2	2	1A	6	4	15	5
25	6,2	6	3	4	6	6	4	4,2	2	4,5	4,5	2,4,5	2	1A	20	6
26	1B	1B	1B	1B,4	1B,5	4	3	6,1B	4,6	6	6	4	1B	5	18	5

*NDC – number of different categories of spelling strategies used

Table 8-8: Strategy use by item pre-test group B

Child code	hen	have	kiss	could	worked	running	fright	frown	wrong	object	head	back	fudge	bite	Total (number)	Total (NDC)*
27	2	5,2	2	2	2	2	2	2	2	2	1B	1B	2	5	15	3
28	1A	1A	1A	2	2	2	2	2	2	2	2	1A	2	2	14	2
29	2	1A	1B,2	2	2	5	2	2	2	2	2	4	2	5	15	5
30	2	2,6	2	2	1B	3	2,5	1B	2	2	1B	5,2	2	2,5	18	4
31	2	1A	1A	2	2	2	2,4	2	2	2	1A	4,2	2	5	16	4
32	2	2,7	2	2	2,4	3	2	2	2	2	2	2	2	2	16	4
33	2	1B	1B	2	2	1B	2	1B	2	2	2	1B,2	2	2	15	2
34	2	2	2	2	3	3	2	2	2	2	2	2,6	2	2	15	3
35	2	2,6	2,6	2,6	5,2	2,3	2	2	2	2	2	1A	2	1A	19	5
36	4	1A	2,4	1A	3	3	1A	1A	1A	1A	2,6	4,2	2	1B	17	6
37	2	5	2	5	5	2,5	2,4	4	2	2	2,4	4,2	2	2	18	3
38	2	2	2	2	2	2	2	2	2	2	2	2	2	2	14	1
39	2	2	2,6	2,6	2	2	1B,4	2	2	2	1B	1B	2	1B	17	4
40	2	2,6	2	1A	2	2	2	1A	2	1A	2	2	2	2	15	3
41	2	2	2	2	2	2	2	2	2	2	2	2,6	2	2	15	2
42	1A	2	2	2	2	2	2	2	2	2	1B	1B,2	2	1B,2	16	3
43	2	1A	2	2	2	2	2	1B	2	2	1A	2,6	2	5,6	16	5
44	1A	2	2	1B,2	2	3	2	2,6	2	2	1A	6,7	6	3	17	6
45	2	2	2	1B,2,6	2	2	2,5	2	2	2	2	2	6,2	5	18	4
46	2	2,6	2	2	2	2	2	1B	2	2	2	2	2	2	15	3
47	1B,2	1B,6	1B,2	5	3,4	3,5	1A	2	6	4	4	4	1B	4	19	7
48	2	1A	2	2	2	4,2	2	2	2	2	2	2	2	2	15	3
49	2	2	2,6	2	2	2	2	1B,4	2	2	2	2	2	2	16	4
50	2	1A	2	1A	2	2,6	1A	2	2	2	2	1A	2	1A	15	3

*NDC – number of different categories of spelling strategies used

Table 8-9: Strategy use by item post-test group B

Child code	cat	because	miss	should	opened	swimming	light	clown	wrote	fact	spread	crack	hedge	note	Total (number)	Total (NDC)*
27	2	2	2	1B	5	5	1B	2	2	2	4	2	4	2	14	4
28	2	2	1A	2,1B	4	5	4	4,2	4	2	4	4,2	4	6,4	18	6
29	1A	1B	1B	1B	1B,2	2,5	2,6	4,2	5,4	2	2,4	5,4	2	2,5	22	6
30	2	1B	2	4,2	4,5	4,5	4	1A	6,2	2	4,2	4	6,2	5	20	6
31	1A	6,1B	1A	6,4	5,4	5,4	4	4,2	6,2,5	1A	2,4	2	2,4	1A	23	6
32	2	2,4	1A	2,6	5,3	5,3	4	4	6,2	2,4	4,2	5,3	2	6,5	23	6
33	2	1B	1B	4	4,2	6	1A	6	5	2,4	4,2	6	2,4	5,2	19	6
34	2	1B	1B	4	3	4,5	2,4	2,4	4	2,5	2	2,4	2,6	2,5	21	6
35	2	1B	4	1B,2	4	5,2,4	1A	4	2,4	1A	2,4	1B	2	2,5	20	5
36	2	1B	4,2	4,2	5,4,2	6,2	1B,2	4,2	4,2	4,2	4,2	1A	4,2	5,2	26	5
37	2	1B	4	4,2,1B	5,2	4,5	4,5	4,5	4,2	2	2	5,2	2,4	1A	23	5
38	2	1B	2	4,2	2,6,5	2,5,4	6,4,2	4,2	4,2	2,4	2,4	5	2,7,4	2,4	28	6
39	2	1B	2	2,4	2,4,5	2,5	2,4	4	4,2	2,4	2,4	2,4,5	2,4	2,5	26	4
40	2	2	1A	2	2	2,5	2,4	2,4	2	2	2	3	3	2	17	5
41	2	1B	2	4	4	5,6	4	4	4	2,4	2,4	5,4	4	1A	18	6
42	2	1B	3	2	2	5,2	3,2	4,2	2,5	2	2,6,3	5	3	5,2	21	6
43	2	1B	6	2,4	2,5	2,5,4	2	2	2	2	2	2	2	2,4,7	20	6
44	2	1B	1B	3,4	3,4	5	4	4	1A	6	4	5	5	5,2	17	6
45	2	1B	1B	4	5	5	4	4,2	4,2	2	4,2	2	4,2	4,6	19	5
46	2	1B	1B	4,2	2,4	4,2	2	2	4	2	2,4,6	2	2	5,2	20	5
47	1B,2	1B	1B	4,2	5,3	5,3,2	4,2	1B	1B,4	2,5	4,2	4,5	1B,2	5,2	26	5
48	2	1B,2	2	2	2	2,5	2,4	2,4	2	2	2	2	2	1A	18	5
49	2	2	2	2,6	2,4,5	4,5	4,2	1A	2,6	2	2,4	2,4	2	2,5	23	5
50	1B	1A	2	2	2	3,5	4,2	2	2,4	1A	1A	2,4	2	1A	18	6

*NDC – number of different categories of spelling strategies used

Table 8-10: Frequency table comparing strategies used pre/post-test all participants

Child code	Retrieval – (automatic)		Retrieval (using strategy)		Sounding out (phonetic)		Retrieve/ sound out		Drawing analogies		Relying on rules		Visual checking		Semantic knowledge		Total Strategies (number)		Multiple Strategies		Total Strategies (NDC)*	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	2	4	4	3	9	7	0	1	0	2	0	0	0	0	0	0	15	17	1	4	3	5
2	3	5	3	0	7	5	1	0	0	8	1	1	0	1	0	0	15	20	1	6	5	5
3	1	5	2	4	7	5	2	1	0	4	1	1	2	0	0	0	15	20	1	7	6	6
4	3	2	2	1	10	10	0	0	0	7	0	1	0	1	0	0	15	22	1	8	3	6
5	3	2	0	0	10	8	0	0	0	9	0	1	2	1	0	0	15	21	1	7	3	5
6	5	3	1	2	7	10	0	0	1	9	0	1	2	0	0	0	16	25	2	10	5	5
7	4	3	2	5	8	4	1	3	3	5	0	2	1	3	0	0	19	25	5	11	6	7
8	4	3	5	9	2	2	1	0	0	4	3	3	3	2	0	0	18	23	4	8	6	6
9	0	2	5	2	6	10	1	1	1	3	4	5	3	1	1	0	21	24	5	9	7	7
10	2	2	2	1	11	11	0	0	0	2	0	0	1	0	0	0	16	16	2	2	4	4
11	0	6	4	0	8	3	0	0	0	3	2	3	2	0	0	2	16	17	2	3	4	5
12	4	6	5	6	3	3	1	0	1	4	0	2	1	0	0	0	15	21	1	7	6	5
13	3	4	1	1	10	8	0	0	0	2	1	4	1	1	0	0	16	20	2	4	5	6
14	1	2	2	1	10	8	0	0	0	7	0	1	2	2	0	0	15	21	1	7	4	6
15	8	4	2	3	2	5	1	1	0	3	0	2	1	0	0	0	14	18	0	4	5	6
16	3	5	3	1	7	4	0	0	0	3	1	3	1	2	0	0	15	18	1	4	5	6
17	3	4	3	0	6	6	0	0	0	5	0	0	3	3	0	0	15	18	1	4	4	4
18	4	5	2	1	7	5	0	1	0	6	0	1	2	2	0	0	15	21	1	7	4	7
19	1	9	4	1	8	3	0	2	0	2	0	2	2	1	0	0	15	20	1	5	4	7
20	4	3	3	3	6	1	0	2	0	4	0	1	1	2	0	0	14	16	0	2	4	7
21	3	3	2	1	8	5	0	0	2	6	0	0	1	3	0	0	16	18	2	4	5	5
22	0	5	4	2	11	2	0	0	0	5	0	2	2	0	0	0	17	16	3	2	3	5
23	1	3	2	1	9	4	0	0	0	5	1	2	3	2	0	0	16	17	2	3	5	6
24	3	1	2	0	9	4	0	0	0	4	0	3	0	3	0	0	14	15	0	1	3	5

*NDC – number of different categories of spelling strategies used

Child code	Retrieval (automatic)		Retrieval (using strategy)		Sounding out (phonetic)		Retrieve/sound out		Drawing analogies		Relying on rules		Visual checking		Semantic knowledge		Total Strategies (number)		Multiple Strategies		Total Strategies (NDC)*	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
25	1	1	6	0	4	5	0	1	0	6	0	3	4	4	0	0	15	20	2	5	4	6
26	0	0	12	7	0	0	0	1	1	4	0	2	4	4	0	0	17	18	3	4	3	5
27	0	0	2	2	11	8	0	0	0	2	2	2	0	0	0	0	15	14	1	0	3	4
28	4	1	0	1	10	6	0	1	0	8	0	1	0	0	0	0	14	18	0	4	2	6
29	1	1	1	4	10	8	0	0	1	4	2	4	0	1	0	0	15	22	1	8	5	6
30	0	1	3	1	10	7	1	0	0	6	3	3	1	2	0	0	18	20	4	6	4	6
31	3	4	0	1	10	5	0	0	2	7	1	3	0	3	0	0	16	23	2	8	4	6
32	0	1	0	0	13	7	1	3	1	5	0	4	0	3	1	0	16	23	2	9	4	6
33	0	1	5	2	10	6	0	0	0	5	0	2	0	3	0	0	15	19	1	5	2	6
34	0	0	0	2	12	8	2	1	0	6	0	3	1	1	0	0	15	21	1	7	3	6
35	2	2	0	3	12	7	1	0	0	6	1	2	3	0	0	0	19	20	5	5	5	5
36	6	1	1	2	4	12	2	0	3	8	0	2	1	1	0	0	17	26	3	11	6	5
37	0	1	0	2	10	8	0	0	4	7	4	5	0	0	0	0	18	23	4	8	3	5
38	0	0	0	1	14	12	0	0	0	9	0	3	0	2	0	1	14	28	0	10	1	6
39	0	0	4	1	10	12	0	0	1	9	0	4	2	0	0	0	17	26	3	10	4	4
40	3	1	0	0	11	11	0	2	0	2	0	1	1	0	0	0	15	17	1	2	3	5
41	0	1	0	1	14	4	0	0	0	9	0	2	1	1	0	0	15	18	1	4	2	6
42	1	0	3	1	12	10	0	4	0	1	0	4	0	1	0	0	16	21	2	6	3	6
43	2	0	1	1	10	12	0	0	0	3	1	2	2	1	0	1	16	20	2	4	5	6
44	2	1	1	2	8	2	2	2	0	5	0	4	3	0	1	0	17	16	3	3	6	6
45	0	0	1	2	13	7	0	0	0	7	2	2	2	1	0	0	18	19	3	5	4	5
46	0	0	1	2	13	11	0	0	0	5	0	1	1	1	0	0	15	20	1	5	3	5
47	1	0	4	6	3	8	2	2	5	5	2	5	2	0	0	0	19	26	5	11	7	5
48	1	1	0	1	13	13	0	0	1	2	0	1	0	0	0	0	15	18	1	4	3	5
49	0	1	1	0	13	12	0	0	1	5	0	3	1	2	0	0	16	23	2	8	4	5
50	5	4	0	1	9	8	0	1	0	3	0	1	1	0	0	0	15	18	3	4	3	6
total	97	114	111	94	440	342	19	30	28	251	32	111	66	61	3	4	796	1007	96	285		

*NDC – number of different categories of spelling strategy use

Table 8-11: Number of times each strategy was used calculated as a percentage of total strategies reported within each period.

STRATEGY*	Pre-test %(n=50)	Post-instruction %(n=50)	<i>t</i> value	<i>p</i> value
Retrieval - automatic	12.18	11.32	1.07	.288
Retrieval with strategy	13.94	9.33	1.12	.268
Sounding out (phonetic)	55.27	33.96	4.12	.001
Retrieval/sounding out	2.39	2.98	1.53	.132
Drawing analogies	3.51	24.92	13.73	.001
Relying on rules	4.02	11.02	9.21	.001
Visual checking	8.29	6.05	.46	.643
Semantic knowledge	.38	.40	.33	.743
<i>Total number of strategies</i>	<i>796</i>	<i>1007</i>	10.03	.001
<i>Multiple strategies**</i>	<i>12.09</i>	<i>28.39</i>	10.38	.001

*strategies calculated as a % of overall use (including where used in multiple strategies)

**multiple strategies were identified where more than one strategy is used on a per-item basis

Strategy Use –All Participants

At pre-instruction, group results revealed that a sounding out (phonetic) strategy was used most representing the highest percentage of the overall responses. Retrieval with strategy represented the second highest category followed by automatic retrieval. Visual checking was used slightly less than the two retrieval strategies while the remaining strategies (relying on rules, drawing analogies and the combined strategy of retrieval and sounding out) each represented less than 5% of the overall responses. The final strategy, using semantic knowledge, was the least used strategy, representing less than 1% of the overall responses. Multiple strategies on an individual item represented 12.09 % of the overall responses.

The results identify a shift in strategy use from pre- to post-instruction. The scores demonstrated that there was a significant increase in the total number of strategies identified and the number of multiple strategies used. There was also a significant decrease in the number of sounding out (phonetic) responses at post-instruction as well as a significant increase in the use of drawing analogies as a strategy. There was a decrease in the use of retrieval - automatic, retrieval with strategy, and visual checking, however, these differences were not significant. There was a small increase in the use of a retrieval/sounding out strategy and semantic strategy but these differences were also not significant.

Table 8-12: Number of different categories (NDC) of strategies used pre/post-instruction all participants

Condition	Mean	Standard Deviation
Pre-test	4.10	1.33
Post-instruction	5.56	.79

A paired samples *t*-test identified a significant difference between the number of different categories of strategies used by the children at the two time points, $t(49) = 7.14, p < .001$, indicating that the children utilised a larger number of the different categories of strategies from pre- to post-instruction.

8.4.5 Graduated Prompts (GP)

Results – All Participants

Table 8-13: Graduated Prompts all participants

Level of prompt	Mean no of prompts (raw)	Mean GP (weighted)
No prompt	8.68 (3.27)	
1 prompt	3.02 (2.06)	
2 prompts	1.30(1.36)	2.60 (2.71)
3 prompts	.96 (1.81)	2.94 (5.50)

Prompt levels were first calculated as a raw score (i.e. the number of prompts required to produce the correct answer per item) and then transformed into a weighted score using the scoring metric previously outlined. The weighted score provided a total measure for GP (GPW) that incorporated both the number of items requiring prompts and the breadth of the prompts (1, 2 or 3 prompts). At

post-instruction, total GPW scores ranged from 0 (no prompts) to 27 (demonstrating a high level of support required). Overall, the data shows that at lower baseline levels the children required more prompts than children who started from a higher baseline score (see Figure 8-4).

On average, the children required more single prompts per item (i.e. 1 prompt) than multiple prompts (i.e. more than 1 prompt). Analysis revealed a strong negative correlation between the total raw GP score (number of items requiring prompts) and HAST standard scores ($r(48) = -0.78, p < .001$), identifying that the lower the HAST score, the higher the number of prompts required. There was also a strong negative correlation between the GPW scores and HAST standard scores ($r(48) = -0.70, p < .001$).

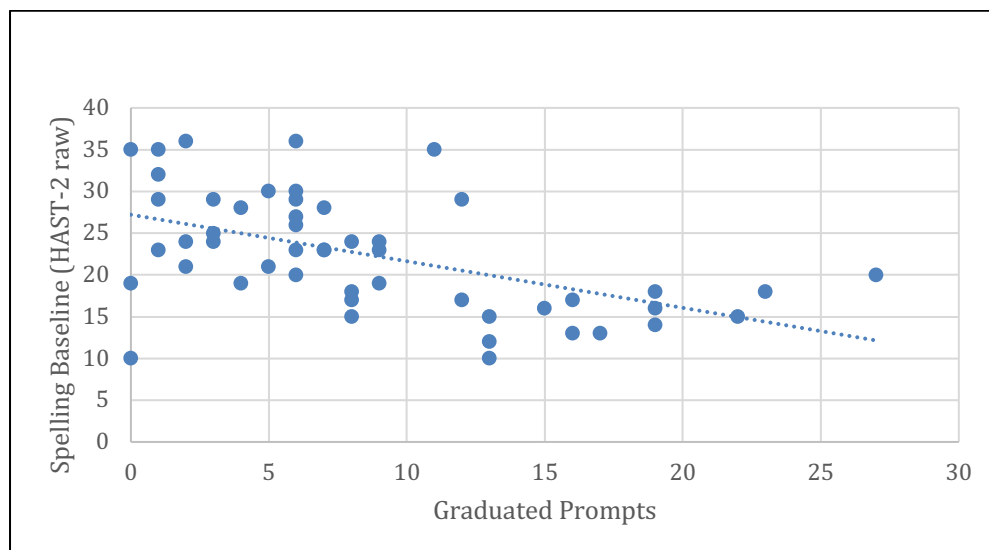


Figure 8-4: Total Weighted GP (GPW) score and Baseline HAST-2 raw scores

8.4.6 Spelling Profiles – Standardised Scores, Strategy use, Spelling accuracy and GP

The DASp procedure provided information on several different aspects of spelling ability to accompany the standardised score of spelling. First, strategy use was captured before and after training and changes in the number and type of strategies was recorded. Second, spelling accuracy (the number of words after training) was also measured and compared to pre-test scores to provide a change score. Finally, a snapshot of the child's response-to-intervention (GP score) was calculated by examining how much assistance each child required and how detailed this assistance needed to be (GPW) for each item in the

experimental task. Information for each child in order of their baseline standardised score is presented in Table 8-15.

Table 8-15: Spelling profiles ordered by standard scores (lowest to highest)

CHILD CODE	HAST 2 ¹	STRAT PRE ²	STRAT POST ²	NDC ³ PRE	NDC ³ POST	CHANGE SCORE ⁴	POST ⁵ =0	GP=1 ⁶	GP=2 ⁶	GP=3 ⁶	Total ⁷	TOTAL GPW ⁸
50	60	15	18	3	6	-2	3	7	2	2	11	17
38	60	14	28	1	6	1	4	7	3	0	10	13
28	60	14	18	2	6	1	4	5	4	1	10	16
27	63	15	14	3	4	2	3	6	2	3	11	19
32	64	16	23	4	6	1	3	9	1	1	11	14
46	65	15	20	3	5	1	5	2	2	5	9	21
14	65	15	21	4	6	3	6	2	5	1	8	15
48	67	15	18	3	5	4	7	6	1	0	7	8
13	69	16	20	5	6	1	6	2	4	2	8	16
20	70	15	16	4	4	0	8	4	2	0	6	8
41	70	15	18	2	6	5	8	2	2	2	6	12
10	70	16	16	4	4	3	5	3	2	4	9	19
33	70	15	19	2	6	3	8	4	2	0	6	8
49	72	16	23	4	5	1	5	5	0	4	9	17
23	72	16	17	5	6	1	6	6	1	1	8	11
40	72	15	17	3	5	0	4	1	1	8	10	27
11	72	16	17	4	5	1	9	1	4	0	5	9
43	74	16	20	5	6	-1	5	2	0	7	9	23
5	77	15	21	3	5	6	10	4	0	0	4	4
29	77	15	22	5	6	2	4	3	5	2	10	19
15	77	14	18	5	6	4	14	0	0	0	0	0
45	77	18	19	4	5	7	10	3	1	0	4	5
24	81	14	15	3	5	1	8	6	0	0	6	6
35	81	19	20	5	5	3	10	2	1	1	4	7
1	82	15	18	3	5	3	9	3	2	0	5	7
21	82	16	18	5	5	4	13	1	0	0	0	1
4	82	15	22	3	6	4	9	4	1	1	6	9
39	83	17	26	4	4	2	10	3	1	0	4	5
31	83	16	23	4	6	3	9	4	1	0	5	6
22	84	17	16	3	5	4	9	4	1	0	5	6
17	84	15	18	4	4	4	11	3	0	0	3	3
30	86	18	20	4	6	2	10	2	2	0	4	6
16	86	15	18	5	6	5	11	3	0	0	3	3
34	87	15	21	3	6	4	10	3	0	1	4	6
42	88	16	21	3	6	1	6	6	0	2	8	12
47	88	19	26	7	5	0	13	1	0	0	1	1
12	88	15	21	6	5	0	13	0	1	0	1	2
3	90	15	20	6	6	6	11	2	1	0	4	4
18	90	15	21	4	7	-3	8	5	1	0	6	7
2	91	15	20	5	5	0	8	3	3	0	6	9
19	91	15	20	4	7	5	13	0	1	0	1	2
37	92	18	23	3	5	1	11	1	2	0	3	5
8	93	18	23	6	6	1	14	0	0	0	0	0
36	96	17	26	6	5	4	13	1	0	0	1	1
6	96	16	25	5	5	3	11	3	0	0	3	3
25	99	15	20	4	6	2	11	1	1	1	3	6
44	98	17	16	6	6	3	13	1	0	0	1	1
9	93	21	24	7	7	3	13	1	0	0	1	1
7	100	19	25	6	7	1	10	2	2	0	4	6
26	105	17	18	3	5	1	14	0	0	0	0	0

¹ Standardised spelling score ² pre/post -training strategies ³ Number of different categories of strategies

⁴ change in spelling accuracy pre/post ⁵ spelling accuracy post-test (no prompt required) ⁶ GP raw ⁷total

no. of GP raw ⁸total weighted score

Ordering of the data by baseline HAST-2 standard scores provides a profile of each child's spelling abilities allowing comparison to their peers. For example, participant 50, Mary (pseudonyms have been used throughout), achieved a baseline spelling score of 60, placing her in the very low range. At post-test (after spelling training) Mary reported using strategies more often (18 compared to 15) and an increased range of strategies (6 compared to 3). However, her spelling accuracy score decreased by 2 points between pre- and post-test which suggests that despite being able to recall the strategies, she was not yet able to use them effectively. Examination of the number of prompts required for her to produce the correct spelling showed that the majority of items required 1 prompt. This is an indication that although her accuracy score decreased at post-test, she was able to produce the correct answer with only one prompt on 7 of the incorrect 9 items. By comparison, Callum (participant 46) achieved a slightly higher baseline score than Mary (65). His strategy use increased from 15 strategies at pre-test to 20 at post-test. The range of reported strategies increased from 3 to 5 and demonstrated that although he still used a phonetic strategy, he was able to explain an approach to spelling that included other categories including the use of analogy and spelling rules. His post-test score increased by 1 (from 4 to 5) and his GP score identified that 5 of the items needed the maximum number of prompts to achieve the correct answer with 2 prompts required on 2 other items. Callum's overall weighted score was higher than Mary's (21 compared to 17, with the highest score representing the largest amount of support). This suggests that although both children have spelling abilities in the very low range and will need substantial support, Callum may need more intensive support than Mary. George (participant 40) achieved a higher baseline score (72) than both Mary and Callum suggesting better spelling performance. Examination of his data identified that the strategies reported pre- and post-training changed to a smaller extent than Mary and Callum, while his total weighted GP score was 27, the highest score for the children overall.

At higher baseline spelling scores the data showed similar variability. For example, Ahmed (participant 34, standard score 87) and Sophia (participant 42, standard score 88) reported identical strategy use scores at post-test. However Ahmed's spelling accuracy score increased by 4 items from pre- to post-test with an overall GPW score of 6. By comparison, Sophia's spelling accuracy score changed by 1 item from pre- to post-test with an overall GPW of 12

points. This identifies that despite achieving similar scores on a standardised test of spelling, the two children have different needs for spelling support.

8.5 Discussion and conclusions

Children with dyslexia have difficulties not only with reading, but also with spelling. While reading difficulties may resolve with appropriate support, spelling difficulties can persist into adulthood (Berninger et al., 2013; Hatcher et al., 2002; Maughan et al., 2009). This suggests that further work is needed to examine how we assess and support these spelling difficulties. The primary aim for this thesis was to develop spelling assessment within a DA model that provides a detailed profile of spelling ability for children with spelling. Two main research questions were identified. The first was to determine if a spelling assessment could be developed within a theoretical framework for DA, and the second was to identify additional information that might be provided by a DA approach when compared to a static assessment. A sub-question was included in this study to determine if the self-report methodology used in the recognition task in Study Two could be transferred to a production task.

Research Question One: Can a spelling assessment be developed within a theoretical framework for DA?

The DASp procedure developed in Study Three appears to fit well within the theoretical framework for curriculum-based DA (Lidz, 2014). As demonstrated in Figure 8-1 in this chapter, the DASp procedure mapped clearly onto the theoretical model by fulfilling all but one of the eight steps, starting with a referral question and concluding with suggestions for recommendations. The final step, follow-up and monitoring was not completed in this study but will be explored in Study Four.

Lidz (2014) argues for diversity and flexibility in model-building within DA while offering some guidelines about what can be considered DA. In her view, a procedure is considered to fit within a DA model if 'intervention is embedded within the assessment process and the response of the individual being assessment to this intervention is of primary interest' (p293). In addition, Lidz notes that the focus should be on how the learner goes about learning, how intact these processes are, and whether the procedure provides enough

information to generate hypotheses about successful interventions. Within this framework, the DASp was developed using a combination of established procedures drawn from the literature. The final design was novel in that it incorporated the two broad formats identified by Dörfler et al. (2009) - a test-train-test design that also included a train-within-test element in the post-test by using a series of graduated prompts. While recognised as a novel approach to DA in that two broad formats are combined, such an approach is supported by the literature. Although this did increase the amount of time required to complete the procedure (approximately 45 - 50 minutes) it provided the opportunity to capture detailed information about the spelling abilities of each child. This is discussed further in the next section.

Research Question Two: Compared to static assessment, what additional information can a DA approach to spelling provide?

The DASp procedure developed in this study provided information about children's spelling abilities in a number of ways – spelling accuracy scores and strategy use pre- and post-training, the number of items that needed support, and importantly, the extent of the support that was required.

Strategy use

To better understand why children with dyslexia have spelling problems, it is important to identify the strategies they use when they attempt to spell words and to try to discover the most effective approaches to use when supporting them (Darch, Soobang, Johnson, & James, 2000). Analysis of the group data for strategy use after the instruction phase revealed an increase in the number of overall strategies, multiple strategies on single-items, and the different categories of strategies used (i.e. how many of the 7 spelling strategies identified in the coding were reported). On average, the children's spelling accuracy score increased by two on a 14-item word list. Group results suggest that the children in the study benefited from the short spelling strategy training incorporated into the procedure by demonstrating an increase in spelling accuracy at post-test and the use of more strategies overall, as well as multiple strategies on a single item. Although a phonetic strategy was most frequently reported, this was reduced after instruction. This is a positive change since phonetic strategies will have limited success given the highly unpredictable

correspondences between phonemes and graphemes in the English language (Caravolas et al., 2001).

Graduated prompts as response-to-intervention

The graduated prompt (GP) procedure discussed in this study provided a quantitative measure of progress for the child as well as a comparison to peers. This was operationalised as response-to-intervention (RTI), a procedure whereby support is provided with progressively intensive tiers of individualised instruction to identify children who are struggling the most (Darch et al., 2000). As identified in Study One (see Chapter Six for a full discussion), dyslexia specialists currently rely on a standardised test to measure spelling ability that may be supplemented with additional information such as post hoc error analysis or by the examination of a sample of the child's writing. Given the reliance on standard scores, it is possible the dyslexia specialists may make the assumption that children with the same baseline scores may have similar spelling difficulties. However, the data from Study Three identifies that the children have distinctly different profiles. By collating the quantitative information from the graduated prompt procedure with accuracy scores and strategy reports, a specific spelling profile could be developed for each child that demonstrated unique strengths and weaknesses. This outcome is consistent with other studies, for example the DA of word learning (Camilleri & Botting, 2013) and the DA of sentence structure (Hasson et al., 2012). This was demonstrated not only between the children at different baseline levels (as might be expected) but also between children at very similar baseline levels. For example, one child with a baseline score of 64 (participant 32) achieved a total weighted graduated prompt score of 14 with only one item requiring the maximum number of prompts, while another child (participant 46) with a baseline score of 65, achieved a score of 21 and required three prompts on five of the items. Similarly, one child at the lowest baseline standard score recorded for the group (60, participant 38) achieved a lower total weighted graduated prompt score (13 points) than another child (participant 40) with a score of 27 points. The higher score identified that this child needed the maximum number of prompts for eight of the items, compared to participant 50, who despite a lower baseline score, required the maximum number of prompts on only two of the items.

The differences in the scores between the children represents notable differences in their ability to respond to the intervention provided in the DASp. This identifies that although children may demonstrate similar spelling abilities on a standardised spelling test, children with higher prompt scores may need more extensive and possibly more explicit spelling intervention. This information is important in adding to the teachers' understanding of the child when developing a support programme. The graduated prompt procedure therefore demonstrated a unique measure of how much support might be required, as well as how intensive it might need to be. Taken together, the results suggest that a dynamic assessment of spelling such as the DASp, based on the curriculum-based framework of Lidz (2014), has the potential to identify variability in the spelling abilities of children with dyslexia beyond the information provided by a standardised test of spelling. The literature identifies that good spellers report using a range of spelling strategies while poor spellers tend to rely on a phonetic strategy (Kernaghan & Woloshyn, 1995). In this study, strategy use by the children after strategy instruction identified differences with regard to the use of overall strategies, multiple strategies and the number of different strategies used as well as in the amount of support (number and breadth of the prompts) required to reach the correct answer. Understanding the strategies used by the children when they attempt to spell words is important in determining effective approaches to support (Aravena et al., 2016). While standardised spelling measures provide an essential normative measure, they do not provide the fine-grained information revealed by the DASp that can potentially guide intervention and support progress.

By developing a DA of spelling that incorporates measures of change in strategy use, spelling accuracy and graduated prompts, variability in the children's spelling ability and response-to-intervention was revealed. This supports the view that the DASp has the potential to provide a fine-grained understanding of the spelling abilities of children with dyslexia and has important implications for guiding intervention and supporting progress.

Sub-Research Question: Can 8-9 year-old children with dyslexia provide verbal reports of the spelling strategies they use in a spelling-production task in the same way as a spelling-recognition task?

For Study Three, the children's reports of strategy use were gathered at two time points, once during the pre-test and then again after a short period of strategy instruction. Given the difference in formats between the spelling task in Study Two (recognition) and Study Three (production) and in the words used, it was important to compare the outcomes. At pre-test, strategy use was broadly in line with the strategy use reported by children with dyslexia in Study Two. As a percentage of the total number of strategies reported, a sounding out (phonetic) strategy was used 55.27% of the time, compared to 43.93% in Study Two. Other spelling strategy categories showed similar results, retrieval - automatic 12.18% (compared to 11.11%), retrieval/sounding out 2.39% (compared to 1.29%), drawing analogies 3.51% (compared to 3.62%). The children in this study used a phonetic approach more often than any of the other spelling strategies. The dominance of this approach continued, although at a reduced percentage, after strategy instruction suggesting that some children may need a longer period of training to help them to understand how to appropriately use the full range of strategies to improve their spelling outcomes. The children's response to the Spelling Detectives procedure varied considerably. All of the children were familiar with the concept of sounding out unknown words however very few identified that they were aware of the full range of strategies. In some instances the children seemed to be familiar with concepts, particularly with the use of analogy, but did not identify using them. Some understanding of spelling rules was also evident, but this often appeared to be incomplete or inaccurate as demonstrated in their verbal self-reports. It is difficult to determine if the reduction in the use of a phonetic strategy following the Spelling Detectives activity was due to the adoption of new strategies, or if the children were already aware of these strategies but failed to use them at pre-test. This may be a subject for future research. Clearly, while there is substantial evidence that phonics is an important component of effective literacy instruction, particularly for children with dyslexia (Carreker, 2011; Peterson & Pennington, 2012; Rose, 2009), it may be that poor spellers may need to be explicitly taught a range of spelling strategies. This may be required well beyond the age that their typically developing peers stop receiving such instruction (Carreker, 2011; Peterson & Pennington, 2012; Rose, 2009).

There were, however, some differences between the two studies. The largest difference was in the use of a visual checking strategy which was lower in this

study (8.29% compared to 20.67% in Study Two). This may be due to the change in format from a recognition to a production task. The recognition task used in Study Two required the child to listen to a word and then identify the spelling that they believed to be correct from a list of alternative spellings presented to them on a card. This may have prompted the use of a visual strategy for some children. By comparison, the production task required the children to write the word using metacognitive strategies to formulate their answer. While a visual strategy was available as part of the production process this may have been employed later, for example after the word was written. Less emphasis may have therefore been placed on this strategy. This may also explain the increase in the retrieval with strategy response as the children were required to reflect on how they produced the word in contrast to explaining how they recognised the correct word. The strategy of relying on rules was also lower in this study (4.02%) than in Study Two (9.04%) which may reflect a weaker understanding of spelling conventions for children in this study. The strategy used least was semantic knowledge and this was used even less (0.38% of the time in Study Three compared to 2.07% in Study Two). This strategy was generally applied to the homophone *through* in Study Two. No homophones were included in Study Three which may account for the reduction in use.

Overall, the results for strategy use were similar for both studies with small differences in the outcome most likely due to changes in the format and word list. This provides evidence that the children in the study could provide verbal reports of the strategies used in a spelling production task in the same way as a spelling recognition task.

8.6 Chapter summary

Study Two identified that children with dyslexia are able to verbally report the spelling strategies they use. Study Three built on this study by applying the verbal self-report methodology in a DA of spelling for children with dyslexia. The results demonstrated variability in the children's spelling profiles across the standardised baseline measures of spelling. Study Four, described in the next chapter, explores if dyslexia specialists are able to independently administer the DASp and if the information gained from the DA procedure can then be useful in

the development of effective interventions for children in a small-scale pilot study.

CHAPTER Nine: Study Four. DASp pilot and evaluation

9.0 Introduction and rationale

Study Three described the development of a Dynamic Assessment of Spelling (DASp) for children with dyslexia and concluded that it produced individual spelling profiles for children that would not be identified from a static measure. The profiles generated by the DASp identified spelling accuracy and spelling strategy use as well as a quantitative measure of the child's response-to-intervention. The aim of Study Four was to investigate dyslexia specialists' evaluations of the DASp. The specialists were asked to administer the DASp and use the information alongside standardised scores to design and deliver five hours of 1:1 literacy intervention. Children's progress was identified by measuring changes from pre-test to post-intervention. Teachers' evaluations of the DASp were studied via feedback from questionnaires and interviews.

Research Aim:

The primary research aim for this thesis was -

To develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling.

For Study Four, a further aim was identified –

To provide an evaluation of the DASp procedure from dyslexia specialists working in schools

A sub-research question was formulated -

1A. Do the DASp results provide additional information (compared to a standardised assessment) that can be incorporated into a five-hour literacy intervention to improve the spelling outcomes for children with dyslexia?

9.1 Methodology

9.1.1 Participants and inclusion criteria

Teachers

Seven dyslexia specialists were initially recruited from six schools in the Greater London area and one in the Midlands. Each teacher was asked to recruit two pupils with literacy difficulties using the same criteria as the previous studies (i.e. between the ages of 8 years 0 months and 9 years 11 months with a standard score of reading of 85 or less). One teacher attended the training but withdrew as she felt unable to commit to the amount of time required for the intervention. The remaining six teachers participated throughout this phase of the study and were successful in obtaining permission from the children, parents and school to participate in the study.

Children

Each child was initially assessed using a range of standardised tests to identify reading and spelling levels in the same way as the previous studies presented (see Chapters Seven and Eight). Children with co-occurring difficulties such as ADHD were excluded. All participants achieved a score in the average range on a test of expressive language. All of the children in the study spoke English as their first language. In the final analysis six girls and six boys aged from 8 years 0 months to 9 years 9 months (mean age 8 years and 8 months) participated.

9.1.2 Measures

Reading, Expressive language, Phonological Awareness and Spelling

Following the procedure from the previous studies the dyslexia specialists administered base-line standardised tests. Both the sight word (Sight Word Efficiency) and non-word (Phonemic Decoding Efficiency) subtests of TOWRE 2 (Torgesen et al., 2012) were administered and a Total Word Reading Efficiency score recorded. As for the previous two studies, this was used as an indicator of reading difficulties. Raw scores were converted to standard scores ($M=100$, $SD=15$). Expressive language was measured using the *Formulating Sentences* subtest taken from the CELF-4 (Semel et al., 2006) with raw scores converted to scaled scores. A composite measure of phonological awareness included 3 sub-tests from the CTOPP-2 (Wagner et al., 2013) and the resulting composite

reported as a scaled score as per Study Three. As a measure of baseline spelling, the HAST-2 (Caplan et al., 2012) Form B, was administered. Raw scores were converted to standard scores ($M=100$, $SD=15$). Detailed information for each of these standardised tests is included in Chapters Seven and Eight.

Experimental Measures

The measures for this study were identical to the DASp procedure outlined previously in Study Three (Chapter Eight).

9.1.3 Procedure

As for Study Three, the children's baseline scores were collected in one session and the DASp in a second session. Each child worked with a dyslexia specialist on a 1:1 basis. An overview of the DASp procedure is repeated in Figure 9-1 for ease of reference.

SESSION ONE	Base-line measures- TOWRE-2 CELF- 4 HAST-2
SESSION TWO DASp Procedure Parts A and B (approx. 45 -50 minutes)	PART A Pre-instruction test and Instructional Training Static spelling test (14 words taken from HAST 2) Child explains strategy used after each word Child indicates words correct, incorrect or not sure using coloured pens (unaided by researcher) Child self corrects using correction procedure Child identifies words for training procedure <i>Spelling Detectives</i> Metacognitive Strategy Instruction (intervention) (approx. 15-20 minutes)
	Gap Activity Phonological Awareness assessment – ‘Let’s play a word game’ (approx. 15 – 20 minutes)
	PART B Post-instruction test with Graduated Prompts Spelling test (14 words alternate form – counterbalanced by group) Child explains strategy used after each word Child indicates words correct, incorrect or not sure using coloured pens (unaided by researcher) If correct, the next word is administered. If incorrect – examiner administers graduated prompt procedure (approx. 15 minutes)

Figure 9-1: Overview of the DASp procedure

9.1.4 Scoring and coding

Standardised tests and Spelling production task

Standardised tests were scored according to manual instructions. A raw score was calculated and a standardised score derived. As for studies Two and Three, the number of correct responses on the spelling production task generated a spelling accuracy score.

Strategy Use

The strategies used by each of the children were recorded, transcribed and coded by the dyslexia specialist working with the child and then independently coded by the researcher. A summary of the coding used is reproduced in Table 9-1 for ease of reference.

Table 9-1: Summary of coding for spelling strategies

CODE	NAME	EXPLANATION	EXAMPLE
1A	Retrieval	Automatic retrieval	'I just know it...' 'I learned this in grade 1...' 'I don't really know.'
1B	Retrieval with strategy	Child retrieves the answer using a strategy	Uses mnemonics such as 'o u lucky duck' (for the letters in words such as SHOULD, COULD, WOULD) or 'I know this one, it is the name of my grandma's dog...'
2	Sounding out (phonic decoding)	Child demonstrates a sounding out strategy	Child sounds out the letters while writing (as noted by the researcher) or replies 'I sounded it out...'
3	Retrieve/Sound out	The child knows part of the word and sounds out the rest	'I think it could be SWIM and ING.'
4	Drawing analogies	The child uses word patterns to support the spelling of a word	Where the child uses a word with a similar spelling as support, for example using LIGHT to spell FRIGHT
5	Relying on rules	The child demonstrates the use of a spelling rule	'It has to have an 'e' on the end or it would be BIT...' 'When you put ING on the end you have to put two m's...'
6	Visual checking	Child uses a visual approach to identify if the spelling is correct	'I think it is right, it looks right...'
7	Semantic knowledge	Child uses the meaning of the word to support spelling	'They sound the same but one is NIGHT and the other one is a KNIGHT who fights dragons...'

Graduated Prompts

Following the DAsp guidelines, the following score metric was applied –

- Where the spelling was correct without any prompts, the item was awarded 0 points.
- Where one prompt was required to produce the correct spelling, the item was awarded one point.
- Where two prompts were required to produce the correct spelling, the item was awarded two points.
- Where three prompts were required to produce the correct spelling, or where the child's response was still incorrect, three points were awarded. Where the child was unable to provide a correct spelling, the researcher modelled the correct answer for the child to copy.

The prompt scores for each item were then combined to give a total raw score (GP) and total weighted score (GPW). Within this scoring metric the more prompts (support) required by the child per item, the higher the score.

9.1.5 DASp training for dyslexia specialists

All teachers were invited to participate in two training sessions with the researcher, approximately one week apart. Each session lasted for approximately 45 minutes. Due to the timetables of the teachers it was not possible to find two session times that were mutually convenient to all and therefore a number of sessions were conducted to allow flexibility of attendance. Training manuals and all materials were provided (see Appendix L).

9.1.6 Intervention planning and delivery

After collating the information collected from the base-line tests and the DASp procedure, the dyslexia specialists were then asked to construct and deliver an individualised intervention programme for each of the children they worked with that focused on spelling. There is a strong evidence base in the literature to inform practice at Wave 2 (targeted level) with less information available at Wave 3 (specialist level) (Darch et al., 2000). For the purposes of this study the 1:1 intervention support provided by the teachers is conceptualised as Wave 3 (specialist) support.

Given the lack of research evidence from Wave 3 (specialist) interventions, what is known about the effective provision of Wave 2 (targeted) interventions has been used to guide the duration of the support provided in this research design. Griffiths and Stuart (2011) identified an optimal duration for intervention of 12 weeks with diminishing gains after this period. Hatcher et al. (2006)

delivered an intervention over a shorter duration of 10 weeks advocating a little and often approach – short periods of highly-structured support spread over the week. This approach is supported by additional studies (e.g. Carroll, Bowyer-Crane, Duff, Hulme, & Snowling, 2011; Hindson, Byrne, Fielding-Barnsley, Newman, & Hine, 2005). Due to time constraints for the participating teachers and given that the focus of the intervention was on spelling, teachers were asked to undertake five hours of 1:1 support for each of the children they worked with. They were also asked to keep records of individual progress and provide lesson plans for each of their students (a discussion of the lesson plans is provided in Part Two of this chapter).

9.1.7 Post-Intervention testing

At the end of the intervention two final measures were administered. The HAST-2 (Caplan et al., 2012) (alternate Form A) was administered together with a further DASp graduated prompt procedure using an alternate form of 14 words (List C, see Appendix M). As for the previous studies, this third set of 14 words was identified and matched based on word type or spelling pattern using the Children's Printed Word Database (Masterson et al., 2010). Where multiple options were available, the closest frequency match to the previous two lists was used. The word lists used are presented in Table 9-2.

Table 9-2: Word frequency List B and List C

List A	Frequency Per million	List B	Frequency Per million	List C	Frequency Per million
cat	1187	hen	241	top	500
because	611	have	3746	was	11301
miss	449	kiss	43	hiss	14
should	376	could	1901	would	1425
opened	333	worked	141	looked	2556
swimming	154	running	265	hopping	35
light	306	fright	241	night	725
clown	138	frown	11	town	681
wrote	73	wrong	173	write	122
fact	70	object	11	insect	27
spread	54	head	703	bread	224
crack	51	back	2299	track	105
hedge	51	fudge	3	edge	87
note	35	bite	43	late	187

9.1.8 Fidelity of the procedure and interrater reliability

DA sessions were audio-recorded and transcribed by the researcher to ensure fidelity to the administration of the assessment. The coding of the spelling strategies by the dyslexia specialists was then independently coded (post-hoc) by the researcher for all time points and reliability of the coders' decisions was established on the sample. The interrater reliability (Cohen's Kappa) on the coding was .89 indicating good interrater agreement. Where there was disagreement, the researcher's coding was used.

9.2 Results

The results of this study are presented in two parts. Part One presents and discusses the outcomes for the children in the study. Part Two discusses the interventions developed by the dyslexia specialists by reviewing their lesson plans. The specialist's evaluations and their impressions of the helpfulness of the DASp measure are also included in Part Two.

9.2.1 Baseline Measures

Children in the study were identified as having either a formal diagnosis of dyslexia or were considered to have literacy difficulties in line with dyslexia. All of the children achieved a standard score of 85 or less on a test of reading thus reaching the inclusion criteria of one standard deviation below the mean.

Children with expressive language difficulties were excluded to ensure that the children would have no difficulty with the verbal nature of the DA task. Results are presented in Table 9-3.

Table 9-3: Descriptive statistics all participants

Participant	1	2	3	4	5	6	7	8	9	10	11	12
Age (years months)	8;11	8;8	8;5	8;4	9;3	9;5	8;1	8;6	8;0	8;10	9;5	9;9
TOWRE 2 SWE raw	59	26	49	23	53	60	31	40	41	40	25	43
TOWRE 2 SWE standard	97	66	94	69	81	90	76	83	84	69	65	72
TOWRE 2 PDE raw	11	6	10	1	11	13	15	16	15	14	14	18
TOWRE 2 PDE standard	74	66	76	59	70	73	84	85	84	78	75	80
TOWRE 2 TWRE standard	85	64	84	62	74	81	79	83	83	72	68	75
CTOPP 2 Elision raw*	18	16	17	10	27	16	18	13	27	17	19	16
CTOPP 2 Elision standard	7	7	7	5	10	6	7	6	11	7	7	6
CTOPP 2 Blending Words raw*	33	24	24	13	31	27	29	32	19	19	22	23
CTOPP 2 Blending Words standard	15	10	10	6	13	10	12	14	8	8	8	8
CTOPP 2 Phoneme Isolation raw*	32	30	29	16	29	22	28	16	24	25	22	28
CTOPP 2 Phoneme Isolation standard	15	13	12	6	12	7	11	6	8	9	7	11
CTOPP 2 Phonological Awareness standard	116	100	98	73	112	86	100	92	94	88	84	90
HAST 2 raw	22	10	18	10	36	29	18	13	26	25	27	27
HAST 2 standard	79	<61	75	<61	103	88	80	67	94	86	83	80
CELF 4 raw	41	39	50	41	47	41	41	34	39	37	41	53
CELF 4 standard**	10	9	14	10	11	8	10	7	9	8	8	14

*standard score ($M=100$, $SD = 15$)

** scaled score ($M=10$, $SD=3$)

Key: HAST = Helen Arkell Spelling Test; TOWRE = Test of Word Reading Efficiency; SWE = Sight Word Efficiency; PDE = Phonemic Decoding Efficiency; TWRE = Total Word Reading Efficiency; CTOPP = Comprehensive Test of Phonological Processing; CELF 4 = Formulating Sentences subtest taken from the *Clinical Evaluation of Language Fundamentals*.

9.2.2 Experimental measure – DASp procedure

Spelling Accuracy

Spelling accuracy scores were calculated at pre- and post-test following the DASp procedure. At post-test, 8 of the 12 children demonstrated an increase in spelling accuracy ranging from one to five points following the short session of spelling strategy training with the dyslexia specialist. Three of the children showed a decrease in score – two children’s scores (participants 4 and 12) decreased by 1 point, while two additional children’s scores (participants 7 and 8) decreased by 3 points. Table 9-4 presents the spelling accuracy scores as measured by the DASp alongside baseline HAST-2 scores.

Table 9-4: Spelling accuracy scores HAST-2 alternate forms and experimental measure pre/post-test

Child	HAST-2 A Baseline Raw score	HAST-2 A Baseline Standard score	Pre-test T1	Post-test T2	Change Pre-Post
1	22	79	7	9	2
2	10	<61	1	3	2
3	18	75	5	8	3
4	10	<61	2	1	-1
5	36	103	11	12	1
6	29	88	9	13	4
7	18	80	4	1	-3
8	13	67	5	2	-3
9	26	94	9	10	1
10	25	86	6	8	2
11	27	83	6	11	5
12	27	80	7	6	-1

Spelling Strategies

Self-reports of strategy use were elicited at pre- and post-test following the DASp procedure. The data was coded according to the training manual provided. Strategies used were coded in the same way as the previous two studies (see Table 9-1).

All children in the study were able to self-report a strategy that enabled their responses to be allocated to a specific strategy for all items. Tables 9-5 and 9-6 provide the strategy use by item in the experimental task for each of the children at pre- and post-test. Table 9.7 provides a comparison of strategy use at the two time points.

Table 9-5: Strategy use by item pre-test (T1)

Child	cat	because	miss	should	opened	swimming	light	clown	wrote	fact	spread	crack	hedge	note	Total strategies (number)	NDC*
1	1A	1B	6	2	1B	1A	1A	6	6	1A	6	1A	2	5	14	6
2	1A	1A	6	2	2	1B	1B	2	1B	1B	2	2	2	2	14	4
3	1A	1B	1A	2	2	2	2	3	2	2	2	3	2	1A	14	4
4	1A	1B	2	2	2	2	2	2	2	2	2	2	2	2	14	3
5	2	4	4	1B	1A	1B	1A	2	4	2	2	2	4	5	14	5
6	1A	4	6	7	5	1A	4	2	4	3	2	2	2	1A	14	7
7	2	1B	2	2	2	1B,6	2	2	2	5	2	2	2	2	15	4
8	2	1A	2	2	2	2	3	3	3	2	2	2	2	2	14	3
9	1A	1B	2	1A	2	2	2	3	4	1A	2,3	1B	1B	1A	15	5
10	1A	1A	1A	3	1A	1A	1A	1A	1A	1A	2	2	2	2	14	3
11	1A	1B	4	1B	5	5,1B	7	2	2	2,6	2	2	1A	1A	16	7
12	1A	1A	1A	4	4	1A	4	4	2	2	1A	2	2	4	14	3
Total															174	

*Number of different categories of strategies

Table 9-6: Strategy use by item post-test (T2)

Child	hen	have	kiss	could	worked	running	light	frown	wrong	object	head	back	fudge	bite	Total strategies (number)	NDC*
1	1A	1A	1A	3	1B	5	2	2	1A	6	1A	1A	6	5	14	6
2	2	2	4	2	2	2	2	2,3	2	2	2	1A	2	2	15	4
3	2	1A	1A	4	2	3	2	1A	2	2	1A	1A	2	6	14	5
4	2	1A	2	2	2	3	2	2	2	2	2	2	2	2	14	3
5	1A	1B	2,6	1A	5,2	5,2	1A	2,6	1A	2,6	4,2	1A	2,6	1A	21	5
6	4	1A	4	4	5	1A	5	2	1A	6	4	4	2	5	14	5
7	1A	2	2	2	2	2	2	2	2	2	2	2	2	2	14	2
8	2	2	2	2	2	3,5	3	2,6	2	2	2	6	1A	1B	16	6
9	2	1B	4	1B	4	5	4	4	2	1A	4	5	1A	5	14	5
10	1A	1A	1A	4	4	1A	4	4	2	2	1A	2	2	4	14	3
11	1A	1A	1A	4	4	1A	4	4	2	2	1A	2	2	4	14	3
12	1A	1B	2,6	1B	2,5	2,5	1A	2	2	2,6	2	2	2	2,6	19	5
Total															185	

Table 9-7: Frequency table comparing strategies used pre/post-test all participants

Child	Retrieval (automatic)		Retrieval (strategy)		Sounding out (phonetic)		Retrieve/sound out		Drawing analogies		Relying on rules		Visual checking		Semantic knowledge		Total strategies		Multiple strategies		NDC*	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
1	5	6	2	1	2	2	0	1	0	0	1	2	4	2	0	0	14	14	0	0	6	6
2	2	1	4	0	7	12	0	1	0	1	0	0	1	0	0	0	14	15	0	1	4	4
3	3	5	1	0	8	6	2	1	0	1	0	0	0	1	0	0	14	14	0	0	4	5
4	1	1	1	0	12	12	0	1	0	0	0	0	0	0	0	0	14	14	0	0	3	3
5	2	6	2	1	5	7	0	0	4	1	1	2	0	4	0	0	14	21	0	7	5	5
6	3	3	0	0	4	2	1	0	3	5	1	3	1	1	1	0	14	14	0	0	7	5
7	0	1	2	0	11	13	0	0	0	0	1	0	1	0	0	0	15	14	1	0	4	2
8	1	1	0	1	10	9	3	2	0	0	0	1	0	2	0	0	14	16	0	2	3	6
9	4	2	3	2	5	2	2	0	1	5	0	3	0	0	0	0	15	14	1	0	5	5
10	9	5	0	0	4	4	1	0	0	5	0	0	0	0	0	0	14	14	0	0	3	3
11	3	7	3	3	5	4	0	0	1	0	2	2	1	0	1	0	16	16	2	2	7	4
12	2	2	1	2	11	10	0	0	0	0	2	2	0	3	0	0	16	19	2	5	5	4
Total	35	40	19	10	84	83	9	6	9	18	8	15	8	13	2	0	174	185	6	17		

At post-test, group data for strategy use demonstrated increases in the use of automatic retrieval, retrieval/sounding out strategies, drawing analogies, relying on rules, visual checking and multiple strategies. The use of phonetic strategies reduced but remained the strategy used most often. Strategy use data for the group is presented in Table 9-8 below.

Table 9-8: Percentage of strategies pre/post-test all participants

STRATEGY	Pre-test %	Post-test %
Retrieval - automatic	20.12	21.62
Retrieval with strategy	10.91	5.41
Sounding out (phonetic)	48.27	44.86
Retrieval/sounding out	5.18	3.24
Drawing analogies	5.18	9.72
Relying on rules	4.60	8.11
Visual checking	4.60	7.02
Semantic knowledge	1.14	0.00
<i>Total number of strategies</i>	<i>174</i>	<i>185</i>
<i>Multiple strategies</i>	<i>3.44</i>	<i>9.18</i>

9.2.3 Graduated Prompts

Prompt levels were first calculated as a raw score (i.e. the number of prompts required to produce the correct answer per item) and then transformed into a weighted score using the scoring metric previously outlined in Study Three (see section 9.1.4). The weighted score provided a total measure for the Graduated Prompts (GPW) incorporating the number of items requiring prompts and the breadth of the prompts (one, two or three prompts).

The number of prompts required by each child is presented in Table 9.9. The minimum score (representing the least number of prompts required) was two (participant 6) and the highest score (representing the greatest number of prompts required) was 36 (participant 4). In general, children with the highest number of correct items at post-test required the fewest prompts.

Table 9-9: Graduated prompts post-test all participants

Child	GP = 0	GP raw =1	GP raw =2	GP raw = 3	Total GP raw	Total weighted (GPW)
1	9	5	0	0	5	5
2	3	5	1	5	11	22
3	8	0	1	5	6	17
4	1	1	1	11	13	36
5	12	1	1	0	2	3
6	13	0	1	0	2	2
7	1	7	3	3	13	22
8	2	2	2	8	12	30
9	10	2	2	0	4	6
10	8	2	1	3	6	13
11	11	1	1	1	3	6
12	6	4	1	3	8	15

9.2.4 Spelling Profiles – Standardised scores, strategy use, spelling accuracy and GP scores

A spelling ability profile was compiled for each of the children in the same way as for Study Three. Information for each child ordered by baseline standardised score is presented in Table 9-10.

Table 9-10: Spelling profiles ordered by standardised score (lowest to highest)

CHILD CODE	HAST-2	STRAT PRE	STRAT POST	NDC PRE	NDC POST	CHANGE SCORE	POST=0	GP = 1	GP = 2	GP = 3	TOTAL	TOTAL GPW
2	<61	14	14	4	4	2	3	5	1	5	11	22
4	<61	14	14	3	3	-1	1	1	1	11	13	36
8	67	14	16	3	6	-3	2	2	2	8	12	30
3	75	14	14	4	5	3	8	0	1	5	6	17
1	79	14	14	6	6	2	9	5	0	0	5	5
12	80	19	16	5	4	-1	6	4	1	3	8	15
7	80	15	14	4	2	-3	1	7	3	3	13	22
11	83	16	16	7	4	5	11	1	1	1	3	6
10	86	14	14	3	3	2	8	2	1	3	6	13
6	88	17	14	7	5	4	13	0	1	0	1	2
9	94	15	14	5	5	1	10	2	2	0	4	6
5	103	14	21	5	5	1	12	1	1	0	2	3

Variability between the children's strategy use, spelling accuracy and RTI can be identified from the table. John (participant 2 - pseudonyms have been used) earned a high GPW score identifying the need for extensive support. By comparison, Sam (participant 1) despite achieving a standard score of 79, improved his spelling accuracy score at post-test by three points with relatively little support, requiring only one prompt on the five items scored incorrectly.

As outlined in the methodology section, the dyslexia specialists used the information derived from the DASp procedure to develop a tailored five-hour intervention programme.

9.2.5 Post-intervention measures

Post-intervention measures for spelling accuracy (standardised and experimental) strategy use, and GP (response-to-intervention) were administered at the end of the intervention. Strategy use per-item data are presented in Table 9-11. Table 9-12 provides a comparison of strategy use for the children between pre-test (time 1) and post-intervention (time 3). The total number of strategies used between the two time points increased from 174 responses to 203 identifying that as a group, the children reported using more strategies, with more multiple strategies being reported on a single item. The minimum number of strategies reported at post-intervention was 14 (4 children, representing one strategy per item reported) and the maximum number 21 (1 child, representing the use of multiple strategies on a number of individual items). The minimum number of different categories of strategies reported at post-intervention was four (3 children) and the maximum number was seven (two children).

Table 9-11: Strategy use by item post-intervention (T 3)

Child	top	was	hiss	would	looked	hopping	night	town	write	insect	bread	track	edge	late	Total strategies (number)	NDC*
1	2	1A	3	6	5	5	1B	1B	1A	1B	6	1B	1A	1A	14	6
2	2	1A	4	4	5	5	2	2	1B	2	2	6	2	1B	14	6
3	1A	2	1A	2	2	1B	2	3	2	3	2	2	2	1A	14	4
4	1A	2	2	2	5,6	5	2,6	2	2	2	2,6	2,6	2	2,5	19	4
5	1A	1A	1B	1A	5	5,6	1A	1A	1B	2	1B,5	4	2,3	1A	17	7
6	1A	1A	1B,4	1B,4	1B,5	5	1B	3	3	3	1B,4	1B,4	6	1B,4	20	6
7	2	1A	2	1B	6,3	1A	2,5	2	1A	3	2,5	2	1A	6,2	18	6
8	1A	2	1A	1B	1A	4	1A	2	1B	3	1B	3	1B	4	14	5
9	1A	1A	2,4	1A	1A	5	1A	2,4	1A	2	1A	1A	1A	1A	16	4
10	1A	1A	3	4	1B	5	4	4	1B,3	2	4	1B	2,1B,3	1A	17	6
11	1A	1A	1A	1B,4	1A	1B,5	1B	1B,5	1B,5	2	1A	2	6,2	5	19	6
12	2,6	1A	1A	1B	1B,5	2,5,6	1A	1A	7,6	2	1A	6,2	2	2,3	21	7

*Number of different categories of strategies

Table 9-12: Comparison of strategy use pre (T 1) and post-intervention (T 3)

Child	Retrieval (automatic)		Retrieval (strategy)		Sounding out (phonetic)		Retrieve/Sound out		Drawing analogies		Relying on rules		Visual checking		Semantic knowledge		Total strategies		Multiple strategies		NDC*	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
1	5	4	2	4	2	1	0	1	0	0	1	2	4	2	0	0	14	14	0	0	6	6
2	2	1	4	2	7	6	0	0	0	2	0	2	1	1	0	0	14	14	0	0	4	6
3	3	3	1	1	8	8	2	2	0	0	0	0	0	0	0	0	14	14	0	0	4	4
4	1	1	1	0	12	11	0	0	0	0	0	3	0	4	0	0	14	19	0	5	3	4
5	2	6	2	3	5	2	0	1	4	1	1	3	0	1	0	0	14	17	0	3	5	7
6	3	2	0	7	4	0	1	3	3	5	1	2	1	1	1	0	14	20	0	6	7	6
7	0	4	2	1	11	7	0	2	0	0	1	2	1	2	0	0	15	18	1	4	4	6
8	1	4	0	4	10	2	3	2	0	2	0	0	0	0	0	0	14	14	0	0	3	5
9	4	10	3	0	5	3	2	0	1	2	0	1	0	0	0	0	15	16	1	2	5	4
10	9	3	0	4	4	2	1	3	0	4	0	1	0	0	0	0	14	17	0	2	3	6
11	3	5	3	5	5	3	0	0	1	1	2	4	1	1	1	0	16	19	2	5	7	6
12	2	5	1	2	11	6	0	1	0	0	2	2	0	4	0	1	16	21	2	6	5	7
Total	35	48	19	33	84	51	9	15	9	17	8	22	8	16	2	1	174	203	6	33		

*Number of different categories of strategies

At post-intervention the children’s scores ranged from one (participant 4) to 13 (participants 1 and 5). Joe (participant 4) also had the highest GPW score, identifying that he required greater support to achieve the correct answer. By comparison, Julie and Bill (participants 1 and 5 respectively) achieved the highest spelling accuracy scores at post-intervention with the least amount of support required to produce the correct answer. Table 9-13 presents the spelling accuracy and GP results per child at post-instruction.

Table 9-13: Spelling accuracy and Graduated Prompts post-instruction

Child	GP = 0 Spelling accuracy	GP = 1 raw	GP = 2 raw	GPW (2) weighted	GP = 3 total	GPW (3) weighted	GP raw total	GPW total
1	13	1	0	0	0	0	1	1
2	3	4	4	8	3	9	11	21
3	9	1	0	0	4	12	5	13
4	1	3	1	2	9	27	13	31
5	13	1	0	0	0	0	1	1
6	12	1	0	0	1	3	2	4
7	6	4	2	4	2	6	8	14
8	9	1	1	2	3	9	5	12
9	12	2	0	0	0	0	2	2
10	11	1	2	4	0	0	3	5
11	11	2	0	0	1	3	3	5
12	10	2	1	2	1	3	4	7

9.2.6 Comparing pre/post-test DASp measures with post-intervention results

As in Study Three, the results were ordered by baseline spelling ability to compare the children’s progress between pre-test at time 1 and post-intervention at time 3. Results are presented in table 9-14.

Table 9-14: Post-intervention (T3) spelling profiles (compared to baseline and ordered by baseline standard scores)

Child	Baseline scores (T1)				Post-intervention (T3)				Change scores			
	HAST-2		Spelling Accuracy	GPW total	HAST-2 alternate		Spelling Accuracy	GPW total	Change HAST-2		Change	Change GPW
	raw	standard	Pre-test	Total	raw	standard	Post-intervention		raw	standard	Spelling Accuracy	Total
4	10	<61	2	36	10	<61	1	31	0	0	-1	-5
2	10	<61	1	22	13	64	3	21	3	3	2	-1
8	13	67	5	30	22	81	9	12	11	14	4	-18
3	18	75	5	17	29	92	9	13	9	17	4	-4
1	22	79	7	5	34	99	13	1	12	20	6	-4
12	27	80	7	15	30	80	10	7	3	0	3	-8
7	18	80	4	22	20	80	6	14	2	0	2	-8
11	27	83	6	6	32	89	11	5	5	6	5	-1
10	25	86	6	13	29	90	11	5	4	4	5	-8
6	29	88	9	2	34	93	12	4	5	5	3	-2
9	26	94	9	6	34	100	12	2	8	6	3	-4
5	36	103	11	3	40	105	13	1	4	2	2	-2

At post-intervention all of the children showed improvement in their spelling accuracy scores on the experimental task with the exception of 1 child whose score decreased by one point (participant 4). Standard scores improved for 9 children from pre-test to post-intervention while two children showed no change despite raw score changes (participants 7 and 12) and one child (participant 4) recorded no change in their raw score. GPW scores decreased for all of the children in the study.

9.3 Discussion – Part one: intervention results

The first part of this chapter explored the results of a five-hour literacy intervention programme for 12 children identified with dyslexia. Six dyslexia specialists were trained to follow the procedure described by the DASp to collect information about the children's spelling accuracy, use of spelling strategies and a measure of how the children responded to intervention. This data was used to identify a spelling profile for each of the children to inform the structure of the intervention. At post-intervention the DASp procedure was repeated to explore changes in the children's spelling levels.

As for Study Two and Study Three, all of the children in this study provided meaningful self-reports of the strategies that they used at pre-test, post-test and

post-intervention enabling the strategies to be allocated to a specific category. Over the short period of intervention, the children demonstrated variability in their use of spelling strategies consistent with the overlapping waves model (Siegler, 1996) moving between simple and more complex strategies depending on the demands of the task. Overall, the children used more strategies and relied less on a phonetic strategy over time. Multiple strategies were reported on an increased number of items and the majority of the children also reported using an increased number of different categories of strategies at post-intervention.

Spelling accuracy scores on the experimental measure indicated improvement for all of the children, with the exception of Joe (participant 4) who scored one point lower at post-intervention. Joe's standardised score of <61 for spelling placed him in the well below average range of spelling ability. After five hours of individual support his standard score did not change. At pre-test, Joe's GPW score was 36, the highest in the group, suggesting that he might need extensive spelling support over a longer period than the other children in the study. Despite his lack of progress in spelling accuracy on both measures (standard score and experimental task) his GPW score at Time 3 was lower than at Time 1, that is, he needed less support to produce the correct answer at post-intervention. This suggests that he did make improvements in his spelling ability but that this was at a lower rate than the majority of his peers. Julie (participant 1) achieved the largest improvement in spelling accuracy on the experimental task (from seven points to 13 points) as well as on the standardised task (from 79 to 99). Her pre-test GPW score of five provided an indication that despite her below average score on the standardised test, she demonstrated a good ability to respond to the intervention. This was confirmed in her results at post-intervention.

Sally (participant 8), with a baseline standard score of 67, a spelling accuracy score of 5 and a GPW score of 30, demonstrated a better performance at post-intervention than might be suggested from the DASp procedure. For Sally, spelling accuracy increased from 5 to 9 points, her standard score increased from 67 to 81 and her GPW score decreased from 30 to 12. Despite the need for repeated support to produce the correct answer at post-test, five hours of intervention resulted in an increase in spelling accuracy on both the experimental and standardised spelling task. Although she remained in the

below average range compared to her peers and may require further support, this improvement is encouraging. Sam (participant 12) achieved a standard score of 80 at baseline, a spelling accuracy score of 7 and a GPW score of 15 at baseline, with three of the items requiring the maximum number of prompts. At post-intervention his raw score increased by 3, however this was not enough to impact on his standard score. His spelling accuracy on the experimental task also increased by 3 points. Despite this apparent lack of progress, Sam's GPW score decreased by 8 points, identifying that he needed less support to produce the correct spelling after five hours of intervention. This suggests that although some additional support may be required, he has responded to the intervention offered.

At higher baseline levels, Kat (participant 9), with a baseline standard score in the mid-average range of 94, spelling accuracy 9 and GPW score of 6, showed an improvement at post-intervention. Her standard score increased from 94 to 100 while her spelling accuracy score increased to 12 and her GPW score reduced to 2. Similarly, Bill (participant 5), with a baseline standard score of 103 (the highest for the group) achieved a spelling accuracy score at pre-test of 11 (also the highest for the group) and a GPW score of 3. At post-intervention, his standard score increased to 105, spelling accuracy of 13, and a total GPW score of 1. The post-intervention tests demonstrated that Bill has a good level of spelling ability.

Overall the results from this pilot study support the view that the DASp measures provide useful additional information to inform a programme of support compared to a static spelling test. This is consistent with other DA approaches reported in the literature (e.g. Camillieri & Botting, 2013; Glaspey & Stoel-Gammon, 2007; Hasson et al., 2012). At post-intervention the children made varying levels of progress on the spelling accuracy task and this was generally consistent with the spelling ability profile established at post-test during the initial DASp procedure. Even where no change in the spelling accuracy score was recorded, all of the children demonstrated a decrease in their GPW scores suggesting some improvement in spelling ability.

9.4 Part Two: Intervention planning and evaluation of the DASp procedure

9.4.1 Background Information

To qualify as a dyslexia specialist, teachers must complete a one to two-year (part-time/full-time) post-graduate programme. The focus of specialist programmes is the development and delivery of tailored 1:1 intervention for children with literacy difficulties (Rose, 2009). For the purposes of this study it is therefore assumed that graduates have the required expertise to support children with reading and spelling difficulties. All of the teachers in this study held post-graduate qualifications fully accredited by the British Dyslexia Association (BDA). The participants' experience in the teaching profession ranged from 10 years to 36 years while experience as a dyslexia specialist varied from 2 to 10 years. All of the teachers worked in the primary sector, with one working in both the secondary and primary sectors. Full details of this background information are included in Table 9-15.

Table 9-15: Qualifications, experience, role in school and sector

Participant	Qualification	Years of experience	Role	Sector
1	BA Combined honours, PGCE, MA SpLD (AMBDA)	36 years, 6 years as a dyslexia specialist	Dyslexia specialist (SpLD) Modern Languages Teacher	Secondary and Primary
2	B.Ed, PG Dip (Dyslexia)	14 years, 5 years as a dyslexia specialist	Dyslexia specialist (SpLD)	Primary
3	Reading Recovery, PG Dip (SpLD Dyslexia)	25 years, 9.5 years as a dyslexia specialist	Reading Recovery teacher, Reading support KS2	Primary
4	BA, PGCE, MA SpLD (dyslexia) AMBDA	10 years, 2 years as dyslexia specialist	Class teacher with responsibility for English across the school	Primary
5	BA Honours Education Studies and History, PGCert Dyslexia and Literacy Difficulties	15 years, 10 years as a dyslexia specialist and SENCO/Inclusion Manager	Deputy Headteacher/Inclusion Manager	Primary
6	NASENCO, BA (QTS) Hons, PG Dip SpLD AMBDA	21 years, 6 years as a dyslexia specialist	SENCO	Primary

Prior to participating in the study the specialists were asked to provide information about their school's spelling policy, identify any concerns relating to the teaching of spelling and how children with spelling difficulties were currently identified and supported. This information is included in Appendices N and O.

9.4.2 Intervention planning

As explained in the methodology section (see section 9.1), the specialists administered the DASp in addition to a standardised spelling assessment to inform intervention. The combined information was then used to develop a tailored five-hour literacy intervention for each of the two children they worked with. No additional input was provided as to how the lessons should be taught

or delivered, allowing the teachers flexibility in their approach. The aim of this study was to determine if the DASp procedure was considered to be a helpful, additional assessment measure.

Lesson content – overview

The specialists in the study provided a lesson plan for each lesson delivered during the intervention. Although no direction was provided by the researcher in relation to content or delivery of the lessons, support generally took the form of two x 30-minute support sessions each week, extending over five weeks. Sessions were timed to fit best with the teachers and the children in the study and varied over the course of the week. The structure of the delivered intervention lessons was similar, possibly reflecting the curriculum of the post-graduate programmes completed by the specialists and accredited by the BDA. The lessons generally began with a review of the previous lesson to check understanding and retention, followed by a short introduction of the current lesson. The use of spelling strategies was included in the lessons, for example, spelling rules (particularly suffixing rules), retrieval strategies (e.g. mnemonics or colour coding of letters), and visual checking (often via self-correction methods). This tallies with the changes seen in the children's strategy use from pre-test to post-instruction. Reading, either at the sentence level or word level, was incorporated into the lessons and new learning consolidated using review activities such as word games, spelling cards and magnetic letters. Summaries of the lessons provided by each dyslexia specialist are presented in Table 9-16.

Table 9-16: Summary of lesson plans constructed by specialists

Specialist	Child	WEEK 1 teaching points (Lessons 1 & 2)	WEEK 2 teaching points (Lessons 3 & 4)	WEEK 3 teaching points (Lessons 5 & 6)	WEEK 4 teaching points (Lessons 7 & 8)	WEEK 5 teaching points (Lessons 8 & 9)
1	1	<ul style="list-style-type: none"> • 'ould' – strategy • Revise 'sh' sound – in isolation and in sentences • Review 'ould'. Analogy strategy 	<ul style="list-style-type: none"> • Suffix – ing. Review 'ould' • Doubling rule – investigate final 'e' on a word (hope/hope hoping/hopping) • Morphology – help/helps/helped/helper/helpfully/helpfulness 	<ul style="list-style-type: none"> • Words within words (retrieve/sound out) • Review spelling rules. • Suffix 'tion' – Visual checking 	<ul style="list-style-type: none"> • 'ur' – generate a list of words. (purpose, further, burger, surprise, curl) • 'allow' – morphology • Review 'ight' – analogy 'er' at end of words – mother, brother, sister, over, clover 	<ul style="list-style-type: none"> • 'dge' – edge, ledge etc – generate word list. Spell in isolation and in a sentence • 'badger' 'other' • Review spelling strategies using cue cards
	2	<ul style="list-style-type: none"> • HF words, 'ai' words 'could' • Review 'ay' words • Suffix - ed 	<ul style="list-style-type: none"> • Review 'a-e' words • Consolidate suffix -ed • Review and consolidate 	<ul style="list-style-type: none"> • Review 'ould' words • Suffix 'ing' • Review doubling rule • Review suffixes • Visual checking (self-correction) 	<ul style="list-style-type: none"> • 'going' • Review suffix 'ed' • Final 'e' on a word and review doubling rule • 'rare' spellings (exception words) - mnemonics 	<ul style="list-style-type: none"> • Review – 'ould' (in isolation and in a sentence) • Morphology – help/helps/helped/helper/helpfully/helpfulness • 'all' words • Review
2	3	<ul style="list-style-type: none"> • Review strategies using cue cards • Double letter analysis of 	<ul style="list-style-type: none"> • Self-correction technique (visual checking) • 'zz' – fizz, buzz 	<ul style="list-style-type: none"> • Revise doubling rule - swimming, skipping, running • Suffix – ed • Drop – 'e' racing, dozing, poking, 	<ul style="list-style-type: none"> • <i>Were</i> – 'Whales eat radishes and eggs' In isolation and in sentence. 	<ul style="list-style-type: none"> • Double consonant – butter, button, better, letter, ladder • Review

		<p>one syllable words after vowel (spelling rule).</p> <ul style="list-style-type: none"> • Analogy – miss, boss, fuss, mess, pass, this • Review double 'll' – in isolation and in sentences 	<ul style="list-style-type: none"> • 'ff'- puff, sniff • Colouring of 'tricky bits' • Review alphabet fluency • Doubling rule – puffing, swimming, skipping, rotting, running, fizzing, missed • Suffix - ed 	<p>waking</p> <ul style="list-style-type: none"> • Where/were • Strategies for recall – colouring, mnemonics 	<p>Where – colourful h</p> <ul style="list-style-type: none"> • Here, there, - word search • 'bble' words – bubble, hobble, dribble, 'ble' words – table, feeble, stable • Review short vowel and doubling rule 	<p>strategies – visual checking, spelling rules taught, mnemonics</p>
	4	<ul style="list-style-type: none"> • Review – are, because (mnemonic) have, was 'with' – in isolation and in a sentence • Final 'e' • Sentence dictation – You can come with us • Use of coloured pens – saying letters at the same time 	<ul style="list-style-type: none"> • 'ame' – came, same • Reinforcement from previous lesson using word shark • Analogy – come/some • 'sh' – she, shell, shop, shut • Review – come, some, came, same 	<ul style="list-style-type: none"> • Review 'sh' as <i>endings</i> of words – fish, wish, cash • 'sh' in the <i>middle</i> of words – rasher • Spelling in isolation and in sentences – 'They saw a fish'; 'The girl bashes the nut' etc. • Self-correction (Visual checking) 	<ul style="list-style-type: none"> • Review 'sh', beginning, middle and end of words • a-e words – mad/made • Sentences – made, grade, fade, shade • Wordsearch activity • Review strategies • Long/short vowel sounds 	<ul style="list-style-type: none"> • Alphabet sequencing • Review long vowel sound – 'a' - cake, rake, lake, hate, mate, late (analogy). • Long vowel sound 'i' – kite, site, while, spire, bike, ride
3	5	<ul style="list-style-type: none"> • 'dge' endings – nudge, fridge • 'ea' making short /e/ sound • Spelling by analogy 	<ul style="list-style-type: none"> • 'ck' endings – sick, pick, neck – card sorting • Review 'ea' • Question words 	<ul style="list-style-type: none"> • Alternate 'ou' • Suffix 'cian' – magician, musician • Spelling cards • Review words in isolation and in 	<ul style="list-style-type: none"> • 'tion' sound – action, nation, potion. Practice adding -tion to root words. Difference 	<ul style="list-style-type: none"> • Review all lesson items • Review strategy use

		<ul style="list-style-type: none"> Identified words child wanted to learn 	<p>who/what/where/when</p> <ul style="list-style-type: none"> 'ct' endings Review 'dge' – crossword activity 	<p>sentences (dictation)</p>	<p>between -tion and -sion</p> <ul style="list-style-type: none"> Words ending in 'se' suspense, tense, repulse, convulse Words ending in 'ct' detect, inspect 	
	6	<ul style="list-style-type: none"> 'dge' endings – dictation task 'ea' making short sounds Review strategies child finds helpful – what strategies do you use Self-correction – do they look right? 	<ul style="list-style-type: none"> -ct endings- evict, act. Homophone 'through', 'threw' 'igh' words, e.g. light/sight/might Were/write Long and short vowel sounds 	<ul style="list-style-type: none"> Review 'igh' – light, night, tight, sight 'ss' flossy rule – hiss, miss, kiss – explain letters that are doubled after a short vowel in one syllable word Review - crossword 	<ul style="list-style-type: none"> Just add -ed – mess/messed dress/dressed, tip/tipped Doubling rule - stop/stopped Rub/rubbed, pat/patted In sentences (dictated) and in isolation 	<ul style="list-style-type: none"> 'ice' – mice, lice ace, face, pace Tracking exercise – how is it used? Review strategy use
4	7	<ul style="list-style-type: none"> Revisit – Can you remember the strategies you used to help you spell? Use picture cards Could/would/should – mnemonic. Practise in isolation and in sentences. How are you 	<ul style="list-style-type: none"> Review – 'ould' Errors in class writing book – come/some – any/thing/goin g Review – could/come/should/finally/some/going/would Words in isolation and 	<ul style="list-style-type: none"> Review – question words - what/why/when /where/who – 'woody not hoody' mnemonic Used prompts for correction procedure Sorting word cards into correct/incorrect piles 	<ul style="list-style-type: none"> Review – some/who/finally/what/could/going Introduce – 'dge' - edge/hedge/sledge/badge/bridge/judge/fridge/smudge Sentences and isolation Any/many – 	<ul style="list-style-type: none"> Review - any/edge/should / have/who/some/bridge/finally/what 'ew' – grew/threw/new/flew/knew 'wr' – wrap/wrong/wrist/write

		<p>going to remember this?</p> <ul style="list-style-type: none"> • Magnetic letters 	<p>sentences</p>		<p>anything/anyw here</p> <ul style="list-style-type: none"> • Review strategies 	
	8	<ul style="list-style-type: none"> • Recap on strategy cards 'igh' – light – how will you remember? Discuss best strategy for remembering • High/light/night /bright – analogy • Words in sentences • Review – use prompts if necessary • Sorting cards game 	<ul style="list-style-type: none"> • Errors in writing – saw – mnemonic 'ould' could/should/ would • Review 'y' at end of words – fly/cry/why • Words in isolation and in sentences • Sorting game – long 'i' vowel sounds – 'y' 'igh' 'i-e' 	<ul style="list-style-type: none"> • Review – could/bright/saw/ would/should/fly/ cry – prompts used as required. Self-correction used • Review – fly/cry/why – in sentences – Please don't cry. Why is the sun too bright? 	<ul style="list-style-type: none"> • Review – might/could/fly /saw/they 'ast' – last/fast/past • Words in sentences – 'they' – They are playing football • Review long 'i' vowel spelling choices • 'ast' – last/past 	<ul style="list-style-type: none"> • Errors in writing – people/school – how can you remember? Review strategies • Something/ anything
5	9	<ul style="list-style-type: none"> • Short vowel sounds • Closed syllables with polysyllabic words – button/rotten/ horrible/little • Board game – spell words on cards. Visual checking activity – identify errors 	<ul style="list-style-type: none"> • Review short/long vowel sounds • Nicer/finer/ better/letter/ loner/ later/latter • Words in isolation and in a sentence • Child identifies incorrect words – write in water with 	<ul style="list-style-type: none"> • Review off/of – identify difference. Child identifies errors in words – prompting provided 	<ul style="list-style-type: none"> • Review previous learning • Morphology – play/care/arm/ hand/help with <i>ful</i> Discuss meaning and use in sentence. • Write words in isolation and in a sentence 	<ul style="list-style-type: none"> • Revision using workshark • Review class spelling and identify correct and incorrect spellings – visual checking • Figure 8 game to review

		<ul style="list-style-type: none"> • Errors from written work – heart/off • Wordshark to revise words 	squirty bottle in playground			
	10	<ul style="list-style-type: none"> • Identify vowel sounds (short–peg game). Self-check. • Introduce concept of short vowel sound and notation. • Reads lists of words and separate according to vowel sounds • Visual checking – which word is correct? • Owl game – picture of item in correct 'owl' pot 	<ul style="list-style-type: none"> • Review of short/long vowels – not/note hat/hate/ rat/rate • Make word card with flap for each word • Suffix -ed identify base word and whether consonant is doubled – stopped/trapped/jumped/fitte d • Cloze activity – write words in gap in sentences 	<ul style="list-style-type: none"> • Review – progress in class? Check class writing books • Review – doubling rule • Suffix -ing and -ed • Child makes own memory aid for remembering rules and strategies • Activity for review – ed -ing • Class word bank – self correcting 	<ul style="list-style-type: none"> • Review silent letters - write/wrote/written/wriggle/wrong/wrist • Computer activity to reinforce • Spelling to dictation • Review – ing -ed • Words that don't follow phonic rules but can be linked to others – head/bread/thread • Make a picture in our mind, make a picture on paper 	<ul style="list-style-type: none"> • Review progress – go through word list once, play games if specific difficulties • Check piece of class-work for spellings – correct and incorrect. Encourage self-check, prompt if necessary • Choose from practical items to use to recap spellings not recalled accurately – shaving foam, play dough with alphabet cutters, water bottle
6	11	<ul style="list-style-type: none"> • Introduction to intervention - igh(t) Develop mnemonic 'I go home (tonight)' • i-e words – explain vowel 	<ul style="list-style-type: none"> • Review – long i sound • Silent 'w' – identify r sound alternative as silent 'w' – sometimes 	<ul style="list-style-type: none"> • Review silent letters • - ge range/charge/plunge/fringe and dge rule-fridge/wedge/lodge/edge • Spelling rule – 	<ul style="list-style-type: none"> • Revision of silent letters - ge and -dge rule – Dictation exercise.. Child explains rule to 	<ul style="list-style-type: none"> • Review learning to date. • -ow and -ou sounds. Show pictures, then words • ESWC (echo, spell, write,

		<p>consonant pattern.</p> <ul style="list-style-type: none"> • Long i vowel sound – usually at end of words • Spelling and reading cards to practice • Consolidation – spelling choice – igh/i-e, or y? • Review – ESWC to dictation – night/fine/try/s py/like/fright 	<p>within a word (not linked to 'r')</p> <ul style="list-style-type: none"> • Spelling to dictation – <i>The wrestler wrapped the wrong sword.</i> Child highlights the silent 'w' • Noughts and crosses – silent 'w' • Other silent letters – 'k' and 'g'. Show picture cues – what does G notice? • Sign – important root word – resign/assign/signature 	<p>dge has the sound 'j' and is found at the end of a one syllable word after a short vowel. The 'd' is added to give a 'wall' of 2 consonants between the vowels, thus keeping the first vowel short.</p> <ul style="list-style-type: none"> • Word sort activity • Dictation • Review suffix rules • Snakes and ladders game 	<p>teacher.</p> <ul style="list-style-type: none"> • Spelling activity to consolidate with prompting provided where necessary. 	<p>check) round/ ground/ mouse/ house/ brown/crown/tow n/owl/flower/tow er/ power</p> <ul style="list-style-type: none"> • New lesson – ck endings
12	<ul style="list-style-type: none"> • Review strategies for remembering alternative long vowel sounds • Review <i>-igh</i> rule. Practise. • Revise alternative long 'i' sounds & practice in isolation and in sentences 	<ul style="list-style-type: none"> • Review – Dictation er/ir/or/ur rule • Dictation of -igh and alternative long 'i' • Revise rules with game to consolidate 	<ul style="list-style-type: none"> • Silent 'w' words – write/wrote/ answer Use prompts to support learning. Other silent sounds • Dictation to consolidate - -igh, alternative long 'i' sounds, - er/ir/or/ur and silent w, -ge and -dge rule 	<ul style="list-style-type: none"> • Revision of work to date - <i>ge</i> and <i>-dge</i> rule • Write/draw/ make visual representations to assist learning • Word sorting activity – child decides which column they go in – 	<ul style="list-style-type: none"> • Revise • Practise cards – ESWC – wrong/purse/bird /fatter/herb/swor d • -ight – light/bright • Pelmanism, game - ir/or/er 	

				<ul style="list-style-type: none"> Ways to remember – spelling strategies 	cringe/plunge/ hedge/fridge/jo g/ edge/fringe/ch arge/ jolly/bridge/ja m/ page/badge <ul style="list-style-type: none"> Self-correction 	
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9.4.3 Method

A paper survey (adapted from Ganske, 1999) was developed to elicit information from the specialists about –

1. The helpfulness of the measure in understanding the children's spelling knowledge (not helpful, somewhat helpful, very helpful).
2. The ease of use (not at all easy, fairly easy, easy, very easy).
3. Comparisons with other measures (not informative, informative, somewhat informative, very informative).

The survey was completed by all of the participating teachers at the end of the five-hour intervention (see Appendix O).

9.4.4 Survey results

Results from this survey are included in Table 9-17. In summary, five of the six dyslexia specialists considered the DASp to be a very helpful measure while one found it somewhat helpful. Four dyslexia specialists found the procedure fairly easy to use, one felt that it was easy and one reported that it was not at all easy. When compared to other measures available to the specialists, four reported that the information gained from the DASp was very informative, one that it was informative and one that it was somewhat informative.

Table 9-17: Post-Intervention survey results

Participant	Helpfulness of the measure (quote - taken directly)	Ease of Use (quote – taken directly)	Comparison with other measures (quote – taken directly)
1	<p>Very Helpful This procedure gives detailed insight into the current knowledge and thinking processes of the child, providing very useful information for planning an intervention. It helps to identify strategies which the child is using and is finding effective and to identify gaps and/or unhelpful strategies which may need to be addressed.</p>	<p>Easy The procedure is easy to use but the information gained will only be as detailed as the child's ability to identify and articulate which strategies he/she is using. Though that in itself provides useful information about their vocabulary and levels of metacognition.</p>	<p>Very Informative This measure gives a much more fine-grained understanding of a child's abilities and current use (or not) of various strategies. It enables identification of individual differences and provides detailed information to ensure that any intervention will be more precisely targeted to support a child's learning.</p>
2	<p>Somewhat helpful It was helpful to hear the children talk about how they are approaching spelling but the procedure can become repetitive and uninformative when a child only used one strategy and this can be evident anyway from the spelling attempt</p>	<p>Not at all Easy The procedure was lengthy for children with a short attention span and little interest in spelling. Going through the strategies as an abstract exercise in one go wasn't helpful and it was difficult for the children to understand or remember without being given the opportunity to explore each one.</p>	<p>Somewhat Informative The DASp seems more of a procedure than a measure so I'm not sure how to compare it with other measures, for example the HAST, which gives a standardised score. The analysis of the spellings in the HAST gives a good deal of information about children's knowledge which is a very useful starting point for teaching. Analysis of children's independent writing also gives a good understanding of the strategies used for spelling too, so the DA could add to the HAST measure and the independent writing analysis approach to enable the children to develop metacognition about spelling. I think the step-by-step prompting approach during teaching sessions is very helpful but only if related to previous</p>

			learning. But other measures (e.g. HAST) are not about teaching approaches so I'm not sure how to compare this aspect
3	<p>Very helpful The use of prompts in the spelling assessments highlighted some of the confusions the children had which was useful, as well as being motivating for them as they came closer to the correct spelling of the words or enabled them to spell the word correctly.</p>	<p>Fairly Easy It was easier with the second child as I became more familiar with it. The instructions were very wordy so I tried to make a summary with bullet points before starting, as once I was with a child it was hard to read it all. It also took longer than I expected. At times it became tedious asking if they thought it was right and what strategy they used after each word. Most of the time they relied on sounding out, even if they didn't say so. The colour coding was straight forward and enjoyable for the children.</p>	<p>Informative It was quite informative but I am not sure how to compare it with the HAST which is a stand-alone spelling test we have in school, as there is no final score. However, I think it is useful to use with the HAST. It did show a slight change in the strategies the children are using now. I like the way they had the opportunity to really look, think and try alternative ways of spelling a word.</p>
4	<p>Very helpful The procedure gave an insight into the pupil's thinking processes. This felt like you weren't always starting from zero knowledge about spelling a particular word but could start from current understanding. More links could be made too. Discussion with the pupil was useful, particularly with the 2 pupils I was working with, who were both impulsive. Making them stop and think about strategies they used I think over time showed them that this was useful.</p>	<p>Fairly Easy Following a new/someone else's procedure is always difficult initially but with practice becomes familiar. The steps were discussed and documented and appeared clear prior to starting the assessment. However, once started, the number of steps to follow made the process seem complex. Recording this made me very conscious of doing something wrong and so I did not relax and use intuition as much as I would normally when working with pupils. Maybe a video of completing this with a pupil might have helped (during training). Completing this again at the end of the teaching programme was much easier than at the start.</p>	<p>Very Informative With a normal spelling test you do not normally quiz the pupil so take the errors at face-value. It is therefore difficult to know how far back to start a spelling recovery programme. Giving a pupil a chance to look again at a word gives those with an impulsive personality a chance to think and correct errors.</p>

5	<p>Very helpful The DASp was very helpful in understanding the individual needs of each of the children. The interaction allowed me to really focus on how much the children knew, not just about spelling a particular word, but their approach to spelling. It was surprising in two ways – sometimes a child would have a really good understanding of the spelling of the word but misunderstand a small thing so the word would be incorrect. On another occasion one of the children spelled a word correctly but really had no idea how or why – it was just a lucky guess so the spelling pattern was not really embedded.</p>	<p>Fairly Easy As with all new procedures it took a little bit of understanding how to follow all of the steps correctly. It was fairly clear and definitely became easier the more I practised it. There were quite a few steps involved but it became logical after awhile.</p>	<p>Very Informative The information from the test (DASp) was really useful. I developed an intervention in the normal way using the DILP (<i>Dyslexia Institute Literacy Programme</i>) but then I also used the spellings that they got wrong. I definitely incorporated more strategies and designed the intervention with the individual needs in mind. This made it a lot more personal than just using the results from the spelling test and looking through pieces of writing to inform the intervention.</p>
6	<p>Very helpful This provided a lot more dialogue – with standardised test results you often make a lot of assumptions. This procedure was a lot more collaborative and I think the children liked that too.</p>	<p>Fairly Easy After the training it seemed as if there was a lot to remember and the particular forms that needed to go with the different sections. However, once I read through all of the material again, it seemed straight -forward. The pictures (<i>of the spelling strategies</i>) were helpful and seem to engage the children, giving them a focal point.</p>	<p>Very Informative Going through the Graduated Prompts with the children was definitely helpful. Previously I supplemented the information from the HAST 2 by looking through their books. I would look for spelling mistakes and teach them that. Because the DASp procedure was more interactive it was about talking to them and asking them what they thought about their spelling and why they spelled things in a particular way. It was very interesting to see some of the misunderstandings that had developed as well as the gaps.</p>

9.4.5 Interviews

Interviews were included to provide further evaluation of the DASp. The interviews consisted of open-ended questions that were designed to allow the participants to elaborate on their experiences with the assessment. Participants were presented with questions relating to aspects of the DASp allowing open-ended and non-standardised responses. This was considered appropriate to allow the exploration of teacher evaluations (Punch, 2013). The interviews were audio-recorded and transcribed and then assigned to the aspects of the DASp as described below.

Questions were constructed relating to seven aspects of the DASp and full responses are included in Appendix Q.

1. Reporting of spelling strategies
2. Spelling training (mediation) and the use of picture prompts
3. Using the graduated prompt approach and the usefulness of the procedure for the intervention
4. Experiences of the children
5. Timing of the procedure
6. Overall impressions of the project
7. Suggestions for improvements

Quotes have been selected from the interviews to illustrate the range of responses.

Reporting of Spelling Strategies

Overall the teachers reported that being able to discuss the strategies that the children used in their spellings was more difficult at pre-test than at other time points in the DASp, as the children became more familiar with that type of discussion.

One of my children was very limited and he only ever (reported) sounded things out... but I think that there were examples of him using a little bit of a rule here and there that he didn't know about.... He had more strategies than he was aware of... he didn't even know. It was if he had learned to say 'sounding it out' but that he didn't really know what that meant or...it was like he'd never had the conversation about different strategies. (Participant 4).

I think that they are not used to anyone asking them about this... it isn't part of their experience... and they are wondering if they are going to be caught-out I think... and I had the pictures in front and I wasn't sure if that was helpful or not. One of them was complaining that they hadn't helped him but they had helped him. And sometimes they would say things like 'my mum says it a lot'... it didn't really match any of the strategies. I think that they were probably sounding it out but they felt they had to say something else... But I think that if you kept doing that it would help them use strategies when they do their spelling and it would also help when they discussed them. So actually, it is a two-fold thing in what it is doing. (Participant 3).

One of the children had knowledge of different strategies because I had already done some things with him before and even though he knew different ways of spelling, he tended to just sound out the things he didn't know. (Participant 2).

There was one...I don't remember which child... They were spelling MISS and when I asked what they were thinking... they said they weren't sure if it was 'I MISS you' or 'MISS' in the classroom. So, they thought that they were spelled differently... I wouldn't have known that without asking what they were thinking. I thought that was interesting. But I think it was fine for a few words, but then it became tedious. If I use it (again) then I would pick and choose which ones to look at... (Participant 6).

And it was interesting to see what they did with the ones they got right, not just the ones they got wrong... it gave a good understanding of what they were thinking about and how confident they felt... (Participant 1).

Spelling Training

Overall the teachers felt that the children enjoyed the self-correction procedure, with one of the teachers commenting that this could be extended into normal classroom practice. They felt that the spelling detective activity was useful although not all of them used the term 'detective' in the procedure. Some teachers felt that the term 'detective' was not understood by the children they worked with. Picture prompts were considered to be helpful with one teacher noting that individual cards might have been more useful than listing all of the strategies on one sheet.

I think they liked it when we did it... they seemed to understand what a detective was and if they didn't... they quickly got the idea that a detective looks for things. I am sure they understood it. I didn't use that terminology with them again in the intervention... but we used the idea of strategies. (Participant 4).

The bit where the children marked where they thought they were right and where they were wrong... the children really enjoyed that bit

actually. I think they were quite accurate with their self-judgements. (Participant 6).

I think that some words, sadly they had misjudged. But I think it is really useful. For some of them, they seemed to know straight away and wanted to grab the green (pen) and some of them they were deliberating about what they should do. I think that is a useful thing to do and it could be done in the classroom. (Participant 5).

It just didn't stick in my mind I guess, using the term 'detective'... but thinking about it, it might have made it a bit more fun... I don't know why I didn't keep using it... perhaps I just had so much else to remember. (Participant 3).

I don't think I used that word much I am afraid... I think if I had a more disruptive child...perhaps if I had an unengaged, distracted year 6 child then to engage them I might use that sort of language, but these (children in the study) didn't really need...I don't know. Detective isn't really part of their vocabulary whereas I think a year 6 child, boy or girl might be more aware of what a detective is. (Participant 4).

I think... it would have been much harder without them. Yes, they were useful. Rather than put them on one sheet I would cut them out and laminate them so there were different cards. And then they could move them about and you could almost make a game out of them... I think they would find that more enjoyable... (Participant 2).

Use of Graduated Prompts

The graduated prompt procedure was considered helpful with some of the teachers commenting that they had extended this practice into the classroom by actively encouraging children to discover the correct answer for themselves. They felt that the children's confidence in spelling improved from the procedure as it allowed them to identify the parts of words they could spell as well as the parts they couldn't. The specialists felt that the DASp helped them to identify strengths and weaknesses in the children's spelling abilities. One teacher commented that sometimes it was difficult to identify an appropriate prompt for some spelling errors, while another teacher would have liked more time to complete the procedure and provide additional prompts.

I was going to say that that is something that I have carried on. I probably already do it to a certain extent (prompting child for the correct answer)... I wonder if this is something that we could try and implement into whole class teaching... because it certainly does work. When I was working with J all I had to say was things like 'what did I say about the question words' and then he would go 'oh' and write it correctly. I didn't have to tell them anything too specific. (Participant 5).

I think it was helping, dealing with each word, one at a time. So, they knew whether they were right or wrong before moving onto the next

word. In spelling tests (in class) you get all the way to the bottom before you find out what you got right... it was a much better way of understanding the child's strengths and weaknesses... I have always thought why move on to the next word if the child is already struggling with a word... (Participant 1).

It gave me a lot more information about the child... they all got the 'dge' words wrong... they all struggled with that... Definitely in that...if they still got it wrong, it helped me understand that more support was required. If they got it right, although I know you can't assume that they always will forever...but if they got it wrong, even with 3 more prompts, then that was something that we really needed to work on. (Participant 6).

I think that it also showed up misunderstandings... that was interesting. Sometimes they were overthinking things.... (Participant 4).

I think it showed a lot of the confusions that they had... I think it is really useful. You think he has got that bit, and now he has got another bit wrong. I think I felt rushed for time... I thought it wasn't long enough... my children who find spelling incredibly hard generally, it wasn't enough to get it right. (Participant 2).

I think they enjoyed the graduated prompt bit... because they are such weak spellers they liked being told that they were nearly right... rather than it is just wrong... and I definitely found that sometimes I didn't know how to prompt for the problem he was having. Sometimes they surprise you with what they write... it is a question of getting into their brain to help them... it is a teacher challenge. (Participant 3).

Experiences of the children

The specialists reported that the children felt positive about the activities they were asked to complete during the DASp. The ability to identify their errors and the opportunity to self-correct appeared to be empowering for all the children.

The self-correction (procedure) was really good. Asking them if they knew (if they got it right or wrong) was really effective... and I have incorporated that into everything that I do now in my other spelling sessions. I think that has been really good. They loved that....and the other thing that I have kept is for them to see which letters they got right. You imagine...I did 12 spellings before and I got 12 wrong... how does that make them feel? When actually, now that I have looked at those 12 spellings, although I didn't get them right, I got most of the letters right on 11 of them... now I feel better about myself. (Participant 5).

It must be so different to what they get in the classroom... it is a completely different experience. And although it seemed a bit tedious with all of the talking... that bit... the engaged bit, they really liked. I think it is really valuable... it was very positive, and I think it was nice to be part of something new. (Participant 3).

And one of mine was saying... 'don't tell me... I want to do it.' They enjoyed being given a little bit of information to work it out. And M at the end said...'if you only told me that (prompt) I would have got it!' So, they did love all of the prompting. (Participant 4).

Timing of the procedure

Some of the teachers felt that the procedure took too long while others reported that the timing of the procedure was appropriate.

Time is a bit of an issue... but maybe that is because I wasn't completely relaxed because I knew it was being recorded. (Participant 6).

It took much longer... than I thought it would. The actual assessment process took longer. I know that it is a case of getting to know the assessment, and that comes... but it did take longer than I expected it to take. I think allowing more time would be useful. But if you have already taken the decision to do a full assessment anyway, then this is far more useful than many things that we already do. So, I would say definitely that it is worth the extra time. (Participant 5).

I don't think it took that long with the Graduated Prompts... it was only 3 wasn't it? I think it was worth the time... it was useful, I think the 14 words was about right. You get a good amount of information about them (the child) with that number of words. Any less and I don't think you would learn that much and any more would be really tiring for the weak spellers... and it would just take too long. (Participant 1).

I think if you have a child for 30 minutes and they have to be back (to class)... maybe it (the procedure) just felt long because it was hard... (Participant 3).

For me it felt like a long time... yes... you mean the intervention or the DASp? I think the whole package felt long because of the other things (baseline measures) but perhaps if you just took the spelling and the prompts and the marking... that bit wouldn't take so long. (Participant 4).

Well I think for me if I had known how much time the procedure would take I would have been more prepared... I kept thinking that I mustn't be doing this right because it is taking too long. (Participant 2).

Overall impressions of the project.

The specialists were positive about trialling the DASp procedure. One teacher commented that being involved in the project helped to raise spelling as a priority in the school. Specific elements from the DASp were also considered to be useful in the classroom. Strategy training for spelling was felt to be important. One specialist commented that it would be useful to introduce the

spelling strategy concepts to children in earlier grades. It was also noted that the procedure felt far more collaborative than standardised static tests.

Being involved with the project has elevated spelling status beyond... What we used to get often was 'oh we will get spelling out of the way and then we can get on with our lesson'... you know it was very much perceived as this negative add-on thing and that's how it was perceived by the children... The parents on the other hand just wanted a list that they could go through with their children... and we have moved away from that... We are going to get the children to self-correct their own spelling tests from next term... including the letters... (Participant 5).

I think that the earlier they start... I know we worked with 8-9 year-olds, but I think if they start earlier... then they have a better understanding of strategies. I know with J... that he has had years of not being able to spell words so he didn't really want to try at first... In class, when he got to spelling he would just stop and he wouldn't try. And this... it helps children have a go... with him I think he had learned that he wouldn't get it right. He didn't want to get it wrong... he wanted to get it right... and with him, it has taken ages... to have a go... (Participant 2).

And also, in terms of self-esteem, the thing that prompted me was... there is a child who has severe dyslexia sat next to a child who is good at spelling... Someone said to me that in the class... they could see him physically shrinking in his seat as he realised how embarrassing it was going to be... So, he was very conscious of the fact that ... It was like - 'I know I can't spell and I know I get them all wrong and now I have to pass them over to someone else... who will cheerily confirm that I got them all wrong'. But I am thinking actually, that any spelling issue... if we impart the knowledge (spelling strategies) and get them to think about their spelling and get them to underline what they think is not correct. (Participant 6).

Yes, this has definitely made a difference in the way that I approach the work that I do. I will prompt gradually... and ask how do you think you got that right? That is something that I will do all the time now. It just seems to be a better way of doing it. (Participant 1).

Before... (information from standardised tests) with the teaching you made a lot of assumptions... but it is still teacher- led isn't it? Whereas this became far more collaborative I think because we could say... 'remember when you told me blah, blah, blah'... and it became far more interactive. And I would say things like... 'can you remember before what it was you struggled with? And I think the children really liked that. Particularly J, because I asked him at the end... and he said... I really like it because we were ticking the things I got right... so instead of it being led by the teacher it was more a collaborative thing. So I think it was taking those things from before and referring back to them... It is about empowering them isn't it, rather than under-estimating what they can do. Because there is this... and it comes down to self-esteem... you know the head is down, they don't want to appear above the parapet... make those decisions and have everyone laughing at them... If we empower them by giving them an

understanding that there are strategies to help with their spelling...that is really important. (Participant 4).

Suggestions for Improvements.

One of the suggestions for improvement of the DASp was that the instructions for administration could be clarified by providing alternative methods of presentation including bullet points and video recordings. They felt that they would have liked more practice opportunities before administering the DASp to the children.

I think a step-by-step... I found it very wordy (the explanation for the procedure)... I tried to redo it on post-it notes... so I knew what to do. Yes, more bullet points... I wasn't sure what to say next and the recorder was going... So, I put post-it notes to help me.... I think that a step by step would be more helpful as well as the more detailed information. (Participant 3).

Now I have done it with two children...now I think I would know what I am doing and I think now that I could do it quite well... Going through the first one was hard, even though I had done the practice one... (Participant 6).

I suppose it is a little bit like learning a new standardised test...it is really hard at first and then after some practice it is easier... (Participant 1).

...I quite like the idea of having a little video... that would have stayed in. During the training it all seemed quite straight forward... but I think watching it... as another way of learning (would be useful). (Participant 2).

9.5 Discussion – Part Two: Evaluation of the DASp by the specialists

The specialists reported a number of positive comments regarding the procedure. Overall, they identified it as being helpful in providing information that contributed to their understanding of the children. In particular they felt that the self-correction and graduated prompt procedures contributed significantly to the children's self-esteem in relation to spelling to the extent that a modified version of the procedure might be usefully implemented in a classroom setting. Their comments suggested that the additional information contributed not only to the specialists' understanding of the child's difficulties but also enabled the child to reflect on correct and incorrect understandings of their spellings.

Strategy use and strategy training were identified as being useful in providing profiles for the children, although it was noted by two of the teachers that they believed the children they worked with used more strategies in their spelling productions than they were able to verbalise. One suggestion offered was that a dialogue around the use of spelling strategies could be developed in the classroom. This may encourage the children to use different approaches to support them with their spelling and provide them with a vocabulary that would enhance discussion.

Criticism of the DASp generally centred on the amount of time needed to complete the procedure, a criticism reflected in the literature (e.g. Elliot, 2003). For this study, measures included baseline testing of reading, expressive language, phonological awareness and spelling. This information was important to allow comparisons to the previous two studies. However, for use in schools, the DASp is intended to sit alongside a standardised test of spelling without other baseline measures (although these may be administered in a full assessment by a specialist teacher). The total time for the DASp (pre-test, teaching and post-test) is approximately 45 minutes. It is acknowledged that the 1:1 interaction required by the DASp does take longer to complete than a standardised spelling test that can be administered quickly and to groups of children if required. However, the variability in the children's spelling abilities as revealed by the procedure does suggest that the DASp makes a valuable contribution to understanding the children's sources of difficulty, particularly for the weakest spellers. Extended practice opportunities may make the process feel less time-consuming.

9.6 Chapter summary

Study Three described the development of the DASp and the information it might provide about the spelling weaknesses and strengths of 50, 8-9 year-old children with dyslexia. The aim of Study Four was to evaluate the DASp procedure for use by dyslexia specialists in schools. Outcomes for the children were reported in the first part of this chapter and the results demonstrated overall improvements in spelling accuracy relative to the difficulties identified by the DASp. This outcome provides some evidence for the efficacy of the procedure. Teacher evaluations suggested that it provided additional information about the children's spelling abilities and that the interactive nature

of the assessment was beneficial in providing a collaborative approach between the child and the teacher. Overall feedback was positive with a number of useful suggestions for improvement of the procedure provided.

CHAPTER Ten: Overall discussion and conclusions

Feuerstein reminds us that the finger should point back at us and not at the child if the child does not respond to the interventions offered. The challenge is to go 'back to the boards' to find interventions to which a child can respond. (Lidz, 2014, p 301)

10.0 Introduction

The primary research aim of this thesis was to develop a spelling assessment within a DA model that provides a detailed profile of spelling ability for children who are struggling with spelling. The intention was that such an assessment might be used alongside a conventional static assessment by dyslexia specialists working in primary schools in the UK as part of an assessors toolkit. Children with dyslexia were identified as being relevant to a study investigating the DA of spelling as there is substantial evidence to identify that this group of children often have difficulties with spelling that are as severe and sometimes more persistent than their reading difficulties (e.g. Cassar et al., 2005). Further, Hasson and Botting (2010) identified that DA as a concept has the potential to provide detailed instructional information to bridge the gap between assessment and intervention and that it could be particularly useful in over-tested populations, such as children with dyslexia. Dyslexia specialists were targeted as being appropriate participants for an exploratory study of a DA of spelling as they are familiar with psychometric assessments as well as the design and delivery of interventions for this population of children.

The over-arching research questions formulated were:

1. What is the current assessment practice of dyslexia specialists working in schools?
2. Given the interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?
3. If so, can a spelling assessment be developed within a theoretical framework for DA?
4. What additional information can a DA approach to spelling provide?

5. How can this information be used to support weak spellers?

10.1 Summary of the studies

Research Question One: What is the current assessment practice of dyslexia specialists working in schools?

Study One (Chapter Six) gathered information on the current assessment and teaching practices of dyslexia specialists. Using an investigative approach, a survey instrument was used to explore how spelling was currently assessed; to determine if an alternative approach to conventional static assessment could be useful; and to examine the level of the specialists' knowledge in relation to the support of spelling. Using randomised sampling, a total of 299 teachers responded to the two surveys. Survey One took a broad approach by including specialists from all educational settings (i.e. primary, secondary, further and higher education) while Survey Two focused on the primary sector. The results from both surveys identified that, most commonly, a conventional static assessment of single-word spelling was used. These assessments typically used a spelling to dictation format and were scored according to the number of words correct. To supplement this information dyslexia specialists used a range of information from informal sources including error analysis and age-appropriate inventories from published programmes such as Alpha to Omega (Hornsby, Shear & Pool, 1999) and Catch-up Literacy (The Caxton Trust). Other resources, including lists of age-appropriate words, were also used. Observation and conversations with the learner were also considered by the specialists to provide useful information when designing support programmes. This use of supplemental material appears to provide support for the argument identified in the research literature that although static tests provide valuable information about a child's ability in relation to his or her peers, the derived standardised scores are relatively gross measures of spelling ability (Al Otaiba & Hosp, 2010; Kohnen & Nickels, 2010). Such measures miss valuable detailed information that could be essential for targeted support. Survey Two focused on dyslexia specialists working in the primary sector (the age-group identified in this thesis for an exploration of the DASp). In addition to questions relating to assessment and information for support, this survey explored the specialists' knowledge of the elements involved in teaching spelling as drawn from the literature. Specialist

teachers reported good levels of understanding of phonology, spelling strategies, spelling by analogy (spelling families) and orthographic strategies, but had less knowledge of morphology, spelling development and etymology. This information was then used to support the design and development of the final DASp procedure.

Research Question Two: Given the interactive nature of DA, can children with dyslexia provide meaningful verbal self-reports of their approach to spelling?

Numerous approaches to DA are identified in the literature with general agreement that the procedure involves verbal interaction between the assessor and the child (e.g. Haywood, 1992; Lidz, 1991). A child's ability to discuss and report his/her approach to spelling words (i.e. provide a verbal self-report) was therefore considered to be an integral component of a possible DA of spelling. A number of studies using a verbal self-report protocol to investigate spelling in typically developing children were found in the literature (e.g. Critten et al., 2007; Dahl et al., 2003; Farrington-Flint et al., 2008; Rittle-Johnson & Siegler, 1999), however no comparable study could be found for children with dyslexia. Given the verbal nature of DA tasks, this was an essential starting point for this thesis. The aim of Study Two (Chapter Seven) was therefore to determine if children with dyslexia (8-9 years of age) could provide verbal self-reports of their spelling strategies and how their performance compared to the performance of typically developing children of the same age. An additional group of younger, typically developing children matched to the spelling age of the children with dyslexia, was included to examine if the strategies used by each of the groups was quantitatively different. Sixty-six children (6-9 years of age) with 22 children allocated to each group, were presented with a spelling recognition task adapted from the procedure developed by Critten et al. (2007). The data was analysed in two ways. First, the children's responses were allocated to the different categories of the Representation Redescription (RR) model (Karmiloff-Smith, 1992). For this analysis the groups were compared using the same procedure as Critten and colleagues. Second, the spelling strategies used by the children were coded according to the categories identified by Rittle-Johnson and Siegler (1999).

The results of Study Two suggested that children with dyslexia could provide meaningful self-reports of the strategies they used in the same way as typically developing children. The term 'meaningful' was defined for this study as the

ability to provide verbal reports that enabled the researcher to classify responses according to the levels identified in Critten et al. (2007) drawing on the RR model. The study found that less children with dyslexia could be allocated to an overall representational level in the RR model than both typically developing groups suggesting a difference between these groups of children in their ability to form representations over time. Although not a primary aim of this thesis, this presents an intriguing finding that could be explored further in future studies and adds to the literature investigating if the errors made by children with dyslexia represent a delay or difference (e.g. Bourassa & Trieman, 2003; Cassar et al., 2005; Protopapas et al., 2012).

Differences in strategy use were also identified between the groups in Study Two. Typically developing children were more likely to use the full range of identified strategies when approaching the spelling task than same-age children with dyslexia who tended to rely on a sounding out (phonetic) strategy in isolation in the spelling recognition task. The children in the dyslexia group were therefore not always successful in identifying the correct spelling of the target word. These children could often identify the sounds in the words but showed difficulty in recalling the exact letters or letter patterns of the word. This is consistent with other studies that report that poor spellers have difficulties remembering word-specific information (e.g. Fayol et al., 2009). One implication of this outcome is that it may be useful to explicitly teach a range of strategies to children with dyslexia when supporting them with their spelling. This study provided two important outcomes concerning the development of a DA of spelling. Firstly, the results identified that children with dyslexia could meaningfully report strategy use; this is an essential requirement for DA that has verbal interaction with the assessor as its core characteristic. Secondly, the reliance on a phonetic strategy by the children in the dyslexia group provided the possibility of a training focus for the mediation phase of the DA approach.

Research Question Three: If so, can a spelling assessment be developed within a theoretical framework for DA?

Study Three (Chapter Eight) outlined the development of a curriculum-based DA of spelling (DASp) using the theoretical framework identified by Lidz (2014). The approach used a combination of established procedures drawn from the literature and incorporated a pre-/post-instruction test format with strategy instruction in the

mediation stage between the two tests. To reduce the effect of immediate recall at post-test, a phonological activity was inserted directly after strategy instruction. The post-instruction test incorporated a Graduated Prompt (GP) scoring procedure to provide some quantitative information against which progress could be measured both within the learner as well as in comparison to peers. While the number of prompts provided was restricted to three prompts, the content of the prompts was not scripted. Prompts took the form of instructional conversations that directed the child to consider the range of spelling strategies discussed during the mediation phase. Fifty children between the ages of 8-9 years, meeting the criteria for dyslexia, participated in Study Three.

Research Question Four: What additional information can a DA approach to spelling provide?

The DASp procedure developed in Study Three provided important information about the children's spelling abilities by producing individual spelling profiles. Taken together, the results suggested that the procedure identified variability in the spelling abilities of the children with dyslexia beyond that provided by a conventional standardised test. The strategies reported by the children in this study were broadly in-line with those reported by the children with dyslexia in Study Two with small differences most likely due to changes in format and word list. Overall, strategy use after mediation (using spelling strategy training) identified differences between the children with regard to the use of overall strategies, multiple strategy use on individual items and the number of different strategies used, together with the amount of support required to reach the correct answer.

Research Question Five: How can this information be used to support weak spellers?

Study Four (Chapter Nine) described the use of the DASp by 6 dyslexia specialists in a primary setting to assess and support 12 children with dyslexia. The specialists were trained to use the DASp procedure and then asked to administer the DASp with the children. The information was then used alongside the results from a standardised test to design and deliver five hours of 1:1 literacy intervention. The progress of the children was identified by measuring changes from pre-test to post-intervention. Specialists' evaluations of the DASp were

studied via feedback from questionnaires and interviews. The DA sessions were audio-recorded and transcribed to check fidelity to the administration of the assessment. The information from the DASp was used to identify a spelling profile for each of the children to inform the structure of the intervention. At the end of the intervention, the DASp procedure was repeated to explore changes in the children's spelling levels.

The results from this small-scale pilot study supported the view that the DASp measures provided useful additional information to inform a programme of support. At the end of the intervention the children made varying levels of progress on the spelling accuracy tasks and this was consistent with the spelling ability profile established from the initial DASp procedure. Even where no change in the spelling accuracy score was recorded, all of the children demonstrated a decrease in the amount of support that they required to achieve the correct answer.

10.2 General discussion

DA as an assessment approach is a concept that is intuitively appealing to practitioners and teaching professionals (Elliot, 2003) as it provides insight into not only what a student knows, but their ability to learn. The approach has an extensive research base emerging from the Vygotskian theory that children's development is mediated by social interaction with others including teachers, peers and collaborators. There have been numerous studies (e.g. Budoff, 1987; Feuerstein et al., 1980) that have used DA to examine domain general cognition, that is, the cognitive processes necessary for all learning and problem solving, particularly with disabled populations. More recently in the developmental history of DA, the approach has been used to examine domain specific cognition, the information particular to a curricular domain such as reading or mathematics. It is this second DA approach that has been of interest to this thesis.

The assessment of spelling presented an interesting subject for the exploration of a curriculum-based DA. Learning to spell is a complex learning process, particularly in an opaque language such as English (Caravolas et al., 2001). It involves the processing of numerous components including phonology, orthography and morphology and the development of a repertoire of appropriate

strategies to efficiently and flexibly coordinate the information required (Farrington-Flint et al., 2008). Beginning spellers internalise and organise information about spoken and written words and then use this information to develop provisional rules in a cognitive framework that can then be applied to the spelling of words. This information is supported at the classroom level by good quality teaching that assists the child's understanding of the building blocks of written language.

For children with dyslexia however the acquisition of accurate and efficient spelling processes is not always straightforward. The literature base in the field of dyslexia has historically focused on the reading difficulties encountered by individuals with dyslexia; however, there is wide general agreement that dyslexia also causes difficulties with spelling (e.g. Berninger et al., 2013; Cain, 2010; Coleman et al., 2009). These difficulties may remain into adulthood even if reading difficulties have been resolved (Berninger et al., 2013) and several studies have identified that adults with dyslexia report difficulties in writing, rather than reading, as their biggest concern (e.g. Burden, 2005; Mortimore & Crozier, 2006).

Recruiting children with dyslexia to a study that aimed to develop and examine the efficacy of a DA of spelling therefore seemed appropriate. Given the research evidence that the earlier literacy difficulties are not only identified but also supported (Rose, 2009), it was considered that children of primary school-age with dyslexia would be the most suitable participants. Children between the ages of 8 to 9 years in Key Stage 2 were identified on the assumption that children of this age would have developed an appropriate vocabulary around spelling to allow them to interact with the assessor. This age group has been used in previous studies of DA, for example the DA of sentence structure (DASS, Hasson et al., 2012). Dyslexia specialists working in primary schools were also considered an appropriate choice to pilot and evaluate the final DA procedure. This group of teaching professionals has expertise in the assessment and support of children with dyslexia – two elements considered to be essential to the DA approach used in this thesis.

In the literature, standardised assessment is identified as static testing because it adheres to strict administration guidelines with examiner impartiality and no feedback provided. In this approach, the emphasis is on what the child knows,

not how they learn. This may be appropriate in some circumstances, for example for the classification of children for special education provision or for research. However, in order to effectively support children, static tests of spelling with a binary outcome (words correct or incorrect) provide only a relatively gross measure of a child's spelling ability. Detailed knowledge of the child's strengths and weaknesses is an important component in guiding decisions about what to support and the best way to do so. As Kohnen and Nickels (2010) argue 'we must go beyond knowing that a child has poor spelling and understand why they have poor spelling' (p. 37).

The two surveys undertaken in Study One identified that dyslexia specialists in the UK commonly use conventional static testing to assess the spelling abilities of children with dyslexia. This is not surprising given that training in the use of psychometric testing forms an integral part of specialist teacher programmes as directed by the national organisations that oversee specialist teacher practice in the UK. Responses from these surveys also identified that the specialists supplemented information from static tests of spelling with additional qualitative information in order to inform intervention. This supports the argument identified in the research literature around the limitations of conventional static assessments (e.g. Resing et al., 2009). The results from the surveys identified that additional information is required to enable the specialists to devise a programme for effective educational support.

The most common supplementary approach reported in Study One was the use of error analysis. Post hoc error analysis has been frequently reported in research evidence as a tool for understanding difficulties in literacy in order to facilitate intervention (e.g. Mather & Wendling, 2017). This procedure allocates errors to specified categories such as phonological, orthographic or morphological errors and has often been used in the literature to develop theories of spelling development. Within stage and phase theories of spelling development (e.g. Ehri, 1987; Frith, 1986) based on error analysis, a child's spelling difficulties are taken to reflect an inability to move from one stage or phase to the next. Allocation of strategies to specific error categories allows the specialist to make assumptions about the child's knowledge and the strategies they use. This information serves as the basis for intervention to support the child to move from one phase to the next (Kohnen et al., 2009). However there has also been criticism of this approach: meeting the criteria for literacy difficulties could be considered highly

subjective since error classification is likely to be strongly influenced by the experience of the researcher or practitioner and the assumptions made may not be a true reflection of the child's abilities (Bissaker & Westwood, 2006). Error analysis may also potentially miss important information leading to incorrect assumptions and decisions. This possibility was clearly illustrated in Study Two, where one child, when asked how she knew that a particular word was correct, answered that she 'just guessed'. In this example, no error analysis would have been applied since the answer was correct. The specialist would thus be left with an incomplete understanding of the child's spelling abilities. An additional complication of error analysis is that numerous classification schemes can be identified in the literature, often relating to specific research aims, however no single system for coding errors is recommended for classroom or specialist use. Therefore, the initial coding scheme used to code errors is likely to vary among practitioners as well as the interpretation of the relevant scheme.

An alternative approach to error analysis that had not been explored in children with dyslexia until this study, was to elicit verbal self-reports about the strategy or strategies the children used when spelling (Donovan & Marshall, 2016). This approach has been used in a number of studies with typically developing children (e.g. Critten et al., 2007; Farrington-Flint et al., 2008). It is suggested that understanding the differences in children's strategy choice has important pedagogical implications for support. This was investigated further in Study Four with children with dyslexia. The use of verbal self-reports, used in a structured way, resonates with one of the survey outcomes from Study One that identified that dyslexia specialists often found it helpful to have conversations with the learner to elicit further information about their difficulties and strengths. On this basis, 'instructional conversations' (Davin & Donato, 2013) were incorporated into the design of the DA procedure in Study Three, rather than a strictly scripted set of prompts. Since Donovan and Marshall's study, a verbal self-report protocol has been used to investigate the differences in strategy use between English speaking children with dyslexia and French speaking children with language difficulties (Joye, 2019).

Study One compared the information identified in the literature and the practice of dyslexia specialists, providing support for the exploration of a DA approach to the assessment of spelling for children with dyslexia. DA moves away from the conventional method of static assessment by integrating assessment and

teaching. This approach therefore also fits well with the response-to-intervention (RTI) model commonly associated with the identification of dyslexia (see Rose, 2009). The RTI model was developed to address the criticism that some children are diagnosed as having a literacy difficulty when they simply may not have had the benefit of a good-quality classroom teaching environment (Justice, 2006).

Study Two established that children with dyslexia were able to verbally interact with the assessor and provide a self-report of their spelling strategies in the same way as typically developing children. Given that the defining component of DA is an interaction between the assessor and the child, this was a crucial consideration. Analysis of the strategy reports from all groups of children across the studies supports the overlapping waves model (Siegler, 1996) that conceptualises children's cognitive development in terms of variability in thinking rather than in a linear relationship with age (as proposed by traditional stage theories). For Study Two, the children's strategies were allocated using the categories adapted from Rittle-Johnson and Siegler (1999). In Study One, while the typically developing children were more likely to use a full range of strategies and often more than one on a per-item basis, the children with dyslexia were more likely to use a sounding out (phonetic) strategy. Relying on this strategy is often not successful in an opaque language such as English. Examining if children with dyslexia make different errors to those of typically developing children could have implications for effective teaching and intervention.

Although the primary aim of this thesis was to investigate the assessment and support of children with dyslexia, the inclusion of typically developing children, matched both by chronological age and spelling age, provided some information that might add to the literature regarding spelling delay, or difference, for children with dyslexia. Studies incorporating error analysis methodology have generally concluded that children with dyslexia do not appear to produce a distinct pattern of spelling errors compared to typically developing children. However, using verbal self-report methodology, Study Two identified differences in strategy choice between the groups. The children with dyslexia appeared to have a narrower choice of strategies available to them suggesting that they may benefit from explicit spelling strategy training and that this may be required well beyond the age that their typically developing peers stop receiving such instruction (Carreker, 2011). Herbert et al. (2018) identified that while phonics instruction is the most common form of support relating to spelling, this training does not

appear to be translating into more accurate spelling. Spelling in the English language requires a good understanding of more than just phonics; there are numerous phonetically plausible ways to misspell words (McGeown et al., 2014). Together with the research literature identifying that good spellers have a diverse repertoire of spelling strategies available (Bourassa & Treiman, 2003; Cassar et al., 2005), spelling strategy training was included in the final version of the DASp procedure.

The final design of the DASp was developed using the theoretical framework for a curriculum-based DA (Lidz, 2014). It used a pre-test, spelling strategy training (as a mediation stage) procedure followed by a post-test that incorporated a graduated prompt approach. A maximum of three prompts delivered in a hierarchical manner from implicit to explicit was provided. The content of the prompts was unscripted allowing the assessor to deliver cues in an individualised mediational style to reflect the difficulties that the child displayed in their written response and subsequent explanation. Variations in the content of the prompts would therefore be expected. All of the children in the study reached the criteria for inclusion based on performance equal to or below the 16th percentile on a standard score of reading, since reading difficulties are the predominant characteristic of children with dyslexia. However, not all of the children demonstrated weak spelling skills, standardised scores ranged from 60 (well below average) to 105 (average). These children typically reflected the different abilities of children with dyslexia and for this study there was no reason that the children all had to demonstrate exceptionally weak spelling skills. By including children with a range of spelling abilities in the study the hope was that different children would respond to the DASp in different ways and that this would reflect different patterns of learning.

The research literature identified two broad approaches to DA – a test-teach-retest design and a train-within-test design (Dörfler et al., 2009). For the DASp the decision was taken to incorporate both elements within one procedure. A short teaching session was inserted between the pre- and post-test (test-teach-retest) while a graduated prompt protocol (train-within-test) was included at post-test. By including the graduated prompt component it was possible to elicit a measure of how well the child responded to the short training session (by providing a change measure for spelling accuracy and strategy use). In addition, it allowed the assessor to capture fine-grained detail of how much additional

support might be required to reach the correct answer. This information was essential in determining the child's level of understanding of each word thereby eliminating the possibility that they may have simply guessed the correct answer. The content of the mediation element for the DASp was informed by Study Two whereby the children with dyslexia demonstrated patterns of strategy use that were dominated by a sounding out (phonetic) strategy. This pattern was reproduced in Study Three although small variations were noted in responses. These may have been related to the change in format between the two studies from a recognition to a production task.

As demonstrated in Study Three, the DASp produced unique profiles for each of the children and demonstrated variability between them when compared to a static measure of spelling. This resulting differentiation is consistent with previous interpretations in similar studies such as the Dynamic Assessment of Word Learning (DAWL, Camilleri & Botting, 2013) and the Dynamic Assessment of Sentence Structure (DASS, Hasson et al., 2012), both in the field of speech and language therapy. Both of these studies identified that the DA procedure provided access to further important information about the children, for example how they approached a language task, their ability to problem solve and self-evaluate, and their potential to learn from the examiner, in comparison to static testing. The expectation is that the additional information gathered by a DA approach would be used to inform the design of individualised intervention.

The DASp was designed as an assessment tool for dyslexia specialists on the assumption that the combination of static and dynamic measures may provide a more complete picture of a child's overall spelling profile than static measures alone. Study Four evaluated the use of the DASp by dyslexia specialists. Feedback was positive overall with regard to ease of use which is an important consideration in terms of the potential uptake of the procedure, although it was noted that the protocol was found to be time consuming. This was partially due to the inclusion of several static measures into the procedure in order to allow for comparisons to the previous studies. These measures would not be considered part of the DASp protocol although they would be routinely administered in a dyslexia assessment. Encouragingly, the results identify that the specialists were able to independently administer the assessment and code the children's strategy reports (as demonstrated by the high levels of interrater reliability between the

specialists and the researcher) with minimal training. Accessibility is considered an important element of any new assessment (Hasson et al., 2012).

The real test of the effectiveness of the DASp is ultimately the outcomes for the children. After 5 hours of intervention, developed by the specialists from the DASp data, all of the children in the study showed improvement. For some children this was reflected in raw scores and/or standard scores from the static test of spelling, and for others in a decrease in the amount of support (graduated prompts) they required to reach the correct answer. Consistent with the DASS and DAWL assessments discussed previously, the outcomes of the DASp illustrated sensitivity to small changes and differences in the children's pre- and post-test scores compared to static tests. The graduated prompt procedure used in the DASp demonstrated variability within the population of children with dyslexia that could not be detected using a static test alone. Glaspey and Stoel-Gammon (2007) argue that static and dynamic assessments provide different information at given points as well as across time and this was clearly illustrated in this study. At both baseline and post-intervention a number of children in the pilot study achieved scores in a similar range on the static test of spelling (and in one case, identical scores), however they demonstrated quantifiably different scores on the graduated prompt procedure. This revealed clear differences in their understanding of the correct spelling of the target word. In addition, the graduated prompt procedure facilitated the identification of strategy-use by the children. These two critical strands of information would not be revealed by a static test of spelling.

Interestingly, the dyslexia specialists evaluating the DASp identified a number of additional positive elements from Study Four that were not considered in the initial design. Giving the children the opportunity to self-correct their errors by providing prompts was considered to be particularly effective and it was reported that the children felt engaged and enjoyed being given the opportunity to respond to the prompts provided. Further feedback identified that the collaborative approach within the dynamic assessment protocol was important to the children's self-esteem and had a positive impact on their learning. Incorporating spelling strategy training into the classroom was also considered important by providing appropriate vocabulary around spelling to enhance discussion. Suggestions for improvements to the DASp included extended practice opportunities, possibly by

providing a video recording of the procedure, as well as refining the administration instructions.

10.3 Limitations and future directions

The DASp has a number of limitations that can be identified. One of these applies to the lack of standardisation of the prompts provided within the assessment that makes quantifiable comparisons difficult. The unscripted nature of the graduated prompts used does raise the question of whether the help *provided* by the assessor in both the mediation session and the application of the prompts, is the same as the help *needed* by the child. This is a major source of unreliability in DA because the examiner has to make a judgement in choosing the most appropriate prompt to support the learner (Carney & Cioffi, 1992; Haywood & Lidz, 2007). It is likely that the dyslexia specialists in the study may respond differently in inferring specific needs for the graduated prompts. This unscripted approach proved problematic for one of the dyslexia specialists in Study Four who reported that she sometimes found it difficult to formulate an appropriate prompt for the child. A concern of DA data is that it is directly dependent on the skill and experience of the examiner and that different examiners may reach different conclusions reflecting their own training and experience (Haywood & Lidz, 2007). Similarly, where a child did not make a clear statement identifying the response (for example by reporting that they 'sounded it out') which made classification unequivocal, the coding decision again relied on the skill and experience of the specialist. It is possible that different specialists could make different decisions. For the study comparing verbal self-reports between children with dyslexia and typically developing children (Study Two) and the study that explored the development of the DASp procedure (Study Three), the coding was initially undertaken by the researcher. A sample of the coding was then compared to the independent coding of another experienced researcher. For the pilot study (Study Four), dyslexia specialists were trained over a two-week period and provided with a coding manual. Audio recordings of the DASp sessions were independently transcribed by the researcher and the responses coded; these were then compared to the coding completed by the dyslexia specialists. In all of the studies a high level of interrater reliability was calculated in relation to the coding of the children's responses to strategy use indicating that there was good consistency between the raters. There was particularly high agreement in the final study (Study Four). This may reflect the professional training and experience of the

specialists in the study that provided them with a good understanding of strategy use (as illustrated in the survey responses in Study One) and their ability to infer strategy use from the children's responses. This understanding would have also allowed them to utilise a range of instructional techniques to support the children during the mediation phase of the DASp. Despite high levels of interrater reliability however, it could be argued that the coding used by each teacher is still subjective and based on experience and training in the same way as error analysis.

The self-report of spelling strategies on which coding was based is also subject to some limitations. It could be argued that the incorporation of picture cues to support working memory for spelling strategies within the DASp procedure may have directly influenced the child's response. It is possible that some children, who may have been unsure of how to approach an unknown spelling, could have simply identified what they thought might be appropriate, rather than reporting the strategy they actually used. Studies with typically developing children (e.g. Rittle-Johnson & Siegler, 1999) established good validity for verbal reports of strategy use with younger children (mean age 6 years 10 months) however no similar study could be found in the literature with children with dyslexia. For future studies therefore, it would be of interest to compare the children's reported spelling strategies with a conventional teacher error analysis in order to identify similarities and differences.

One of the defining features of the DA procedure used in this thesis is the inclusion of a graduated prompt procedure at post-test. In the DASp this was operationalised as the child's response-to-intervention. Although this was conducted over a shorter amount of time than envisioned by advocates of the RTI model (e.g. Fletcher et al., 2007; Justice, 2006), the graduated prompt procedure used in the DASp does fulfill the basic tenets of the model by offering increasingly intensive levels of support within the prompts. As suggested by Carney and Cioffi (1992) however, this might be better described as 'response to instruction' to acknowledge that the procedure provides an indication of the child's level of understanding, rather than identifying a learning difficulty as the RTI model proposes.

DA of any skill is likely to face challenges in establishing psychometric properties (Haywood & Lidz, 2007). By its nature, DA involves the provision of opportunities

for the child to learn. However, because of the highly individualised nature of the learning opportunities presented, scoring becomes increasingly subjective making the analysis and interpretation of the results less reliable and less valid as discussed earlier. In addition, Camilleri and Botting (2013) note a tension in identifying high correlations between standardised tests and measures of DA. On the one hand, correlations between the tests suggest good content validity between the instruments; on the other, high correlations between DA and static measures question whether the DA provides additional information about the learner. In the development of the DASp correlations were identified between the static spelling task (HAST-2) and the graduated prompt scores. For this study this was a negative correlation – the relationship identified that the lower the HAST-2 score, the higher the number of prompts required. However, in contrast to static assessment, the DASp generates both quantitative information (accuracy scores and Graduated Prompts scores) and qualitative information of strategy use. In doing so, it provided a substantial amount of additional information which could be drawn on by the specialists when planning support for individual children.

The studies presented in this thesis explored the possibility that the DASp might provide additional information to a conventional static measure to support children with dyslexia. The results from Studies Three and Four suggest that this was the case. For future studies it may be useful to compare children with dyslexia and typically developing children. It could be anticipated however that a chronological-aged match of typically developing children would achieve spelling accuracy scores on the experimental list of 14 words in the DASp at, or close to, ceiling. A spelling-age match of typically developing children may therefore provide some interesting insights and could be considered for any future studies.

Limitations in the small-scale pilot undertaken in Study Four can also be identified and should be addressed. The 1:1 intervention provided by the teachers was conceptualised as specialist support. Due to the paucity of research evidence available for interventions at this level (Darch et al., 2000), the duration of the intervention was guided by effective provision at the targeted level (Wave 2, using the Rose review terminology). This advocates short periods of highly structured support spread out over the week for a duration of between 10-12 weeks (Griffiths & Stuart, 2011). The lesson plans provided by the specialists identified that support was generally delivered in two 30-minute sessions each week for the requisite five hours of intervention. The author acknowledges that the requirement for five hours of intervention support is an arbitrary number and was essentially

driven by the availability of the teachers and the children in the study. In addition, the content of the intervention was not the same for all of the children. Each specialist constructed an individual programme based on the strengths and weaknesses identified from the DASp. This could be considered a limitation if the intention of the study was to compare children's progress with others in the study or to measure the effectiveness of a specific intervention. However, the aim for this study was to examine the progress made by each child and examine if the information gained from the DASp influenced the outcomes, rather than comparing group outcomes. This approach could be said to be more closely aligned with the approach used by the specialists in their school settings. Overall, the children received the same amount of intervention time allowing some comparisons to be made. A further consideration is that only spelling ability was measured post-intervention. Future studies should also measure reading – reading and writing are functional systems that may exert reciprocal influences on one another. Kohnen and Nichols (2010) identify that spelling training is likely to have more influence on reading, than reading training on spelling.

Finally, one of the major criticisms of DA cited in the literature is the amount of time the procedure can take to administer (Deutsch & Reynolds, 2000) when compared to conventional static assessment. This criticism was also applied to the DASp in the evaluation provided by the dyslexia specialists during the piloting stage (Study Four). This is a relevant criticism for specialists working in a busy school environment. Isolating the DA procedure from the other components of testing required for the study, such as baseline testing, as well as simplifying instructions, would reduce the amount of time required to administer the procedure. Increased familiarity with the assessment would also support this.

10.4 Final conclusion.

DA is supported by an extensive evidence-base (e.g. Haywood, 1992; Poehner, 2008; Sternberg & Grigorenko, 2002) and is considered to be a person-centred approach to assessment in that it describes a child's learning processes, style and potential. The concept of DA was developed as an alternative measure to address the limitations of conventional static assessments that provide a quantitative measure of the child's functioning in a particular domain – *learning product* – but fail to identify the reason for success or lack thereof. By contrast,

DA provides information not only about what the child knows but importantly, how he or she learns. For specialists with the responsibility of supporting children with dyslexia, it is this information that could be considered to be directly relevant.

The outcomes from this thesis identify that a DA of spelling can provide additional information about a child's spelling abilities when compared to a static assessment. To the best of the author's knowledge, the DASp is the first assessment incorporating a DA approach in the domain of spelling. It incorporates many of the characteristics of DA in the domain of reading which rely on specific instruction and practice in meta-cognitive knowledge, including strategies, that relate to specific goals. The results suggest that the DASp should be regarded as a source of information that complements static assessments and other methods of information gathering as part of a comprehensive assessment repertoire rather than as a method for classifying children for special education services. DA is conceptualised as a form of training intervention that provides additional information for educational support as well as being considered a reliable and valid spelling measurement. When a static approach and a DA approach are compared, the information provided by the latter can provide a very different profile; this outcome is consistent with other DA assessments reported in the literature, for example the DAWL (Camilleri & Botting, 2013) and the DASS (Hasson et al., 2012). The commonality of feedback from the dyslexia specialists who piloted the approach was that the DASp constituted a useful source of information to inform the process of planning interventions that improve spelling skills.

It is suggested that the DASp provides a more structured, additional, assessment approach to support specialist teachers' practice when developing support programmes, than current ad-hoc practice. The profiles generated by the DASp provided a unique profile of the strengths and weaknesses of each of the children in the study. This demonstrated that although children may achieve similar spelling scores on a standardised test of spelling, they may also demonstrate different levels of spelling knowledge. The addition of the graduated prompt procedure in the DASp provided a unique measure of how much support might be required as well as how intensive it might need to be. The outcomes from this study support the view that a combination of static and dynamic measures provide a more complete profile of a child's overall skills (Glaspey & Stoel-Gammon, 2007).

Within the confines of the limitations discussed, the findings from this thesis suggest that while more research is clearly required to substantiate and replicate the outcomes, DA offers a promising additional approach for dyslexia specialists. The DA of spelling is offered as a proof of concept adding to the studies of DA in other areas of the curriculum. The results presented suggest that the DASp has practical potential in the assessment and support of spelling difficulties for children with dyslexia. A recent grant from the Nuffield Foundation has funded a large-scale study of dynamic assessment of three components of reading (decoding, orthographic learning and vocabulary) in a UK context (Dynamic Assessment of Reading Test, 2019) illustrating a growing interest in dynamic assessment and literacy.

In the time since dyslexia specialists were surveyed for this thesis to determine how children with dyslexia were assessed (2013), very little has changed. In practice, a distinction is made between an assessment undertaken to diagnose dyslexia and an assessment that gathers information about a learner in order to determine support. In the primary education sector however, the focus has tended to remain on the latter approach with diagnostic assessments more predominant at higher levels of education, possibly to support an application for the Disabled Student's Allowance (DSA). Some local authorities have also moved away from an assessment for diagnosis and are no longer making diagnostic decisions. For example, the educational and psychological services of both Staffordshire and Warwickshire councils have recently attracted substantial media coverage for policy changes that have adopted this approach ("Dyslexia no longer being diagnosed," 2019). A recent development however may change this situation. Earlier this year the Department for Education announced that a diagnostic assessment conducted at any age will now be accepted as part of a DSA application ("Department for Education end requirement for post-16 dyslexia assessments," 2019). It will be interesting to see how this announcement will impact on the assessment of children at primary level and whether the focus will shift from assessment for support to assessment for diagnosis. If this is the case, practice will have strayed somewhat from the recommendation made in the Rose review (2009) where the emphasis was on training teachers to be able to develop expertise that enabled them to deliver high quality interventions for individuals with literacy difficulties.

Taken together, the results from the four studies included in this thesis contribute to the literature on curriculum-based dynamic assessment as well as to our understanding of how to best support the spelling difficulties of children with dyslexia.

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APPENDICES

Appendix A: Study One – Survey One

DYSLEXIA SPECIALISTS QUESTIONNAIRE

Thank you for your time in answering this brief questionnaire. The information that you supply will be confidential and completely anonymous. Feedback from these questionnaires will form part of a larger study that is evaluating an alternative approach to Diagnostic Assessment by dyslexia specialists. This study has been approved by the Ethics Committee at the Institute of Education. If you have any queries about this research, please contact the author directly - Jennifer Donovan j.donovan@ioe.ac.uk.

1. What do you do *most* as a dyslexia specialist?

- Assessments
- Support Teaching
- Both
- Other (please state) _____

2. How long have you worked as a dyslexia specialist?

- 0-5 years
- 6 -10 years
- more than 10 years

3. Do you hold any of the following? (you may tick more than one).

- ATS
- Assessor's Practicing Certificate
- AMBDA
- Other (please state) _____

4. Which teaching setting do you work in? (you may tick more than one)

- Primary/Early Years
- Secondary
- Further Education

Higher Education

5. Approximately how many assessments would you complete each term?

0 - 5

6-10

11 – 15

more than 15

6. Which of the following do you use on a regular basis in your assessments? (You may tick more than one).

WRIT (Wide Range Intelligence Test)

WRAT (Wide Range Attainment Test)

TOWRE (Test of Word Reading Efficiency)

WIAT - T- II (Wechsler)

TOMAL 2 (Test of Memory and Learning)

PhAB (Phonological Assessment Battery)

CTOPP (1 or 2 -Comprehensive Test of Phonological Processing)

SWRT (Single Word Reading Test)

SWST (Single Word Spelling Test)

ART (Adult Reading Test)

DASH (Diagnostic Assessment of Speed of Hand Writing)

DWMP (Diagnostic Test of Word Reading Processes)

Other (please list)

7. Do you supplement your assessment with non-standardised assessments (such as curriculum based or informal assessments, e.g. Letters and Sounds, High Frequency words)?

No

Yes (please identify)

8. When making recommendations for specialist teaching, what information do you find most useful from items 6 and 7?

9. How often do you attend Continuing Professional Development (CPD) events related to assessment?

- Never
- 1-2 per year
- 2-4 per year
- More than 4

10. Would you be interested in participating in further research regarding assessments used by dyslexia specialists?

- No
- Yes (please supply contact email/phone number on the separate tear off page at the back of this questionnaire)

Thank you for taking the time to complete this questionnaire. Your assistance is greatly appreciated.

Appendix B: Study One – Consent Form

I would be interested in participating in further research relating to dyslexia specialist assessments. I understand that I am able to withdraw from this research at any time and that any data collected will be completely anonymous.

Name _____

Contact details _____

A good time to contact me is -

Thank you for showing an interest in my research. I will be in contact shortly with further details.

Jennifer Donovan – Institute of Education

j.donovan@ioe.ac.uk

Appendix C: Study One – Survey Two

1. How long have you worked as a dyslexia specialist?
 - 0-5 years
 - 5+ - 10 years
 - more than 10 years

2. Do you hold any of the following? (you may tick more than one)
 - (APC)Assessors Practising Certificate
 - AMBDA (Associate Member of the British Dyslexia Association)
 - ATS (Approved Teacher Status)
 - Other (please specify)

3. What age group/s do you work with? (you may tick more than one)
 - Key Stage One
 - Key Stage Two

4. What is the main purpose of the assessments that you undertake? (you may tick more than one)
 - Access arrangements
 - To access specialist support
 - To inform support
 - Diagnosis
 - Other

5. What assessment/s do you use to investigate spelling? (you may tick more than one)
 - WRAT 4 Spelling
 - WIAT-T-II Spelling
 - Single Word Spelling Test
 - Helen Arkell Spelling Test 2
 - Spelling section from Spelling and Reading Test SPAR -(3rd edition)

British Spelling Test Series – 2nd Edition

Other (please list)

6. How useful do you find the following information when recommending or designing interventions for spelling?

Standardised scores

Very useful
5.....4.....3.....2.....1
Not useful

Percentiles

Very useful
5.....4.....3.....2.....1
Not useful

Spelling ages

Very useful
5.....4.....3.....2.....1
Not useful

Miscue Analysis

Very useful
5.....4.....3.....2.....1
Not useful

Observations

Very useful
5.....4.....3.....2.....1
Not useful

Conversations with the learner

Very useful
5.....4.....3.....2.....1
Not useful

Is there anything else you find useful? (please outline below)

7. When assessing spelling, do you discuss the student's understanding of spelling with them?

Always

Sometimes

Never

8. How do you select spelling words/patterns to support? Please rate each item

Key:

5= always

4 = most of the time
3= about half of the time
2= not very often
1 = never

- By spelling patterns ()
 - By spelling rules ()
 - Year level list ()
 - Curriculum areas ()
 - Student suggestions ()
 - Student writing ()
 - Analysis of spelling errors ()
 - Other - please specify:
-

9. Read the following statements and circle the response that reflects your beliefs-

My training as a dyslexia specialist/assessor provided me with a very good understanding of how to support students with spelling difficulties.

Strongly agree Strongly disagree

5.....4.....3.....2.....1

Students should be encouraged to self-select some of the words used in their support.

Strongly agree Strongly disagree

5.....4.....3.....2.....1

Students should be encouraged to 'sound out' unknown words for spelling.

Strongly agree Strongly disagree

5.....4.....3.....2.....1

Spelling is best taught when integrated with writing.

Strongly agree Strongly disagree

5.....4.....3.....2.....1

I feel very confident in designing/delivering effective individualised spelling support.

Strongly agree

Strongly disagree

5.....4.....3.....2.....1

In my school setting there is a greater understanding of how to support reading difficulties than spelling difficulties.

Strongly agree

Strongly disagree

5.....4.....3.....2.....1

10. Your future training needs

With regards to supporting children with spelling difficulties, I would like to know more about - (you may tick more than one)

- Assessing spelling to inform support
- evidence based tools to support spelling
- morphology and how it can support spelling
- technology that supports spelling
- helping children develop effective spelling strategies
- Other (please specify)

Thank you for your time in supporting this research. I am currently looking for dyslexia specialists to participate in the next stage of this research project. If you work in a Primary School with children aged between 6 – 9 years of age and would be interested in learning more, please provide your contact details below. (please print)

Name:

Phone:

Email:

Appendix D: Consent Form – Parent/Carer (Studies 2-4)



Leading education
and social research
Institute of Education
University of London

Investigating the effectiveness of an interactive assessment approach to support spelling difficulties in learners with developmental dyslexia

Consent Form

Name of child _____

Date of birth _____

Address _____

Telephone _____

I have received a copy of the information leaflet that details this project. I am aware that my child's responses will be audio recorded. I understand that my child's name and the name of the school will remain anonymous in the reporting of the study.

I understand that my child is able to withdraw from this research at any time.

I am willing to let my child participate in the project.

Signed _____ Date _____

Appendix E: Consent Form – School (Studies 2-4)



Leading education
and social research
Institute of Education
University of London

Investigating the effectiveness of an interactive assessment approach to support spelling difficulties in learners with developmental dyslexia

Consent Form – Head Teacher

Name of teacher _____

Name of school _____

Address _____

Telephone _____

Email _____

I have received a copy of the information leaflet that details this project and I am willing to allow the primary researcher for the project to work with children in my school. I also agree to allow a specialist teacher from my school to participate in this project as outlined. I am aware that the specialist teachers and children recruited for the study will be audio recorded and that their names and the name of the school will remain confidential at all times.

I understand I am able to withdraw my school from this research at any time.

I am willing for my school to participate in the project.

Signed _____ Date _____

Appendix F: Information Leaflet – Parent/Carer (Studies 2-4)



Leading education
and social research
Institute of Education
University of London

Investigating the effectiveness of an interactive assessment approach to support spelling difficulties in children.

A research project

Participants – Specialist Teachers and children with literacy
difficulties

Information for Parents/Carers

(Phase 4)

Jennifer Donovan
Department of Psychology and Human Development
Institute of Education, University of London

j.donovan@ioe.ac.uk

020 7612 6018

Introduction

This leaflet tells you about my research- I hope it will answer any questions you may have and encourage you to participate but please do contact me if you have any further queries. My contact details are on the front of this leaflet.

Please note that the primary researcher and specialist teachers involved in the study will have DBS clearance.

Who is involved in the project?

Specialist teachers and children with literacy difficulties aged between eight to nine years. The aim of the study is to support children who may have difficulties with spelling. We have also collected information from children without literacy difficulties in earlier phases of the study – this has helped us gain an understanding of how we can most effectively support all children.

Why is this research being done?

This research is part of a study that is exploring the effectiveness of a dynamic assessment approach that involves interaction with the assessor. This information will be compared to earlier data collected from children with good literacy skills to extend our understanding. Data collected will be used to inform researchers on how children can be supported in improving their spelling.

What will happen during the research?

The research project incorporates a number of phases. In this phase I would ask your permission to work in your school with your child. A number of children have been asked to participate.

The children will work with the researcher on two occasions, ideally one week apart. In the first session, base-line data including reading, spelling, phonological awareness and language abilities will be collected. In the second session, the children will be given a spelling task and then asked to explain, in a friendly discussion, the strategy or strategies that they used when encountering an unknown word. The activity is presented as a 'spelling detective' task. The answers given by the children will be audio recorded with your permission. Each session will take approximately 45 minutes.

Children will only participate if they are happy to do so at the beginning of each session. Some children may get tired during the tasks; if so we will stop. If at any time you have any concerns about the research, please let me know.

How much time will you spend with the children?

The time taken to work with the children may vary but should take no more than 90 minutes in total, over two sessions, approximately two weeks apart.

How will this research help?

This research will help to find additional ways to support children who may be experiencing literacy difficulties as well as identifying ways of effectively supporting all children. Participating in the research will develop an enhanced understanding of how to best support your child in the school.

Will participants in the research be identified?

All information about the participants will be confidential and anonymous. Information will be stored securely and the names of the participants and the school will not appear in any of the reported information. All records and audio recordings, where used, will be coded only with the number that we allocate to each participant in the study and will therefore remain anonymous.

Who will know about the research?

Information gathered from the research will be shared with other researchers and educators in the field and may be used for future research projects and/or training. Anonymity will be fully retained in all reporting.

Do we have to take part?

Participation is completely voluntary. If you decide to take part, you will be asked to sign a consent form to indicate this. You can decide to withdraw at any time.

Will you be told about the research results?

If you would like a summary of the research I would be happy to send a copy as soon as the study is completed.

Who is supervising the project?

The project has been reviewed by the Research Ethics Committee at the Institute of Education and ethical approval has been approved by the Department of Psychology and Human Development.

It is being jointly supervised by Dr. Chloe Marshall at the Institute of Education and Dr. Bernard Camilleri at City University London.

Contact details are below.

Dr. Chloe Marshall
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Institute of Education
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London WC1H 0A
c.marshall@ioe.ac.uk
020 7612 6509

Dr. Bernard Camilleri
School of Health Sciences
City University, London
Health Building, Northampton Square
London EC1V 0HB
Bernard.camilleri.1@city.ac.uk
020 7040 8505

Thank you for taking the time to read this leaflet. Please let me know if you have any further queries.

j.donovan@ioe.ac.uk
020 7612 6267

Appendix G: Information Leaflet Head Teacher (Studies 2-4)



Leading education
and social research
Institute of Education
University of London

Investigating the effectiveness of an interactive assessment approach to support spelling difficulties in children with developmental dyslexia

A research project

Participants – Specialist Teachers and children with and without
literacy difficulties (dyslexia)

Information for Head Teachers

(Phase 1 & 2)

Jennifer Donovan
Department of Psychology and Human Development
Institute of Education, University of London
j.donovan@ioe.ac.uk
020 7612 6018

Introduction

This leaflet tells you about my research- I hope it will answer any questions you may have and encourage you to participate but please do contact me if you have any further queries. My contact details are on the front of this leaflet.

Please note that the primary researcher and specialist teachers involved in the study will have DBS clearance.

Who is involved in the project?

Specialist teachers and children aged between six to nine years. Although the aim of the study is to support children with developmental dyslexia, a specific type of literacy difficulty, we will also be asking children without literacy difficulties to participate. This will help us gain an understanding of how we can most effectively support all children.

Why is this research being done?

This research is part of a study that is exploring the effectiveness of encouraging children to explain the strategies that they apply to spelling. The information collected from children with good literacy skills will be compared with children with developmental dyslexia to support our understanding. Data collected will be used to inform researchers on how children can be supported in improving their spelling.

What will happen during the research?

The research project incorporates a number of phases and your school is invited to participate in any one or all of them. In the first phase I would ask your permission to work in your school with children who have been identified as having literacy difficulties.

I would like to work with each child on a 1:1 basis on two occasions for approximately 30 minutes. Each child will be asked to complete a short spelling task and then explain, in a friendly discussion, how they approached the task. This will be followed by a training activity where the child will be provided with a range of strategies to support their spelling. In the second session (approximately one week later) the child will be given a similar task to determine if they are able to demonstrate a wider range of responses. The answers given by the children will be audio recorded; parents/carers will be asked for permission before audio recording is conducted.

In the second phase of the research, a specialist teacher from your school will be recruited to work with a small number of children in your school. This teacher will be provided with a short period of training to explain a spelling support task. He/she will be asked to work with six children, between the

ages of eight and nine years. These sessions will again be audio and/or video recorded with full permission sought and anonymity retained.

Children will only participate if they are happy to do so at the beginning of each session. Some children may get tired during the tasks; if so we will stop. If at any time you have any concerns about the research, please let me know.

How much time will you spend with the children?

The time taken to work with the children may vary but should take no more than 60 minutes in total, over two weeks.

How will this research help?

This research will help to find additional ways to support children who may be experiencing literacy difficulties as well as identifying ways of effectively supporting all children. The specialist teacher participating in the research will develop an enhanced understanding of how to best support children in your school.

Will participants in the research be identified?

All information about the participants will be confidential and anonymous. Information will be stored securely and the names of the participants and the school will not appear in any of the reported information. All records and audio recordings will be coded only with the number that we allocate to each participant in the study and will therefore remain anonymous.

Children will only participate if they are happy to do so at the beginning of each session. Some children may get tired during the tasks; if so we will stop. If at any time you have any concerns about the research, please let me know.

Who will know about the research?

Information gathered from the research will be shared with other researchers and educators in the field and may be used for future research projects and/or training. Anonymity will be fully retained in all reporting.

Do we have to take part?

Participation is completely voluntary. If you decide to take part, you will be asked to sign a consent form to indicate this. You can decide to withdraw at any time.

Will you be told about the research results?

If you would like a summary of the research I would be happy to send a copy as soon as the study is completed.

Who is supervising the project?

The project has been reviewed by the Research Ethics Committee at the Institute of Education and ethical approval has been approved by the Department of Psychology and Human Development.

It is being jointly supervised by Dr. Chloe Marshall at the Institute of Education and Dr. Bernard Camilleri at City University London.

Contact details are included below.

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020 7040 8505

Thank you for taking the time to read this leaflet. Please let me know if you have any further queries.

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Appendix H: Pre-Test Word List (time 1) Studies 2-4

PRE-TEST ITEMS – BASE-LINE (time 1)

Instructions: Say the target word, put into a sentence and repeat target word. Do not provide any input at this stage; ask the learner to do their best and tell them that you are going to ask them afterwards how they went about spelling the word; it doesn't matter whether it is right or wrong. Provide the response sheet A for the child and ask them if they would prefer to write their answers with a pen or pencil.

cat	The cat is on the fence	cat
because	You are kind because you are helping me	because
miss	You need to run quickly or you will miss the bus	miss
should	We should take the dog for a walk	should
opened	The lady opened the door	opened
swimming	I love to go swimming at the beach	swimming
light	Turn on the light	light
clown	The clown was at the party	clown
wrote	The boy wrote a letter to his friend	wrote
fact	It is a fact that one plus one equals two	fact
spread	Spread the butter on the toast	spread
crack	There was a crack in the wall	crack
hedge	The fox jumped over the hedge	hedge
note	The girl left a note on the table	note

Appendix I: Post-Training Test Word List (time 2) (Studies 2-4)

POST-TRAINING ITEMS – (time 2)

Instructions: Say the target word, put into a sentence and repeat target word. Do not provide any input at this stage; ask the learner to do their best and tell them that you are going to ask them afterwards how they went about spelling the word; it doesn't matter whether it is right or wrong. Provide the response sheet A for the child and ask them if they would prefer to write their answers with a pen or pencil.

hen	The hen lays eggs	hen
have	I have a cat	have
kiss	Give your mum a kiss	kiss
could	I could get a new book with the money I saved	could
worked	The new pen worked well	worked
running	The girl was running for the bus	running
fright	The loud noise gave me a fright	fright
frown	Be careful not to frown when they take the photograph	frown
wrong	The boy chose the wrong answer	wrong
object	A mysterious object was sitting in the garden	object
head	Put the hat on your head	head
back	We will go back to the park	back
fudge	I love chocolate fudge	fudge
bite	The man took a small bite from the piece of cake	bite

Appendix L: DASp Training Information (Study 4)

DASp training for dyslexia specialists - Week One

Project: Dynamic Assessment of Spelling in Children with Dyslexia

Researcher: Jennifer Donovan

Enclosed:

1. Information Leaflets and Consent forms

- Dyslexia specialist information leaflet and consent form
- Head teacher information leaflet and consent form
- Parent/carer information leaflet and consent form

2. Assessment materials – in order of administration

Session one: between now and end of January 2017

- HAST 2 – Test administration instructions (1), test items B(1), response forms (2), age based norm tables (1). Complete items 1-40 and ignore discontinue instructions.
- TOWRE 2 – Sight Word Efficiency Form A (1), Phonemic Decoding Efficiency Form A (1), Examiner Booklets (2), age based norm tables (1). Complete both subtests
- CELF – Formulated sentences subtest instructions (1), stimulus items (1 set), response forms (2), age based norm tables (1). Complete all items as identified in the instructions.

Session two: to be conducted prior to intervention, starting January 2017

- Pre-test items (not yet included) Please audio-record.
- CTOPP 2 – instruction and response forms (2), age-based norm tables (1)
- Post-test and graduated response sheet (not yet included) Please audio-record.
- ‘Spelling Detectives’ spelling strategy stimulus form (not yet included)

Project Synopsis

Thank you for agreeing to participate in the pilot project to trial the effectiveness of a Dynamic Assessment procedure to support an intervention programme for children with dyslexia. The aim is to investigate if this procedure adds additional information beyond that gained from traditional static assessment.

Overview of requirements and proposed timeline:

Prior to end of January 2017:

1. Read dyslexia specialists Information leaflet and sign consent form indicating your willingness to participate in the project.
2. Distribute information leaflets to the appropriate parties and collect signed consent forms.

You will need informed consent from the head teacher (if you are working in a school).

3. Identify two children between the ages of 8 years 0 months and 9 years 11 months with either a diagnosis of dyslexia or who show indicators of dyslexic type difficulties. (**Note: children with additional SpLDs should not be included in the study**). Approach the parents/carers and gain informed consent.
4. Please return all of the consent forms to me as soon as possible. Scanned copies would be preferable.
5. Undertake base-line assessments – Session One as outlined above. This session should take around 30 minutes to administer all of the tests. I would suggest that you audio-record the responses to the CELF subtest to ‘speed up’ administration, as this can take some time to administer if you are recording responses verbatim.

Note: Children need to achieve a score in the average range on the CELF Sentence Formulation task (minimum scaled score of 7) and either have a diagnosis of dyslexia or a TOWRE2 score < 85 (below average) in order to participate in the study.

Please send all of the completed base-line tests (including record forms) to me as soon as they are completed.

Jennifer Donovan
c/o Chloe Marshall
UCL Institute of Education
25 Woburn Square
London WC1H 0A

Beginning Jan 2017 (after training session on DA procedure):

1. Complete dyslexia specialists Questionnaire on Assessment Procedures (this will be sent electronically)
2. Administer session two assessments. This consists of a post-test of 14 words (words taken from the HAST 2) and discussion of strategies used, incorporating a training procedure. This is followed by the CTOPP 2 (3 subtests) and finally the post-test of 14 words, incorporating a graduated prompt procedure.

Further information and training in the DA procedure will be provided early in the January term – date to be confirmed.

- Develop a spelling intervention to support each of the learners using the information gained from the assessments and undertake **5 hours** of support during the January term. These should be delivered as they would normally be in your workplace and in line with ‘best practice’ – there are no strict requirements for timing. For example, support lessons may be conducted each day for 20 minutes, or twice a week for 30 minutes, this will depend on your availability and that of the child and is flexible. However, support should equal 5 hours. Intervention should be primarily related to spelling support, but can include extended writing and reading.

Please maintain records of the support lessons to include –

- Timing of the lesson
- Lesson plan for each session with brief explanatory notes
- Progress and ‘next steps’

At the end of the intervention: (materials to be supplied)

1. HAST 2 (alternate Form A)
2. Post-test incorporating DA graduated prompt approach (please audio-record)
3. Teacher survey

Copies of all of the completed (and anonymised) record sheets, teaching records and teacher survey to be collected by the researcher at the end of the 5 hour intervention period.

Please stay in touch and let me know if you have any queries.

Jennifer Donovan – j.donovan.14@ucl.ac.uk

DASp Training for Dyslexia Specialists: Week 2

AT THE END OF THE INTERVENTION – FINAL DOCUMENTATION DA STUDY

1. Post-test incorporating DA graduated prompt approach (please audio record)

Forms: Post-Intervention DA procedure items
Post-Intervention Response Sheet Student
Post-Intervention Response Sheet Teacher

Recap: Spelling Detective diagrams for prompts
Overview for classification of prompts

2. HAST 2 (alternate Form A)
3. Teacher Survey (to be sent once Steps 1 & 2 are completed)

Note: I would suggest that the final assessments are completed in 2 sessions to prevent fatigue – start with the DA procedure first, followed by the HAST in a second session.

DA PROCEDURE

1. Explain to your learner that you are going to ask them to spell a short list of words and ask them what they thought about when spelling the word. Use FORM D instruction and response sheet. Encourage them to use as many strategies as they can. Place the pictures for each of the strategies on the table as prompts.

2. As the child spells each word, provide immediate feedback. (Do not provide the correct answer at this stage). Ask the child to indicate how sure they feel that the answer is correct and what strategy they used. How did you know that was the correct answer? (if correct)
What did you do when you were thinking about that word? (if incorrect)
(NOTE: The strategy/strategies used should be noted and written in the box marked 'Strategy used and additional comments' on the Teacher response sheet – this could be done later from the recording).
3. It may be helpful to refer the child to the strategy sheet/cards. If the answer is correct, praise them, ask them to tick the word, and then move onto the next word. If incorrect, provide a prompt and ask them to spell the word again in the following columns on the response sheet marked 'practice'. If the answer is still incorrect, provide a second prompt, and ask them to write the answer in the next 'practice' column. If still incorrect, the teacher should model the correct answer by writing it correctly for the child. Ask the child to look at the word and identify the mistake.

To illustrate the procedure – for 'rong' spelled as 'wrong'. Prompt one: That is almost correct, well done, but there is a letter missing, what do you think it might be? (If correct - Well done! If incorrect, administer a second prompt). Prompt two: not quite, this is one of the types of words we talked about earlier with a silent letter at the beginning – do you remember? (If correct- Well done! If incorrect, model the correct answer and ask the child to look at it, identify the error/errors and then write it correctly in the final column, copying if necessary). Direct the child if there are any errors to ensure that the correct answer is reached.

4. Work through the list of 14 words providing plenty of praise for the child's efforts.

SESSION TWO:

Complete HAST 2 alternate form A in the usual way and score. The discontinue rule is 10 non-consecutive errors.

NOTE: For analysis purposes, it is important that the child's spelling attempts are legible. If not, it would be very helpful if you could print the letters underneath the child's work. I would be very grateful if you could please check this (with the learner if necessary) before sending in the documentation.

Many thanks!

FINAL STEPS

Once the final assessment has been completed, I will send the final (short!) teacher survey via email. I am also hoping to have the

opportunity to speak to you in an audio-recorded semi-structured interview to discuss the procedure – do let me know if you are interested.

Appendix M: Post-Intervention Word List (time 3) (Study 4)

POST-INTERVENTION (5 hours) (time 3)

Instructions: Say the target word, put into a sentence and repeat target word. Ask the learner to do their best and remind them that they can refer to the Spelling Detectives prompts to help them if they need to. Provide the response sheet D and ask them if they would prefer to write their answers with a pen or pencil. (Feedback should be provided immediately after each word - refer to the DA instructions provided).

1. top	Put your book on top of the table	top
2. was	He was playing in the park with his friend	was
3. hiss	Sometimes a snake will hiss	hiss
4. would	I would like some cake please	would
5. looked	The girl looked both ways when she crossed the road	looked
6. hopping	The rabbit was hopping across the field	hopping
7. night	At night it gets dark	night
8. town	Lots of people lived in the town	town
9. write	The teacher asked me to write a story about my holiday	write
10.insect	I found a large insect in the garden	insect
11.bread	I bought a loaf of bread from the shop	bread
12.track	The boy followed the track to find the treasure	track
13.edge	We were told to stay away from the edge of the cliff	edge
14.late	The girl hurried so she wouldn't be late for school	late

Appendix N: Study Four -School spelling policy and concerns

School	School Spelling Policy	Whole school Approach?	Concerns with Spelling	Assessment of Spelling in classroom
1	Yes in primary school – led by the national curriculum. In secondary, not deemed necessary	Yes in primary school	Yes, for certain individuals	Weekly spelling tests
2	Yes – The Writing co-ordinator developed a spelling policy based on CLPE model and now NC guidelines	Yes,	Yes, some children not learning spellings using the whole school approach	spelling tests each week after sending list home. Phonics- letters and sounds
3	No – it has a scheme it uses. 'No nonsense spelling' is used in the Spring term years 2-6. Reception and year 1 phonic/spelling. Spellings also taught in shared writing	Yes	No, end results are quite strong.	'Cold spell, Hot spell' children are tested on a number of words then take them home and then retested to measure progress. 2-3 sessions per week. Also do 'Word Aware' for teaching new vocabulary which includes spelling the word
4	No. We do not have a specific spelling policy but spelling is taught in line with a new spelling programme 'No Nonsense Spelling (NNS) introduced from September 2016 and reference is made to the marking of spelling in the school's marking policy	Yes	Yes. Spelling appears to be a difficulty for many pupils - although we know that spelling development progresses in stages and not ages - there are a number of pupils whose spelling seems below that of their peers despite all other areas of literacy being ahead of them. A great number of pupils also reach year 6 making errors with common spellings. We hope that the increased focus on phonics since the phonics screening check will soon have an effect on this - this year's Year 6 was the last cohort to have not been taught phonics in Year 1 following the screening check.	Through marking of work; dictations; half-termly spelling tests, and tests as and when the teacher feels they are needed
5	No. We have spelling guidance and this is on the	No	Yes. For the last few years, we have focused on improving the teaching of Phonics and	There is no longer a weekly test, although there are occasional ones to check on the high frequency

	website for parents to see as well as staff. We have so many policies about so many things outside of the curriculum, we could spend our entire time updating them.		that has worked well. However, there is a very clear divide in classes between children who can spell well and those who find it difficult. Many children have a fuzzy idea of rules and what looks right and, as a result, get to the upper juniors haing spelt words incorrectly for so long, these have been reinforced. Improving spelling across the school is on our School Improvement Plan for this year.	words as set out in the National Curriculum. Most commonly, spelling is assessed through dictation of a learnt pattern. It is also assessed through extended writing and writing in other subjects; however not all incorrect spellings are highlighted- usually it is the high frequency words or those reflecting a rule that has just been taught.
6	No. No formal policy as yet. English lead recently changed, changes to practice made & policy likely once practice is established	No	YES. The schools is concerned at how the teaching of spelling can be integrated into writing/all curriculum areas.	Weekly spelling tests, termly check of 'I can' statements from NC, HAST2 used to assess pupil undertaking intervention (pre & post).

Appendix O: Study Four - How children with dyslexia are supported

	Identification of children With difficulties	Spelling intervention used	Dyslexia specialists assessment used	Helpful techniques
1	Children are referred to me as a dyslexia specialist by the classroom teachers	None	Standardised tests; error analysis from spelling tests, error analysis from writing. Error analysis from writing provides most useful information; I group all incorrectly spelled words and group them to see patterns/areas which need addressing	Words within words' and 'long-word jigsaw'. I use many different strategies depending on the child's strengths
2	Would be discussed in pupil progress meetings and referred on if necessary	None	HAST 2 including error analysis	Individual approach and letting children develop their own strategies from teacher suggestions
3	Through assessments and pupil progress meeting and range of maths, literacy, Speech and Language Intervention used	None	Error analysis from spelling tests and writing. I use the DILP skills analysis tools: sequencing of the alphabet, phonological processing, sight vocabulary, basic word reading, grapheme/phoneme links, spelling, free writing. The analysis of this enables me to note the child's strengths and where the focus of the work needs to be. I have used WRIT and WRAT in the past but find the above gives a more useful picture before starting the programme.	Error analysis from spelling tests and writing. I use the DILP skills analysis tools: sequencing of the alphabet, phonological processing, sight vocabulary, basic word reading, grapheme/phoneme links, spelling, free writing. The analysis of this enables me to note the child's strengths and where the focus of the work needs to be. I have used WRIT and WRAT in the past but find the above gives a more useful picture before starting the programme.
4	Through teacher and parent/carer identification and mainly from evidence in written work.	None	Error analysis from spelling tests and writing. I use the DILP skills analysis tools: sequencing of the alphabet, phonological processing, sight vocabulary, basic word reading, grapheme/phoneme links, spelling,	Games, swap magnetic letters. Multi-sensory approach

			free writing. The analysis of this enables me to note the child's strengths and where the focus of the work needs to be. I have used WRIT and WRAT in the past but find the above gives a more useful picture before starting the programme.	
5	Children who appear to have specific difficulties with spelling are brought to the attention of the SENCo or the Literacy Leader by the class teacher. Sometimes parents contact us directly. They are observed by the SENCo to assess how the child is performing in other areas and to identify if there are other factors affecting their spelling, for example, whether they are able to stay on task, if they are easily distracted, if they have difficulties with personal organisation or if there is a potential hearing difficulty. Parents may be advised to get the child's hearing checked. Our speech and language TA may perform a language screener to assess whether there are receptive or expressive language difficulties. Finally, our SENCo would assess the child using the Dyslexia Screener. We have various options for support, dependent on the degree of difficulty. Units of Sound (computer programme)-supervised by a TA, Lifeboat (multi-sensory programme) - delivered by a TA; DILP (multi-sensory,	None	Error analysis from spelling tests and writing - I will look at the errors and assess whether it is specific irregular words they have got wrong or if there are particular spelling patterns or rules they do not seem to be aware of or have not developed automaticity in.	Asking children to think of their own way to remember a spelling (from a range of strategies e.g. making up a mnemonic, splitting the word into syllables etc.) and asking the child to write this on a card to take home.

	personalised spelling and reading programme) - delivered by a dyslexia specialist, small group, 1-1 or 1-2 tailored to individual spelling need - delivered by a dyslexia specialist			
6		Supported Spelling Programme	HAST2, error analysis from spelling tests - analysed into categories (phonically or visually) or unreasonable attempts, sometimes error analysis from writing (if requested, as for spelling tests) and use of the spelling test in the Supported Spelling Programme.	I have found that the DILP has worked very well in supporting many children. Two is the best number to work with at a time. Getting parents on board and making them really familiar with expectations at home enables the child to practise more - therefore more overlearning takes place. The structure of the programme gives the children a familiarity which reassures them. They particularly love having the cards and drawing their own pictures on as memory aids and they enjoy having a game at the end of each lesson. I think that the games are very useful and a fun way to reinforce learning. I have given templates for some of these to TAs to use with small groups.

Appendix P: Study Four -Teacher Survey

Teacher Survey – Evaluating the DA procedure (adapted from Ganske 1999)

1. Helpfulness of the measure in understanding children's developing spelling knowledge
 - a. Not helpful
 - b. Somewhat helpful
 - c. Very helpful

Please explain:

2. Ease of use
 - a. Not at all easy
 - b. Fairly Easy
 - c. Easy
 - d. Very Easy

Please explain

3. Comparisons with other measures
 - a. not informative
 - b. informative
 - a. Somewhat informative
 - b. Very informative

Please explain

Appendix Q: Study Four - Interview Questions

Spelling strategies

Were the children able to report the use of spelling strategies? How easy/difficult was this to elicit?

Did you find the child's self-report of their strategies useful?

(Mediation) Spelling Training

Did you find this helpful for the child? Why/why not?

How useful were the picture prompts?

Dynamic Assessment – Graduated prompt

Did the procedure add to your understanding of the child and his/her difficulties?

Did you find any of the child's responses surprising?

Children's experiences

How do you think the children found the experience?

Intervention

Do you feel that the procedure gave you any additional information? If so, did this influence the intervention programme in any way?

Impressions of the project - overall

Has being involved in the project changed your practice?

How did you find the timing for the DA procedure?

Suggestions for improvements