

Literature Review of Current Approaches to the Provision of Education for Children with Dyslexia

HM Inspectorate of Education

Dely L Elliot
Julia K Davidson
Jon Lewin

May 2007

CONTENTS

Executive Summary of the key findings	v
1 Overview of dyslexia	1
1.1 Introduction and Scope of the Review	1
1.2 Definition of Dyslexia	1
1.3 Background to Dyslexia	2
1.4 Causes	4
1.5 Diagnosis	5
1.6 Interventions	6
1.7 Additional Needs	8
2 Range of approaches used to teach children with Dyslexia	10
2.1 Background	10
2.2 Approaches Used to Teach Dyslexic Learners	10
2.2.1 Additional Support Strategies	11
2.2.2 Development of Phonological Skills	11
2.2.3 Facilitating a Positive Sense of Self	13
2.2.4 Intensive Remedial Instruction	15
2.2.5 Multisensory Teaching System/Approach	16
2.2.6 Partnership Between Parents and Teachers	18
2.2.7 Promotion of Dyslexia Friendly Schools	18
2.2.8 Teaching Based on Learners' Preferred Learning Style	20
2.2.9 Use of Special Computer Software	22
2.2.10 Use of Suitable Print Size and Background Colour	23
2.2.11 Spelling and Vocabulary Training	23
2.3 Effectiveness of Teaching Approaches and Interventions	25
2.3.1 Case Studies: United Kingdom	25
2.3.2 Case Studies: International	29
3 Implications of the reviewed literature for Scottish Education	33
3.1 Conclusions and Recommendations	33
3.2 Further Recommendations: Examples of best teaching and learning practices with Dyslexic learners	34
Appendix A: A Conceptual Map of the Dyslexia Review	36
Appendix B: Review Method	37
Glossary	40
Bibliography	41

Executive Summary of the Key Findings

There is a rich body of research on dyslexia as a product of over one hundred years of research. The focus of the investigation covers a very wide scope including the nature, causes, diagnosis, and various forms of treatment based on different underpinning theories and philosophies. The most recent research acknowledges that both genetic and environmental influences are contributory factors in dyslexia. Likewise, further attention has been given to a better understanding of the interactions between the behavioural, social and emotional dimensions experienced by dyslexic learners and in so doing, using them to this group of learners' advantage. In the midst of all these research studies, the review also found that a universal consensus on the precise nature of dyslexia has still to be reached. On a positive note, there now exist a vast and still growing number of psychologists, academics and researchers who support the view that the development of dyslexics' phonological processing skills plays a significant role in helping them to learn to read.

Based on the overall review, the following observations are offered for further reflection:

- The review of the literature undertaken here indicates a dearth of published studies on diagnosis, treatment and best practice in the Scottish setting.
- The earlier that a child with dyslexia is identified and given appropriate intervention, the more successful the results will be. Vital clues such as family history of dyslexia, delay in speech and poor spelling can help both parents and teachers in identifying children at risk.
- Research shows that dyslexic children tend to suffer from low self-esteem. Therefore, it seems likely that programmes will be more successful if, alongside practical support, they emphasise activities and tasks that allow dyslexic learners to recognise not only their weaknesses but also their strengths and areas of competence.
- A long-term synchronised effort between the teachers and parents in the identification, treatment and provision of continuous support appears to be crucial in helping dyslexic learners to function, adapt, compensate for their limitations and improve perceptions and capabilities as a person as part of overcoming dyslexia.
- Dyslexia is purported to be a multifaceted learning disorder, and the severity of the condition varies. The research suggests the importance of accurate diagnosis of the child to ascertain the type of intervention that can best help him/her.
- The advances made in the area of information and computer technology (ICT) for helping dyslexic learners are very promising and are perhaps worthy of attention and possibly some scoping studies for wider usage.
- There were suggestions that a reflection on effective teaching pedagogies for teaching children how to read may help prevent any occurrence of dyslexia resulting from inappropriate teaching methods.

Examples of Best Practice

The choice of specific examples of best practice highlighted in this review is based principally on methodological rigour and the effectiveness of the outcomes. The use of sound criteria in the selection of research participants was also taken into account.

- Some out-of-school programmes/courses organised for dyslexic learners were empowering because, firstly, they were carried out in an informal environment and the tasks were both enjoyable and educational. Both the tasks and the way they were presented enabled pupils to realise that despite being dyslexic, they could still be creative and productive individuals. Secondly, knowing that other children were in similar circumstances created a sense of belonging. Realising that they were not alone in the challenges they faced was also a form of support. Thirdly, organised activities for small groups of pupils were focused and, therefore, effective in bringing about changes in attitude and behaviour.
- MacKay (2001) wholeheartedly supports the creation of a 'dyslexia friendly' environment in schools. Despite the fact that 'changing a school for the benefit of the 10+% of pupils who are dyslexic may be a difficult package to sell' because of the changes it entails, the encouraging results from a case study school reveal that although the study techniques are meant to support and enhance the learning of dyslexic pupils, they in fact enhanced the learning of all the pupils. Dyslexia friendliness is also an invaluable instrument in raising school-wide awareness of this learning difficulty.
- There is a common factor amongst the three techniques (ie the Multisensory Method, Auditory Discrimination in Depth and Embedded Phonics), which was shown to be effective in helping learners with dyslexia – the key feature is improving the phonological processing skills of dyslexic learners. A number of other studies support the use of techniques that are phonologically related (see Hatcher, 2000; Joshi *et al*, 2002; Lovett *et al*, 1994; Sawyer, 2006; Simpson, 2000; Snowling, 1998; Snowling & Hayiou-Thomas, 2006; Tijms *et al*, 2003; Vellutino *et al*, 1996; Uhry & Shepherd, 1997). In fact, it was asserted that '[t]he widespread consensus in the field is that phonological processes play a key role in learning to read' (Snowling & Hayiou-Thomas, 2006, p. 116).
- Customised software for dyslexic learners (eg a multimedia program which used interesting graphics and features a game-like task used for teaching spelling) can be potentially useful in the Scottish setting.

Past and current research studies on dyslexia are all important for they are part of an ongoing quest to crystallise the concept and to understand the plight of dyslexic learners. Further research in this area 'will ensure more positive outcomes' for them (Sawyer, 2006).

1: Overview of Dyslexia

1.1 Introduction and Scope of the Review

In March 2007, the HM Inspectorate of Education commissioned The SCRE Centre at the University of Glasgow to undertake a review of the literature on the background to dyslexia, the range of teaching approaches used to teach children with dyslexia and the effectiveness of the various approaches. This literature review comprises a brief overview of the main educational, psychological and biological evidence, research/evaluation reviews, web-based materials and other references available to the researchers.

The purpose of this review is to inform HM Inspectorate of Education's evaluation of the educational provision for children with dyslexia in Scotland, due to take place between April and December 2007. This review shows that there is an extensive array of published research literature on dyslexia because it is arguably the most common form of neurobehavioral reading disability (Shaywitz, 2003).

This brief report also provides an overview of the key findings from national and international studies, and concludes with some implications and recommendations for the Scottish education system. A conceptual map of the research field and the approach to the review are given in Appendices A and B.

1.2 Definition of Dyslexia

Reports in the medical literature of 'word blindness' go back to the time when books first became relatively widely available to the population in Europe and reading became popular (Morgan, 1896 cited in O'Brien *et al*, 2005). The broad concepts of developmental dyslexia¹ and specific learning difficulties (SLD) are connected to particular problems with reading. There are two key developments that have underpinned a huge leap in general knowledge and understanding about dyslexia. Recent policy encouraging inclusion of pupils with additional needs in mainstream schooling in the UK and elsewhere has been linked with legislation designed to support the educational needs of all children and people with disabilities, including dyslexics (Pirrie *et al*, 2006). The other key development relating to dyslexia concerns recent findings in the field of biological research. These relate to the underlying mechanisms of dyslexia and brain behaviour. There is also a significant body of research about the genetic determination of dyslexia and the importance of environmental influences (Grigorenko, 2001; Snowling & Hayiou-Thomas, 2006).

Dyslexia is viewed as the most commonly recognised form of specific learning difficulty (SLD). Other neurodevelopmental syndromes also considered as 'specific learning difficulties' are: dyspraxia, specific language impairment (SLI) and hyperactivity and attention deficit (Deponio, 2005). An individual child may often exhibit more than one of these complex syndromes. It is argued that the co-occurrence of these disabilities may be caused by overlapping developmental pathways and interacting genetic and environmental influences (Duane, 2002).

¹ The term 'developmental dyslexia' is now used throughout the UK more or less interchangeably with the word 'dyslexia'.

Dyslexia is also often linked to other conditions, such as Attention Deficit Hyperactivity Disorder (ADHD) and/or other specific and general reading difficulties (Pope & Whiteley, 2003).

Estimates of the prevalence of dyslexia vary across countries from around 10 per cent to 17.5 per cent. In the UK the figure has been reported in the literature to be as high as 20 per cent (Chan *et al*, 2004; Feeg, 2003; Grigorenko, 2001; Shaywitz, 2003). For the purpose of providing a basis for intervention including assessment and teaching of individuals with severe persistent word reading problems, the British Psychological Association have defined dyslexia as follows:

Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty. This focuses on literacy learning at the 'word level' and implies that the problem is severe and persistent despite appropriate learning opportunities.

(British Psychological Society, 2005, p. 18)

This is the working definition of dyslexia that is adopted in the present review. Describing dyslexia as relating to the processing of information that affects the development of literacy has proved to be a helpful starting point for identification purposes. According to Reid and Fawcett (2005), other broad characteristics of developmental dyslexia, which may persist to a greater or lesser extent in an individual over their lifetime, include:

- difficulties in effectively utilising short- and long-term memory
- difficulty in processing information at speed
- organisational difficulties
- phonological difficulties
- visual difficulties in relation to reading words
- co-ordination difficulties
- difficulties in utilising meta-cognitive strategies
- difficulties in the development of automatic reading of words.

1.3 Background to Dyslexia

Saint Augustine remarked with astonishment upon the fact that Saint Ambrose, the bishop of Milan, could read silently, without pronouncing any words aloud (Augustine, Confessions 6.3). Speculating on this remark, historians (Rudich, 1995, personal communication) have suggested that, in those times, the majority of readers only knew how to read aloud: they did not practice reading silently to themselves. It is plausible that comparative genetic studies of populations whose linguistic systems differ will reveal some clues about the evolutionary path of normal and/or dyslexic reading in modern civilisation.

(Grigorenko, 2001, p. 114)

This anecdotal quote aptly shows that the association between reading silently (comprehension) and verbalisation of words out loud has a complex history. In fact, until fairly recently the term 'dyslexia' was often only applied to individuals with otherwise good communication skills and high Intelligence Quotient (IQ). Nowadays in the UK this 'discrepancy model' is no longer generally accepted by educational psychologists (BPS, 2005; see Vellutino *et al*, 2004).

Dyslexia is characterised as a problem with word recognition when speaking out loud. These problems are not specific to particular languages and the Intelligent Quotient (IQ) of individuals concerned. It can take the form of problems with phonological skills and recognising how to use the conventional sound structure of words, and also an atypically slow speed of remembering how to say words (Grigorenko, 2001). The type of dyslexic difficulties can be linked to the child's first language. The simpler and more consistent the mapping of the alphabetic letters/symbols to sounds in a language, the less risk there is of children suffering phonological problems. In fact, languages with more complex orthographies, such as English, have a greater occurrence of this type of dyslexia (Snowling & Hayiou-Thomas, 2006). The research literature has found this to be true for various languages with differing degrees of orthographic complexity, including German, Italian, French, Dutch, Danish, English and Chinese (Grigorenko, 2001).

A detailed description of types of dyslexia, from mild to severe, and including surface and phonological, is given in Ho *et al* (2004). Goswami (2002) emphasises that the ability to detect rhyme forms in speech is part of the normal development of pre-reading skills in young children in different languages and this ability can be less evident in some dyslexics. Longitudinal studies in Sweden, which followed young children with dyslexia through to adulthood, have provided evidence that early phonological deficits can persist through to adulthood (Svensson & Jacobson, 2006). In Cantonese, a specific problem children experience is often due to the speed of remembering words (Chan *et al*, 2004).

Before embarking on a discussion about the causes of dyslexia, a broad outline of the basic processes involved in reading is required. According to Vellutino *et al*, (2004) the complex processes to be acquired and to occur automatically in order to read fluently and comprehend language include:

- linguistic coding (phonological, semantic, syntactic, morphological, pragmatic)
- sublexical awareness and skills (phonological, orthographic, alphabetic, general knowledge)
- visual coding
- working memory (and permanent memory)
- metalinguistic processes.

1.4 Causes

... parents provide not only the home environment but also the genes that will affect the child's language and literacy skills.

(Snowling & Hayiou-Thomas, 2006, p. 120)

Vellutino *et al*, (2004) provide a useful cognitive framework for understanding the causes of dyslexia according to the research findings over the past forty years in terms of deficiencies in:

- reading subskills
- general learning ability
- visual perceptual and visual memory
- language and language-based skills (semantic, syntactic, phonological coding and double deficit)
- hearing.

Historically there have been some cultural differences between psychologists in their main focus when studying the causes of dyslexia. Grigorenko (2001), for example, points out that in Asia and France the emphasis was more likely to be on inadequate motivation and educational opportunities for students than was the case in the UK and the USA.

Recent literature on the hereditary basis of dyslexia and other specific reading difficulties suggests a high multi-factorial genetic component, a strong environmental component and also significant genotype-environment interactions (based on twin studies) (Grigorenko, 2001). Researchers have isolated various genes on different chromosomes using a molecular genetic technique, known as Quantitative Trait Loci (QTL) identification. Putative chromosomes linked to families with dyslexic individuals include the chromosomes 2, 13, 14, 15 and X (Jenkins, 2005). It is interesting that the X chromosome is implicated because males are typically four times as likely as females to be dyslexic. A number of different chromosomes have been implicated in various molecular genetic studies (Grigorenko, 2001). Moreover, the base rates of reading disability in boys are generally much higher in twins, ie twin boys were only 60 per cent as likely as singletons to have adequate literacy standards by the age of 14 (Hay *et al*, 1984). Adoption studies of dyslexics may be a next step in understanding the interactions between genetics, development and the environment in young children. It has also been argued that environmental factors, such as parents' attitude to education, could be related to the literacy skills of adopted children (Petrill *et al*, 2005).

1.5 Diagnosis

Initial diagnosis and treatment of dyslexia usually involves a staged intervention process with many different tests and an observation checklist typically involving the following adults:

- parents and/or carers
- class teacher
- additional support needs staff/support for learning teacher
- home visit service (home-link staff)
- educational psychologist.

In the UK, teachers and parents usually play a crucial role in the initial diagnosis. The treatment will inevitably depend on whether the dyslexia is regarded as severe or mild. For more details about screening tests used in connection with looking at the whole child, the reader is referred to McIntyre and Deponio (2003). A useful selection of published tests for dyslexia identification is also given in BPS (2005). Cognitive profiling followed by screening using behaviour checklists and literacy measures has been applied in a large-scale research study in Hong Kong. The type of testing produced some false positives and it depends on an arbitrary cut off, the appropriateness of which is open to debate in the literature (Ho *et al*, 2004; Snowling, 2005).

In England, there is some limited evidence that teachers have been resistant to using the term 'dyslexia' (Regan & Woods, 2000). Paradice (2001) points out the importance of establishing a common understanding of the research evidence between parents and professionals through initial discussions prior to a child's diagnosis. This dialogue can be difficult to sustain due to a somewhat emotive debate about 'dyslexia' in the popular media (Levelt, 2001; Elliott, 2005). Indeed, there is research indicating that not all teachers in England agree that it is important to consider a child's family history, in terms of reading difficulties and current parental reading skills, before making a diagnosis of dyslexia (Lawrence & Carter, 1999).

From the review of the literature, we found that there are some collaborative projects on dyslexia involving voluntary, government and private organisations in Scotland (Reid & Fawcett, 2005). Reid *et al* (2005) also found from their study that 'all authorities in Scotland seemed to be engaged in some way in the area of dyslexia/SpLD' (p. 212), yet, it can be observed that there is a dearth of published studies on diagnosis, treatment and best practice undertaken in the Scottish setting.

1.6 Interventions

... the pressure imposed by an industrialised society on a child with developmental dyslexia to master reading is of remarkable magnitude... Yet, if a person then 'escapes' the pressure of educational institutions by ending his or her education, or dropping out of school, or foregoing reading, the difficulties suppressed and alleviated by the pressure of the environment resurface. (Grigorenko, 2001, p. 92)

This quote paints a bleak picture of life for people of any age with dyslexia. Socio-economic status is consistently negatively correlated with oral language and literacy skills (Phillips & Lonigan, 2005). Vernon-Feagans (1996) found that children of disadvantaged families (on the Head Start programme) are behind their peers in terms of vocabulary size.

Not recognising their specific needs may lead to a sense of failure in children that persists into adulthood (Reid & Given, 1998). Some evidence of links between adolescents' sense of self-esteem and achievement in school and whether or not they engage in activities detrimental to their own health was mentioned in a report by the Committee on Dyslexia of the Health Council of the Netherlands (Gersons-Wolfensberger & Ruijssenaars, 1997) and also elsewhere (Feeg, 2003). However, there is now some light at the end of the tunnel for educators because the recent behavioural genetics research indicates the importance of both genetic and environmental influences in both typical and atypical development of language and literacy skills (Snowling & Hayiou-Thomas, 2006). Although the magnitude of the contribution of shared book reading on a child's print knowledge is not yet clearly defined, the contribution of the home literacy environment on variables related to a child's early literacy development is not in dispute.

Snowling *et al* (2003) have emphasised the importance of early identification in pre-readers of a very young age of the precursors of dyslexic-type symptoms in order to facilitate the development of compensatory reading strategies. Indeed, Snowling and Hayiou-Thomas (2006) suggest that with appropriate intervention, children with average oral comprehension skills and classic dyslexia symptoms, and also children with specific learning impairments in both oral and written comprehension, should be able to respond to appropriate teaching interventions, and become relatively normal readers. Their model has been developed in response to new knowledge and understanding about co-occurring syndromes and assumes that 'some poor readers, whose phonological difficulties are either severe or complex (co-occurring with non-phonological deficits), require a different form of intervention' (p. 122). They propose that all intervention programmes should include fundamental skills that are important for reading comprehension.

West (1997) has emphasised the special visual and spatial talents exhibited by some dyslexics, not only in the expressive arts but also in engineering. More generally, Reid (2006, p. 31) discusses the need for teachers to be given professional development training in recognising and accommodating children's different learning and emotional styles in order to implement successfully the inclusion agenda in Scottish schools.

Interventions previously reported as potential cures for dyslexia were often based on studies of children with multiple learning difficulties. The fact that many development and behavioural abnormalities often co-exist with dyslexia complicates the interpretation of some of the early research studies. Recent studies have concentrated on identifying the co-occurring characteristics, such as ADHD, which is one of the most likely factors to be associated with dyslexia (Pope & Whiteley, 2003). Various substances produced by genes have also been implicated, such as glactose (Goldstein & Obrzut, 2001). Indeed, the stimulation of the cognitive system using a Tactile Training Box (TTB) resulted in improvements to the psychomotor functioning and the reading skills of some dyslexics (Grigorenko, 2001). However, the dietary regime of the participants was not controlled and so one cannot exclude the possibility that dietary changes may have somehow influenced the reported findings.

Although not effective for improving word recognition, visual stimulation and tactile exercises have been used to improve reading comprehension and accuracy of dyslexics (Goldstein & Obrzut, 2001). Byl *et al* (1989) found that exercises, including throwing and catching balls, computational tasks, tongue-twisters and puzzles, and jumping and balancing, improved the spatial awareness of young boys with ADHD. The claims of a cure for dyslexia based on a specific exercise programme involving balance and visual focusing need further investigation (Pope & Whiteley, 2003).

There have been some major policies orientated directly towards dyslexic learners of all ages and circumstances in society (Reid & Fawcett, 2005). The DfES also commissioned a review of different approaches to dyslexia (Fawcett, 2002). Further details of some major policies are either given in the rest of the review or can be explored through the weblinks provided. These include:

- A government report on the Task Group on Dyslexia in Northern Ireland published in 2002 (<http://www.deni.gov.uk/dyslexia.pdf>)
- Special Educational Needs (SEN) Code of Practice 2001 in England and Wales (<http://www.bdadyslexia.org.uk/code.html>)
- The Dyslexia Friendly Schools campaign in England, Wales and Scotland (MacKay, 2005)
- Additional Support for Learning (Scotland) Act 2004
- Training provision for class teachers provided to local authorities in Scotland (Schneider & Crombie, 2003)
- The Study Programme to Evaluate Literacy Learning through Individualised Tuition (SPELLIT) in England and Scotland (<http://www.dyslexia-inst.org.uk/spellitsum.htm>)
- The Dyslexia, Dyspraxia and Attention Deficit Treatment (DDAT)/DORE Programme (<http://www.dore.co.uk>)

- Collaborative projects in the UK and Eastern and Western Europe (eg a multimedia program evaluated in Greece).

1.7 Additional Needs

The final section of this introduction presents a wide range of issues in order to highlight the complexity of the additional needs of dyslexic learners, and paying particular attention to the situation in Scotland. The Additional Support for Learning (Scotland) Act was introduced in 2004. The principles and aspirations of the Act are to broaden the support for children with special needs, including dyslexia and to co-ordinate and focus professional support with a view to improving the educational potential of all young children. The statutory duty to deliver additional support rests with the local authorities in Scotland, but support needs are typically identified in schools. The majority of support packages are initiated and co-ordinated by schools and managed on a day-to-day basis by teachers.

Parents are the ones who usually have concerns and demand entitlement for their dyslexic children (Amatangelo *et al*, 2001; Hales, 2001). Regan and Woods (2000) report that teachers were not keen on administering tests themselves, although they were not averse to the screening of their pupils by outside experts. The teachers in this study, which took place in England, saw the main purpose of the screening tests to be the confirmation and validation of national tests. It was also mentioned that the teachers had not made full use of educational psychologists, in terms of encouraging them to develop participatory assessment protocols involving teachers, the children, and their parents (Lawrence & Carter, 1999; Regan & Woods, 2000).

On a related issue, scant research has been carried out on children with dyslexia for whom English is an Additional Language (EAL), and also on how dyslexics respond to learning foreign languages. However, the following quote encapsulates some of the inherent problems noted in the available literature:

One dilemma which we face [in Scotland] is whether or not we should present all young people with a common modern language curriculum irrespective of any additional support needs which they may have, or deprive students of what may prove to be a worthwhile and satisfactory learning experience.

(Crombie, 1999)

Resolving the dilemma of how to identify dyslexia in multi-lingual children is still a challenge for experts working with children who are using more than one language at home and at school (Reid & Fawcett, 2005, p. 13). The BPS (2005) suggests a need for a culture-fair assessment and intervention.

Any review of dyslexia is not complete without mentioning dyscalculia (ie specific difficulties associated with learning mathematics) because ‘for some dyslexic students, “easy” things in Mathematics are hard and “hard” things can be easy’ (Henderson & Chinn, 2005, p. 302). Some of the examples where difficulties may arise include learning to count, recognise and say numbers and using everyday language to describe three-dimensional shapes (Henderson & Chinn, 2005).

In conclusion, the interaction between research findings, policy and teaching practices is a recurring theme in the literature about dyslexia.

2: Range of Approaches Used to Teach Children with Dyslexia

2.1 Background

Historically, dyslexia has had a reputation for being a 'hidden disability', which was the 'culprit' for the feelings of shame, guilt and embarrassment in those who were silently suffering from this condition. This view has shifted significantly in recent decades, and nowadays dyslexia is regarded by teachers, psychologists and the general public as a common learning disorder.

A wide range of approaches is used to improve the educational experience and achievement of learners with dyslexia: a testimony to over one hundred years of research undertaken in the fields of medicine, psychology and education (Simpson, 2000). This diversity of approaches also reflects the fact that, since dyslexia is suggested to be on a continuum and the condition ranges from mild to severe (see Riddick, 2006), various interventions and approaches in different degrees are deemed obligatory in responding to the needs of dyslexic learners. Furthermore, the quest for a universally accepted definition and the continuous debate about the exact nature of dyslexia is still ongoing (Gregor *et al*, 2003; Sawyer, 2006; Simpson, 2000; Vellutino *et al*, 2004). Consequently, the observation that 'there may be as many differences between dyslexics as there are similarities' (Simpson, 2000, p. 356) has led to various approaches, strategies and interventions based on the respective underpinning theories. There are also assertions that inappropriate teaching methods might cause this learning disorder (Joshi *et al*, 2002; Vellutino *et al*, 2004).

In contrast, there is overwhelming agreement amongst researchers and academics that the earlier that the dyslexic condition is identified, and given an intervention, the better the diagnosis will be (Amos, 2004; Humphrey, 2002; McNulty, 2003; Polychroni *et al*, 2006; Simpson, 2000; Tsovoli, 2004). For instance, it has been asserted that adopting an intensive structured reading program at the early grade levels can lead to a significant improvement in children's reading ability (Joshi *et al*, 2002). However, Snowling (1998) observed that the most common referrals to clinicians were from children who had already failed to learn to read.

The literature also reveals that children's development of reading and the spelling skills of dyslexic learners may remain delayed despite years of intervention and instruction (see Cooke, 2001; Oakland *et al*, 1998). Even when reading difficulties have been overcome, it may possibly still cause some residual problems later in life (Snowling, 1998).

2.2 Approaches Used to Teach Dyslexic Learners

In this section, the traditional as well as the most recent approaches used for improving the educational experience and achievement of dyslexic learners will be presented and discussed to provide an up-to-date review of these approaches inside and outside the classroom. Emphasis will be given to the most widely used approaches, especially the ones that generated a greater number of studies in the field.

In the past, the majority of published research on dyslexia concentrated on causation and treatment (Humphrey, 2002) with emphasis on the neuroscientific aspects of this learning disorder. In this review, we took into account the behavioural, emotional and social aspects of conditions affecting dyslexic learners. Furthermore, the advances in computers and technology have also been looked at to see what role they might play in assisting learners with dyslexia.

2.2.1 Additional Support Strategies

Dyslexic learners ... are supported to minimise their weaknesses, capitalise on their strengths and to begin to operate at an ability appropriate level.

(MacKay, 2001, p. 4)

Following the then Scottish Education Minister Brian Wilson's announcement in 1998 that 5,000 new classroom assistants were to be employed over three years, the possibility of assistants supporting the learning process, especially of those learners who need it most, was explored by Wilson, Schlapp and Davidson (2002) in a national evaluation. According to Calder (2004) classroom assistants can contribute to a meaningful and positive learning experience for dyslexic learners. Her small-scale study² undertaken in Scotland, explored the kinds of support strategies appropriate for a typical dyslexic pupil included provision of learning support, practical support and socio-cultural support as well as emotional support.

Calder (2004) emphasised that 'learning support' is highly desirable because dyslexic learners are likely to benefit from additional help in picking up new concepts. The presence of the learning assistants also makes it easier for the teacher to try using new teaching approaches that can be of benefit to dyslexic children. Similarly, classroom assistants can extend some 'practical support' to learners, especially when they get frustrated with their writing difficulties. Working closely with learners can also provide some useful information (through observation) of the child's progress, which they can eventually pass on to the teacher. 'Socio-cultural support' also comes in, as they help with the class management and through modelling good social skills. Finally, the literature suggests that dyslexic children may lack self-esteem (Humphrey, 2003; Polychroni *et al*, 2006) because of their continuous experience of failure (Alexander-Passe, 2004; MacKay, 2004). Skilled classroom assistants, by developing very close personal relationships with the learners and understanding their emotional needs, enable them to respond appropriately in times of learner frustration and exhaustion with school activities.

2.2.2 Development of Phonological Skills

Reading is either viewed as a complex activity (likened to 'the performance of a symphony orchestra') or a relatively simple one consisting of two independent processes: decoding, which requires the use of lower order language skills to convert letters into sound sequences, and linguistic comprehension skills (Simpson, 2000; Snowling, 1998). Such an approach, focusing

² This is part of a larger study.

on the development of phonological skills, is based on the premise that decoding and language comprehension are equally essential for reading simply because the written language is a set of codes³.

It is also worthy of mention that the most current and widely held understanding of dyslexia can be traced to the deficit in phonological processing abilities (Sawyer, 2006). According to Simpson (2000), the 'current consensus is that developmental dyslexia is best regarded as the manifestation of a deficit in the language system' (p. 357). Stanovich (1988, 1991 cited in Simpson (2000) explains further the rationale for this: it can be observed that a common phenomenon amongst dyslexic learners is that they all display phonological processing problems which lead to their word recognition failures (Lovett *et al*, 1994; Sawyer, 2006). Snowling (1998) also explains that dyslexia manifests itself in different cultures, languages and school systems, and this supports the argument that the reading difficulties of dyslexic learners stem from their phonological processing problems. This also suggests that children who are delayed in their phonological development are at risk of dyslexia (Snowling, 1998).

The wealth of evidence suggesting a causal link between phonological awareness and effective reading justifies the numerous interventions concerned with how phonological skills can be improved (see Gang and Siegel, 2002; Hatcher, 2000; Lovett *et al*, 1994; Tijms *et al*, 2003; Schneider *et al*, 1999; Simpson, 2000; Snowling, 1998; Snowling & Hayiou-Thomas, 2006; Vellutino *et al*, 1996; Uhry & Shepherd, 1997). According to Joshi *et al* (2002), a number of studies prove that 'systematic, explicit, decoding instruction that emphasized synthetic phonics yielded better results than other instructional methods' (p. 231). Many studies tend to echo the effectiveness of such an approach (see also Hatcher, 2000; Schneider *et al*, 1999; Simpson, 2000) including their observed long-term impact (Tijms *et al*, 2003). A large body of research over the years supports the idea that specific instruction in aspects of phonological awareness can effectively assist students in the acquisition of reading skills (Sawyer, 2006; Simpson, 2000). Furthermore, it has also been strongly advocated by its proponents that the 'central problem of dyslexia', ie learning to read, can both be solved and prevented by using the right teaching methods and tools⁴.

It is also acknowledged that the impact of this approach may vary due to three interlinked factors: the severity of the child's phonological difficulty; other language skills (eg semantic skills); and the type of teaching the child receives (Snowling, 1998). Despite the effectiveness of using phonological approaches, 'remediation programmes aimed at training phonological skills are often but not entirely successful' (Torgesen, 2000 cited in O'Brien *et al*, 2005, p. 333). In fact, there are criticisms that phonics or letter recognition alone is not sufficient for word identification and reading (O'Brien *et al*, 2005; Smith, 2001). Knowing the position of a letter relative to the other letters in a word is necessary for correct word identification: for example, distinguishing the orthographic input of 'trap' versus 'tarp' or 'part' requires correctly locating the

³ (see < <http://observer.guardian.co.uk/review/story/>, Lost for Wurds, Sunday 30 June, 2002>)

⁴ The comments are from Martin Turner of the Dyslexia Institute (see <<http://education.guardian.co.uk/primaryeducation/story/0,,786809,00.html>>, Lost for Wurds, Sunday 30 June, 2002>)

spatial arrangement of the letters in the word (p. 344). As Simpson (2000) puts it, further research may probably help address some remaining issues related to the promotion of phonological skills amongst readers.

There is good theoretical and empirical rationale for intervention aimed at promoting phonological processing skills, but more research is needed to determine how, for how long, and by whom, such intervention is best offered.

(Simpson, 2000, p. 370)

2.2.3 Facilitating a Positive Sense of Self

... we, as educationalists, are presented with our greatest challenge: to teach our children not only to succeed, but also to value themselves.

(Humphrey, 2003, p. 135)

In a paper presented by Hales (2004), he explained that everybody has a personal 'image' of his/her position in the world and this belief in oneself defines his/her likelihood of success. Consequently, the lack of belief in oneself may increase the likelihood of failure. In a world where reading, writing, spelling and talking are part of day-to-day communication, it is no surprise that social and emotional difficulties, let alone a low sense of self, are constant companions of most dyslexics. They can easily find themselves in situations where they are regarded as different, strange or unintelligent (easily resulting in feelings of anxiety, stress or depression) especially when people they deal with are not aware of their condition. This perhaps accounts for what Humphrey (2002) explains: research studies of children with special learning needs are likely to develop 'maladaptive self-referential styles', ie a tendency to refer to themselves in a negative manner, leading to low self-perceptions as a result of unrealistic comparisons of themselves with their non-dyslexic peers.

A vivid example can be gleaned from a study conducted by Riddick in the UK (1996, cited in Humphrey, 2002) with 22 dyslexic learners, their parents and teachers, in which feelings of disappointment, frustration, shame, discontentment, sadness, depression, anger and embarrassment were found to be caused by their difficulties. Tsovili (2004) further argues that experiences of reading difficulties may not only cause anxiety amongst learners but may even influence their perception of the world.

The idea that 'the self does not operate in isolation' (Humphrey & Mullins, 2002, p. 197) is crucially important when aiming to improve dyslexic learners' views of themselves. Humphrey (2003) elaborates that self-perception, which constitutes all the thoughts, feelings, attitudes and beliefs about a person, is mainly acquired in a social context: 'the child experiences him/herself indirectly from the particular standpoints of other individuals. Teachers and peers reflect an image of the child, which ... is incorporated into the child's developing sense of self' (p. 131). This is because 'self-development is a social learning activity' (Humphrey, 2002, p. 30). Therefore, knowledge of how views of self are created suggests that the significant individuals

(ie parents, teachers, peers) around those with dyslexia play a vital role in the development of these views and perceptions.

With direct reference to the child's development, 'the self system is a significant factor in reading success, motivational orientations, self-esteem and learning approaches. Low self-esteem, specifically in scholastic competence and social acceptance, has been linked with social, emotional and behavioural difficulties.' (Polychroni *et al*, 2006, p. 415). By contrast, MacKay (2004) contends that the expectation of success has its empowering effect. Some of the classroom-based strategies suggested to support dyslexic learners include:

- providing activities that are highly challenging but incur low stress levels
- immediate use of feedback to acknowledge learners' success or progress in doing classroom tasks
- providing a combination of activities and learning strategies
- supporting dyslexic learners as they work within their comfort zones, especially during the initial stages of the task.

According to MacKay (2004), such tasks are designed to help in building and developing both the intellectual confidence and self-esteem of the learners in order to prepare them to undertake activities that are more challenging.

Humphrey (2003), in a UK study, also points out that 'the presence of dyslexia produced marked effects on the self-concept and self-esteem of the children' (p. 130). This is due to the pertinence of such a condition to literacy, which is considered a pivotal aspect of school learning (Riddick, 2006). This is confirmed by a study undertaken with nineteen teenage dyslexic learners in the UK where Alexander-Passe (2004) found that, amongst adults, rebuilding self-esteem is imperative. He further suggested that rebuilding self-esteem alongside remedial help given to children is the key to remediation. It is also emphasised that 'until [dyslexic learners'] reading is corrected to an appropriate level ... they are always likely to perceive themselves as unintelligent, and their notion of self will suffer' as a result (Humphrey & Mullins, 2002, p. 200).

On this note, a thought-provoking question is posed in connection with the cause-and-effect nature of developing dyslexic children's self-esteem (Hales, 2004; Riddick, 2006): does literacy skill boost children's self-esteem or is it their improved self-esteem that motivates them to learn and develop further? It is also equally possible that a third view is at work ie self-esteem and literacy are interdependent and therefore any progress made in one aspect simultaneously affects the other. What is interesting to note is that when an activity designed to enhance dyslexic pupils' self-esteem is administered, the impact was also extended to under-achieving pupils and those with poor attendance (Burton, 2004). In Scotland, the *Curriculum for Excellence* (Scottish Executive, 2004) seeks to provide a broader definition of what constitutes progress and success for all pupils. This includes enabling underachieving pupils to 'achiev[e]

all that they are capable of' (p. 10). Hence, the concept of facilitating a positive sense of self validates the purposes of the curriculum.

2.2.4 Intensive Remedial Instruction

When Torgesen and his colleagues decided to investigate the conditions needed to promote adequate reading skills in US schools, they employed intensive remedial instruction based on the understanding that 'the most common form of reading disability suggests that for children with reading disabilities to achieve adequate reading skills, they must receive more intensive, explicit and systematic instruction in word-level skills than is typically provided in schools' (see Torgesen *et al*, 2001, p. 35). It was also acknowledged even from the outset of the study that such interventions will be very challenging for broad-scale implementation, but it was felt that it is more important to understand further interventions that can actually accomplish the task of remediation rather than merely stabilisation.

In their study, two theoretically viable instructional strategies for pupils with learning disorders were tested, and the impact of each on the children's progress compared. Both instructional approaches were designed to be phonemically explicit and systematic, but the methods of instruction as well as the depth and extent of the phonemic decoding practice varied. Both the Auditory Discrimination in Depth (ADD) and the Embedded Phonics (EP) program were used. What is worth highlighting is that both programmes also incorporated teaching principles appropriate for those with learning disabilities. They are characterised by:

- sufficient opportunities for guided practice of new concepts
- one-to-one tutoring techniques
- systematic cuing of appropriate strategies
- teaching on how to segment and blend the sounds in words. (Torgesen *et al*, 2001, pp. 35-36)

In a study undertaken in England, Humphrey and Mullins (2002, p. 198), describe the characteristics of an intensive remedial instruction:

- The children are in specialised settings spending about 90 per cent of their class time with other dyslexic learners
- Classes are small in size (ie around ten learners per class)
- Teachers receive special training (ie many completed Master's degrees in relevant areas)
- Availability of specialised equipment and resources (including computer software designed for dyslexic learners).

When it comes to impact, Simpson (2000) argues that personal factors including severity of the problem, cognitive and linguistic skills as well as the person's age and personality should influence the 'quantity and quality of general and remedial teaching received and the complexity of the written language system to be learned' (p. 356).

2.2.5 Multisensory Teaching System/Approach

Now I know that reading is something you can learn how to do, it's not something that just happens.

(Trevor, 2nd Grade student, Manchester, England after 8 weeks of MTS instruction cited in Smith, 2001)

The use of the multisensory teaching system/approach⁵ has 'deep historical roots' (Joshi *et al*, 2002, p. 231) which can be traced as far back as the late 1800's when reading instruction was based on teaching the relationship between the letter and its sound. Such a trend was changed in the early 1900's after the introduction of the whole-word approach. After this shift of emphasis on reading, Dr Samuel Orton noticed patients who were unable to read, spell and write, yet this was not determined by any obvious physical cause. Working closely with Anna Gillingham (an educator) he developed the use of the multisensory teaching technique.

Later on, Anna Gillingham and Bessie Stillman published a teacher manual, prescribing both teachers and students to be trained using their proposed technique. Between 1965 and 1975, what was then known as the Orton-Gillingham methodology and used by the staff of the dyslexia child study unit, was further refined into a program called Alphabetic Phonics.

More recently, Margaret Smith developed curriculum materials for teaching Alphabetic Phonics. These materials are now known as the Multisensory Teaching Approach (MTA). The areas of study comprise development of alphabet and dictionary skills, reading, handwriting, spelling, comprehension and composition, and are widely used in remedial classes for both children and adults. With this approach, learners are presented with information through two or more learning pathways simultaneously, whenever possible (Smith, 2001).

According to Barbara Foorman, the following conditions are indispensable when children learn to read (see Smith, 2001):

1. Phonological awareness – sensitivity to the sound structure (rather than the meaning) of speech, eg rhyming words.
2. Phonemic awareness – ability to manipulate sound units (ie phonemes) that are smaller than the syllable.
3. Alphabetic principle – understanding that written words consist of alphabet letters that are linked with the phonemes of every word spoken.

⁵ This approach originated in the US but is now currently used in some UK and US schools (Smith, 2001).

4. Orthographic awareness – knowledge of spelling patterns and orthographic rules, morphology and etymology.
5. Comprehension monitoring strategies – strategies for understanding and remembering the text.
6. The Multisensory Teaching principle addresses four of these conditions and is combined with the fifth element to obtain a balanced reading program. This is due to the notion that although it is primarily based on the use of phonics, it is also acknowledged that the use of phonics alone is not adequate.

According to Smith (2001), Multisensory Teaching which may only require 15 to 30 minutes of instruction a day is intended by its promulgators to be a failure prevention programme (see also Joshi *et al*, 2002). However, it can also be observed that other programmes which evolved from the Orton-Gillingham methodology⁶ such as the Dyslexia Training Program are also used as remedial reading programmes (see Oakland *et al*, 1998).

The Dyslexia Training Program (DTP) is a remedial reading program in the US which uses a variety of teaching techniques that appeal to the visual, auditory and kinaesthetic senses. It involves 'a highly structured phonetic-instruction training with heavy emphasis on the alphabetic system, drill and repetition to compensate for short-term verbal memory deficits, and multisensory methods to promote nonlanguage mental representations' (Oakland *et al*, 1998 p. 140). This remedial instruction is not only widely used, but has also been proven to be effective in improving the reading and spelling skills of those children with dyslexia (Joshi *et al*, 2002).

The curriculum for DTP begins by developing the most basic abilities including letter recognition and gradually extending to a more sophisticated levels of linguistic comprehension (eg syllabication) and then to the more extensive use of vocabulary and to its ultimate goal, ie reading comprehension. The program is structured to 'establish a link between the printed language and the phonetic elements it represents' based on the notion that reading comprehension is a by-product of well-developed decoding skills and vocabulary knowledge (Joshi *et al*, 2002).

Interestingly, Smith (2001) also argued that some studies overestimate the effects of the social and cultural background (eg parental literacy, lap time reading to the child) to the learners' development. Contrary to such prevailing views that socioeconomic status, the quality of linguistic environment provided in the home, parents' attitude and level of education, available books and other literacy materials have a major impact on the development of the children's literacy skills (see Snowling & Hayiou-Thomas, 2006), the interventions using the Multisensory Teaching Approach have been proven to be remarkably effective with learners from socially disadvantaged group (Smith, 2001).

⁶ Some other approaches derived from the Orton-Gillingham principle include the Spalding method, Alphabetic Phonics, the Herman Approach, Project Read and the Wilson Approach (see Joshi *et al*, 2002)

2.2.6 Partnership Between Parents and Teachers

... I don't like to admit it [but] mom and dad really did help me get this far.

(An 18-year-old female dyslexic cited in Amatangelo *et al*, 2001)

Life for many dyslexics can be difficult and unhappy, as they are often expected to perform like their non-dyslexic peers (Alexander-Passe, 2004). In this respect, any additional support they can receive outside the school is considered invaluable. In a small-scale study with dyslexic learners, Alexander-Passe (2004) found that about two-thirds of the dyslexic participants thought that their parents understood their condition. Another third probably had a more troubled life as a result of not getting appropriate social, emotional and practical support from those closest to them (Fawcett & Nicolson, 1991). In such cases, parents may often not even be willing to acknowledge that there is a problem.

According to Sunderland and Klein (2001), successful dyslexic people tend to attribute their success to the support received from their parents. Based on this philosophy, an 18-hour course called 'Help Your Dyslexic Child' was run for six weeks by the London Language and Literacy Unit (LLLU) at South Bank University in summer 2000. The course included information which helped parents to determine whether or not their child was dyslexic; developed their understanding of individual learning styles; and helped them to have practical strategies when helping a child in reading, spelling and writing. As a result, this developed the parents' confidence in how to offer the best help they could to their child. Similarly, as part of promoting a dyslexia friendliness campaign, parents of dyslexic children in East Sussex took part in sessions that were aimed at understanding dyslexia better, and at helping parents to be aware of their role in developing their child's literacy (Amos, 2004).

A study undertaken by Hales (2001) highlighted the experience of dyslexic learners and their parents as they discovered various strategies that parents can use to help their dyslexic child. This may include talking to other parents of children with the same condition, believing that their effort can make a genuine difference to their child, and remembering that they know their child best. As part of a two-year evaluation project, which highlighted the parental-professional communications relating to dyslexic learners' learning difficulties, parents' roles were said to have evolved from a type of compensation (ie parents' supportiveness) to communication, then, to accountability leading to participation or partnership in which parents and teachers worked together.

2.2.7 Promotion of Dyslexia Friendly Schools

... being an effective school and becoming dyslexia friendly seem to be two sides of the same coin.

(MacKay, 2001, p. 2)

In a recent journal article based on a study with participating schools in Durham, Riddick (2006) called for the adoption of dyslexia friendly practices to ensure that the needs of children with

specific learning needs would be legitimately met. When dyslexic learners' self-esteem was compared to that of their peers who develop typically, it showed that they had significantly lower self-esteem. Riddick (2006) indicated that environments which implicitly encourage dyslexic pupils to compare themselves with their immediate peers are not helpful. A study by Humphrey (2002, cited in Riddick, 2006), reveals that when the self-esteem of dyslexic learners from the mainstream classroom and those who were in a specialist dyslexia unit were compared, it was found that the latter scored notably higher. According to Riddick (2006), 'for many children with specific literacy difficulties, the mainstream class is not a "dyslexia friendly" setting' (p. 146).

So, what is a dyslexia friendly school like? How can an ordinary school be transformed into one that is dyslexia friendly? According to MacKay (2001), in a study undertaken in Wales, a dyslexia friendly environment is characterised by the presence of the following:

- staff who are trained in 'dyslexia friendly' techniques
- specialist provision. Extra time for specialist tuition is created. Dyslexic learners are taught by a very experienced and highly qualified dyslexia specialist
- strong leadership from the school management
- whole school approach to special needs in general
- a culture of high expectation for all
- rigorous monitoring and evaluation.

MacKay (2001) also argues that effective schools value strong leadership, staff development, and the quality of instruction and learning. In such schools, all children – irrespective of their abilities – are deemed important and so they are provided with the resources and environment that they need to develop optimally. It has been argued that 'many of the practices advocated for a dyslexia friendly school will benefit a wide range of children and not just those children identified as having dyslexia' (Riddick, 2006, p. 148).

Riddick (2006) explains, in a UK-based study, that in a school where a dyslexia friendly policy has been adopted, all teachers adopt various techniques ranging from the most simple (eg displaying key words, giving photocopied notes) to a specific teaching technique (eg multisensory teaching), which have proven useful in supporting children with dyslexia. Likewise, the use of computers and laptops will be encouraged for those with literacy difficulties, although this is not an easy option for some dyslexic learners (see Cooke, 2001). Riddick (2006) also suggests using a constructive system for marking or grading, where separate marks are given for content and presentation and students are given a choice whether or not they want to read out loud in class. Teachers may also consider using the school's website for posting homework assignments as a form of support to dyslexic pupils. Such a provision is incorporated in the school setting in order to remove potential learning barriers amongst dyslexic learners.

In Scotland, Dyslexia Scotwest, which aims 'to raise awareness and understanding of dyslexia' and 'to offer help and support to anyone with an interest in dyslexia' introduced a scheme called

the Dyslexia Friendly Schools Award (DFSA) in 2001. DFSA involved a partnership with The Scottish Executive and East Renfrewshire Council. An HMIE report for East Renfrewshire Council (2005) stated that fourteen schools have already gained the DFSA whilst others were working towards it. Due to the success of the pilot study, the project was extended to schools in West Dunbartonshire and Argyll and Bute

(see <http://www.dyslexia-scotwest.org.uk/services/dyslexia-friendly-schools-award>). The criteria⁷ set before the school receives the award involve:

- Holding a meeting amongst the school's key management personnel to outline the procedures involved in the process to ensure clear understanding of the targets. School staff and parents in collaboration with Dyslexia Scotwest staff also form a steering committee.
- Dyslexia Scotwest staff begin the assessment process and an awareness session is presented to all school staff, including teaching and office staff, classroom assistants, catering and janitorial staff
- A holistic approach is used throughout the assessment by seeking the views of school staff, parents and pupils regarding the 'dyslexia-friendly' status of the school.
- There are also meetings organised between Dyslexia Scotwest and Additional Needs staff.
- Dyslexia Scotwest provides an initial assessment followed by some suggestions for improvement by which they offer assistance so that the school can incorporate their suggested adjustments.
- Reassessment takes place after the school makes the necessary adjustments. Dyslexia Scotwest staff prepare a report which is presented to the steering committee. Upon acceptance of the report, the school is awarded Dyslexia Friendly Status.

There is some evidence that schools in Scotland continue to investigate and pilot the concept of dyslexia friendliness (see Reid *et al*, 2005; HMIE, 2005).

2.2.8 Teaching Based on Learners' Preferred Learning Style

... each student with dyslexia should be taught in the way he or she learns best.

(Ellis, 1993 cited in Exley, 2003, p. 216)

The idea of tailoring the teaching and learning strategies to suit the needs of dyslexic learners is primarily based on the concept of individual learning styles (Exley, 2003). Cogan and Flecker (2004), in their book *Dyslexia in secondary school: A practical handbook for teachers, parents and students*, agree with the idea that once the learners' learning styles are identified, appropriate teaching methods can be implemented. According to Amos (2004), a lot of work has recently focused on the importance of identifying and teaching in accordance with the

⁷ See < <http://www.dyslexia-scotwest.org.uk/services/dyslexia-friendly-schools-award/dyslexia-friendly-school-assessment-criteria>>

children's individual learning styles. This is partly influenced by the recognition of the fact that dyslexic learners exhibit sufficient but different strengths, needs and approaches to learning (Exley, 2003). It is argued that this is also a means of providing learners with more opportunity to succeed by emphasising their affirmative experience of learning.

A small-scale study by Exley (2003) with students in rural Northamptonshire looked at how the performance and attainment in both literacy and numeracy of dyslexic learners could be improved if their preferred learning styles were taken into account. In her study of four male and three female participants, she conducted appropriate assessment to ascertain whether the students were predominantly visual, auditory or kinaesthetic learners. The results informed the bases on which literacy and numeracy lessons were planned and carried out.

The findings of this research suggested improvement in the performance of all seven students who took part in the research. Five of them showed much improvement in both the mathematics and spelling tests, whilst the other two who made the least progress were also identified as having emotional and/or behavioural difficulties. The results of this research strongly suggest that '[w]hen students are taught using their preferred learning styles, they not only increase academic attainment but also improve their attitudes to learning and behaviour' (Given, 1996 cited in Exley, 2003, p. 218).

However, a rejoinder to Exley's paper from Mortimore (2005) argues for caution in the application of learning style theory to teaching dyslexics since the '[e]xamination of the existing research into learning style and dyslexia reveals a complex picture' (Mortimore, 2005, p. 145). It was argued that more than 70 theories on learning styles have been devised and this plethora of models is the focus of a lot of controversy related to validity and reliability. In addition, Mortimore (2005) also stressed that labelling a student with a particular learning style can restrict rather than liberate him/her.

In addition, a related argument was put forward by Kotula (2003) with regard to the instructional materials used for teaching dyslexic children: reading materials need to be carefully selected to ensure that they will 'best hold children's interest, teach the desired values, or provide readiness for reading instruction' (p. 190). Yet Kotula (2003) also acknowledged that doing so is accompanied by a lot of challenges (eg conflict between the age of the reader and the difficulty of the reading materials).

2.2.9 Use of Special Computer Software

Mentl helf esae. frm as far bak as rekuds are kept mentil ilnes has ben defned xplrud ad dokumntd in the letretre its cuzs haf ben atrebud to a mlutetde of resens rangng from posesten demens bad sprtes and krses.

(A severely dyslexic learner's uncorrected writing cited in Cooke, 2001)

The potential benefits of word processors in helping dyslexic learners 'suggest there is justification for examining how a computer might be used to assist dyslexic readers with text reading and production' (Gregor *et al*, 2003, p. 341). They have a number of features which are particularly helpful to those who have literacy problems. These may include consistent and clear text on the screen, spelling aids, grammar function, and a predictive-typing facility.

However, although a computer is acknowledged to be a useful aid, it also has its limitations. For example, by the nature of the computer and its functions, it is not designed to be used by those who need to wear tinted glasses when reading. Therefore, a team consisting of a software engineer, a teacher with a specialism in dyslexia, a usability engineer/psychologist and a programmer designed *SeeWord* – a highly configurable word processing environment that allows dyslexic learners to select the settings the learners considered most appropriate for reading the text. Experimental findings suggest that dyslexic learners can benefit significantly when reading from the screen using this special software. Gregor *et al*, (2003) suggest that a larger-scale evaluation of such software is necessary.

In another study, which took place in a Spanish context, an intervention (ie a computer-based reading practice) was given to two groups of children: 14 dyslexic children, and 31 'garden-variety' poor readers. Another group (ie control) with 28 children with low reading performance was not given the intervention. Pre- and post-tests were administered to all children in the areas of word recognition, reading comprehension, phonological awareness and visual and phonological tasks. The study findings indicated that there was improved word recognition for the two groups who received the intervention, albeit that dyslexic learners demonstrated difficulties during computer-based word reading. The study also demonstrated that 'low-IQ children with [learning disabilities] were more successful than those with high IQs in improving their phonological awareness skills [suggesting] that intelligence-level information may not be necessary for differentiating children with reading disabilities from garden-variety poor readers' (Jimenez *et al*, 2003, p. 46).

Other programmes that have been specially developed for dyslexic learners over the last ten years include 'Punctuate Plus', 'Sounds & Rhymes', 'Soapbox', 'Chatback' and 'Magic E' (see <http://xavier.bangor.ac.uk/xavier/software.html>).

At the Fifth BDA International Conference held in York, Ann Cooke (2001) presented a case study of 'J', a mature-age student with severe dyslexia. Undertaking a three-year degree

course was a real challenge as she had very limited literacy skills combined with great difficulty with handwriting and with numbers. As a result, she was heavily dependent on a word-processor/computer, which literally performed the mechanical tasks of reading and writing for her. With all the support available to her, including access to course content, study support and funding amongst others, she eventually achieved a degree in psychology. J's case demonstrated that lack of functional literacy can be overcome at a cost not only in personal but also in financial terms. Cooke (2001) also emphasised that although technology is now widely available, she is not suggesting that it is an easy alternative for severely dyslexic learners.

2.2.10 Use of Suitable Print Size and Background Colour

According to Vellutino *et al* (2004), the most prevalent and influential research on dyslexia before the turn of the century focused on the deficiencies in the dyslexic's visual system. A study conducted by O'Brien *et al* (2005) in the US specifically explored dyslexia as a visual-deficit learning disorder and addressed the question 'Do dyslexic learners have a preferred print size to facilitate faster reading?'

There are various reasons why reading impairment can be caused by a stressed visual system. Firstly, when compared with skilled readers, dyslexic learners are probably less efficient at picking up visual information (ie distinguishing letters in words). Secondly, they may be suffering from lateral masking ('crowding') effects. Lastly, it may be a product of short visual span, which determines the number of letters that can be recognised at a glance (O'Brien *et al*, 2005).

The study made some interesting findings, one of which suggests that 'dyslexic readers behave like younger non-dyslexic readers with regard to having slower maximum reading rates and higher critical print sizes' but 'the slowest dyslexic readers did not necessarily require larger print size thresholds to attain their maximum reading speed, whereas slower non-dyslexic readers did' (O'Brien *et al*, 2005, p. 345).

2.2.11 Spelling and Vocabulary Training

... there is a strong relationship between vocabulary knowledge and reading comprehension
(Stanovich, 1986 cited in Fawcett & Nicolson, 1991, p. 379)

Spelling Training

It is widely recognised that spelling mistakes are characteristic of many dyslexic learners (Pavlidis & Katana, 2004). In this regard, Sunday (2004) endorses the teaching of spelling for two reasons:

- Children are failing to master written language skills which can have serious consequences in academic subjects which require proficiency in these skills.
- Concurrent teaching of reading and spelling can reinforce each other which helps children to learn and succeed.

Based on a UK study, Lee (2004) strongly advocates the use of the SpELSS method (Spelling Easily with Logic, Syllables and Suffixes) as one that both works and appeals to dyslexic learners. This logical approach to spelling is designed to help dyslexic learners to have more control of their spelling by learning and analysing the roles of vowels, syllables, syllabled words, and consonant and vowel suffixes amongst others. Lee (2004) also pointed out that spending more time for these lessons will help ensure that dyslexic learners can integrate them into their writing.

Bos and Reitsma (2003) investigated the effectiveness of various spelling exercises in a Dutch context. Taking cognisance of their own experience and with a specific poor speller in mind, a group of experienced support for learning teachers were asked to rank several sets of spelling exercises from the most to the least effective. Such exercises include identification of strategies for teaching spelling:

- provision of explicit rules
- phonological support
- use of structuring into similar words
- repetition of practised words
- reading exercises
- transfer/generalisation of spelling rules.

Their study proposes that 'a rule-based strategy [is found] to be the most effective, irrespective of children's IQ, phonological skill, or attention' (Bos & Reitsma, 2003, pp. 124-125). A slight reservation was expressed whether the findings of the study with a transparent language like Dutch are transferable to an opaque language like English.

Vocabulary Training

Fawcett and Nicolson (1991) contend that '[t]he ability to learn new vocabulary is a crucial component in the acquisition of verbal competence [since] almost every verbal ability or aptitude test includes a vocabulary subtest' (p. 379). This principle prompted them to conduct a longitudinal study involving 13 dyslexic adolescents over five years. Participants from Sheffield were chosen for whom efforts to remedy their reading deficit had proved unsuccessful, resulting in a deficit of at least 18 months.

The participants were initially categorised into two groups (ie the poor vocabulary and the good vocabulary) and were all given a pre-test on different aspects of the experimental tasks followed by six weeks of training on specified vocabulary items. The experiment comprised both enriched and traditional training techniques. The enriched training involved the use of difficult words (eg philanthropist, scapegoat, astound) chosen to encourage generating sentences, semantic linking and identifying affective reactions, as opposed to purely discussion of dictionary definitions. The traditional training employed the use of worksheets, crosswords and word bingo, amongst others, which were presented by using dictionary-type definitions. Parents were asked to provide assistance (eg giving examples that would stimulate the discussion, working directly with their child using the prescribed word cards and work books). At the end of the training period, an immediate post-test (equivalent to the pre-test) was administered and was followed-up by a post-post test six months later. A significant improvement was noticeable from the 'good vocabulary group' when their pre-test and post-test performance was compared. Likewise, it is worthy of mention that the improvement in knowledge of words persisted even after six months. This was not the case for the 'poor vocabulary group', however, in this simple vocabulary training programme, the experimenters were also able to draw the conclusion that 'the training program ...should prove sufficient to lead to long-term improvements in vocabulary knowledge if the initial vocabulary level is adequate' (Fawcett & Nicolson, 1991, p. 383).

2.3 Effectiveness of Teaching Approaches and Interventions

In the inclusion of examples of best practice for this review, we adopted two major considerations. Firstly, we included studies which employed rigorous methodology that enhanced the trustworthiness of the results. This included how various criteria were set in the selection of research participants. Secondly, we attached high importance to studies which demonstrated very effective outcomes.

2.3.1 Case Studies: United Kingdom

It is apparent that a lot of the research in the United Kingdom concerns the use of creative interventions, as well as exploration of issues deemed beneficial to dyslexic learners. The case studies selected for inclusion in this report represent examples of practices which proved effective in various settings and environments. Further details of these cases, which offer a lot of innovative ideas for schools/teachers/LEAs to consider, will be provided below.

Creation of Self-Esteem Groups

As a response to what academics and researchers (see Hales, 2004; Humphrey, 2002; Humphrey & Mullins, 2002; Tsovili, 2004) identified as something lacking amongst dyslexic learners (ie a positive view of oneself), a six-week intervention designed to enhance the self-esteem of secondary dyslexic learners from a school in Winchester was studied by Burton (2004).

The intervention is primarily based on the Esteem Builders Complete Program by Borba (1989, cited in Burton, 2004). According to this programme, the five building blocks of self-esteem comprise:

- security – feeling comfortable and safe; knowing what is expected; understanding rules and limits.
- selfhood – acquiring self-knowledge and awareness of individuality.
- affiliation – developing a sense of belonging; feeling appreciated and respected by others.
- mission – having a sense of purpose and motivation in life; taking responsibility for oneself.
- competence – feeling successful in those things considered important; having an awareness of strengths and acceptance of weaknesses.
(Burton, 2004, pp. 57–58)

There were four groups of students who participated in the six-session course⁸ where each session lasted fifty minutes. The first two groups were used for piloting the study, whilst the third and fourth groups took part in the main study. When it became more apparent that the intervention led to immediate benefits for the pupils, it was decided to conduct a more systematic and robust evaluation of the outcomes. Therefore, the focus of discussion for the results (Burton, 2004) is on the fourth group.

Two of the building blocks, namely 'security' and 'affiliation' were reflected within the individual activities and group work tasks. Participants were also encouraged to practice the Rogerian counselling concept of 'unconditional positive regard', to follow some rules (eg taking turns to speak, being kind to each other), and to show mutual respect (Rogers, 1983). The other building blocks were incorporated in the content of the sessions.

Using a standardised psychometric test of children's self-esteem (ie the Five-Scale Test of Self-Esteem For Children) improvements were noticeable in every component (ie global, academic, body, family and social) for the fourth group, with the greatest increase in the social

⁸ Courses were run at different times.

component. Due to the small number of participants, no sophisticated analysis of data was carried out. Nevertheless, the data clearly showed an increase in scores for their self-esteem following six sessions of intervention. This finding was complemented by the positive feedback and comments received from the participants who found it disappointing when the sessions ended. What they considered most helpful was the opportunity to talk and get to know others who were experiencing similar difficulties. The sessions also made them recognise and realise their respective strengths as well as giving them confidence in coping with dyslexia and other aspects of school life (Burton, 2004).

At the end of the course, the Headteacher, the Special Needs Co-ordinator and class teachers said that they could see improvements in the children's behaviour and in their peer relationships. They also agreed that the intervention had been a positive experience for the children concerned. Burton also felt that the 'willingness of the teacher-in-charge to invest a significant proportion of allocated EP [educational psychologist] time as well as teacher time to such group work is in itself evidence that it is highly valued in terms of the outcome for pupils' (Burton, 2004, p. 68).

Flying Start Programme

The Flying Start programme was a summer programme organised by the City of Edinburgh Council for dyslexic learners. The five aims of the programme were:

- To increase the self-esteem and self-confidence of participants.
- To promote positive attitudes to secondary school by delivering a challenging and enjoyable programme.
- To offer opportunities for success through a programme that reflected a range of intelligences.
- To offer participants opportunities for collaborative working in contexts where literacy difficulties would not be an issue.
- To promote links between pupils with similar difficulties attending the same secondary schools, and across the city.

(Dodds & Houston, 2004)

This special one-week activity for dyslexic learners took place on the last few days of the summer vacation in 2002 and 2003 at Leith Academy in Edinburgh. From the very first morning, the activities were geared to contribute to a positive atmosphere within the programme and to make young people at ease and to get to know other participants. Workshops included film-making, photography, drama, story telling, craft activity, art, t-shirt making (which relies heavily on using ICT) and other leisure activities. There were also visits to some interesting places in Edinburgh (eg Alien Rock – an indoor climbing wall, the Botanic Gardens, the National Portrait Gallery), and games to promote co-operation and teamwork. The final day ended with a barbecue and presentation afternoon.

According to Dodds and Houston, the marked difference between the first session on Monday morning and the last session on Friday afternoon was obvious not only to the programme organisers but also to the participants themselves. It was also apparent that the programme achieved the objectives it set for this group of learners. The creative workshops enabled dyslexics to realise that they had the capacity to do various challenging things successfully. The enjoyable activities instilled a more positive attitude towards learning and helped them to gain more confidence in what they could achieve. The whole programme also provided them with an opportunity to get to know other learners who were in similar circumstances to themselves and who could also be a powerful source of support. The tremendous impact of the programme could be seen from the very positive comments from the 84 pupils who attended the programme (Dodds & Houston, 2004).

Promotion of a Dyslexia Friendly School Environment

Using the principle of a dyslexia friendly school approach, a comprehensive school in North Wales incorporated into their practices the four key areas in transforming an ordinary school into a dyslexia friendly one. These areas included building strong school leadership, assimilation of whole school approaches to special needs in general, rigorous monitoring and evaluation, and creating a culture of high expectation for all in order to meet the needs of dyslexic pupils (MacKay, 2001). In addition, the school offered specialist provision intended to provide supplementary support for students who were severely dyslexic by giving them five hours each week of access to special teaching from a very experienced and highly qualified dyslexia specialist.

Strong leadership was also encouraged through the creation of a Special Educational Needs Co-ordinator (SENCO)⁹ (often this will be a Senior Teacher and a member of the Senior Management Team) and the promotion of the 'corporate responsibility' principle towards children's progress. Additionally, as part of the whole school approach, staff received training, through a rolling INSET programme, in the following areas:

- dyslexia awareness
- mind mapping
- essay planning techniques and the use of frameworks
- handwriting
- study reading techniques
- how to support spelling – with particular reference to 'jargon words'
- numeracy
- oracy.

⁹ The equivalent of a support for learning coordinator.

A rigorous process for monitoring the progress of pupils in various subjects through the school's IT and intranet system was also implemented. Subject teachers helped the students to monitor their own progress through target setting. Depending on the outcome, targets were to be reviewed and modified, after seeking the SENCO's advice if necessary. Finally, teachers were encouraged to look 'through' spelling and organisational mistakes and assess the underlying quality of dyslexic learners' work .

All this effort was supported by the headteacher's high expectation that all pupils (including dyslexic pupils) would take part in national examinations. This implied that dyslexic learners would work much harder than everyone else in their attempt to produce acceptable work. In using the principles of dyslexia friendliness, Mackay (2001) claimed that dyslexic pupils were very successful, pointing to their results: all those in year 11 were leaving with passes at GCSE, and a high percentage achieving 5+ A–Gs with higher grade passes.¹⁰ What was found from using the dyslexia friendly approach was that although the study skills techniques were meant to support and enhance the learning of dyslexic pupils, they actually enhanced the learning of all the pupils (MacKay, 2001).

2.3.2 Case Studies: International

In this section we present a few examples of studies (undertaken mainly in the United States and in other European countries) which demonstrate a well-developed and systematic approach in their methodology leading to effective outcomes. These studies implicitly show that when more than one methodological approach is used in research, the research findings are consequently enhanced.

The Dyslexia Training Program: A Multisensory Method for Promoting Reading

'Dyslexia is a language learning disorder that results in deficits in reading, spelling, and, often, written language' (Oakland *et al*, 1998). Having this tenet at its core, the three qualities which are believed to facilitate the reading development of dyslexic learners involve:

- the provision of a highly structured phonetic-instruction training programme with heavy emphasis on the alphabetic letters
- drill and repetition to compensate for short-term verbal memory deficits
- multisensory methods to promote non-language mental representations (Oakland *et al*, 1998, p. 140)

In a research study led by Oakland (1998) in collaboration with other academics from different parts of the United States, an attempt was made to validate the effectiveness of the extensively used Orton-Gillingham approach (and its adaptations) for promoting reading.

¹⁰ Mackay (2001) did not make any statistical comparison with the results from other comprehensive schools who did not adopt the dyslexia friendly approach.

The experimental study involved 48 dyslexic pupils in total. Twenty-two (22) pupils were in the experimental group, and 26 were in the control group. Various tests (eg Wechsler Intelligence Scale for Children-Revised, vision and hearing tests) were conducted to ensure a suitable match between the two groups. As a result, students found to have brain lesions and major emotional problems together with those who were non-native English speakers were excluded from the study. For a period of two years (10 months of the year, and 5 days per week), a subset of the experimental group attended Dyslexia Training Programme reading classes, involving a multisensory approach. Another subset of the experimental group received their reading lessons through videotapes (also containing the Dyslexia Training Programme) whilst the control group were given school-based reading assistance.

After analysing results from the two Dyslexia Training Programmes which differed in the way they were delivered, it is interesting to note that the two subsets made comparable progress in reading comprehension, word recognition and spelling. When the performance of the experimental group was compared with the control group, the gains achieved by the former group in various reading-related tests were very evident. The study's findings (Oakland *et al*, 1998) assert that the Dyslexia Training Program is effective in promoting the reading development of children with dyslexia. The reading gains achieved by the experimental group, albeit modest, are clinically significant. What makes this study more credible is that the use of a two-year intervention (which is relatively long) managed to eliminate many of the flaws of other reading intervention studies. The length of time used for the intervention, for example, was sufficient for the pupils to adopt a particular reading strategy. In addition, issues pertaining to consistency and control of experimental variables were resolved by using videotapes and encouraging teachers to adhere strictly to the principles of the Dyslexia Training Programme.

Personalised Multimedia Method (PMM)

A study in Greece, in collaboration with six other European countries, evaluated the effectiveness of the Personalised Multimedia Method (PMM), developed by George Pavlidis to help remedy the spelling problems of dyslexic learners (Pavlidis & Katana, 2004). PMM is a multimedia program (run on a PC running Microsoft Windows) designed to improve the reading, spelling, intonation, handwriting and vocabulary of learners. There are six grades and each grade contains five levels of difficulty. Previous positive feedback on the effectiveness and user-friendliness of PMM prompted Pavlidis and Katana to undertake an experimental study into whether or not the PMM could help improve the spelling of Greek dyslexics.

The selection of the participants depended on satisfying ten criteria proposed by the researchers (eg normal IQ, vision, hearing, having Greek as a first language, and having had adequate educational opportunities). After the initial assessment, twenty children took part in this study which lasted between four and six months, with a total training of 22.5 hours. Two experienced trainers assisted the pupils throughout the intervention. PMM has advantages over other reading remedial methods, firstly, because the learning process is presented as a game. Secondly, the multimedia and graphics used are interesting and captivating. Thirdly,

learners were given immediate feedback which is believed to help increased their motivation to learn. A typical teaching session with the use of PMM comprised three stages:

- training without feedback
- practice with feedback
- test with feedback.

During the session learners were given time to have intonation training, to work on a combined spelling and pronunciation technique, and to have further training on spelling with known and unknown words. When scores before and after the teaching session were compared¹¹, spelling errors were immensely reduced after students undertook the prescribed PMM training. These data were obtained after participants were tested twice – before and after approximately five or six months training. The data showed that all participants who underwent PMM training had a reduced number of writing, dictation and composition errors in all categories (eg visual, intonation and grammatical errors) when pre-training and post-training tests were compared. This led to Pavlidis and Katana (2004) concluding that PMM is an effective tool for improving the spelling skills of Greek learners with dyslexia. Pavlidis and Katana also claimed that one year of training using PMM is equivalent to children achieving more than six years of full time school training. The transferability of such a study to the Scottish context may still require further exploration.

Intensive Remedial Instruction

A US-based research study which sought to compare the effectiveness/impact of two tested instructional programmes for severely dyslexic learners was undertaken by Torgesen *et al* (2001). In their study, both instructional approaches were designed to be phonemically explicit and systematic but the methods of instruction as well as the depth and extent of the phonemic decoding practice varied. Both the Auditory Discrimination in Depth (ADD) and the Embedded Phonics (EP) programmes were used.

The Auditory Discrimination in Depth program was designed to directly attack the phonemic awareness problems of children with reading disabilities by helping them discover articulatory cues to the number, identity, and order of phonemes in words. It emphasizes instructional activities that teach children to ‘feel’, as well as hear, the individual sounds in words. ... [T]he vast majority of time in this program was spent building phonemic/articulatory awareness and applying this awareness to solving decoding problems with individual words.

(Torgesen *et al*, 2001, p. 35)

On the other hand,

... the Embedded Phonics (EP) program ... provided explicit instruction in phonemic decoding strategies (letter-sound knowledge and blending) within a direct instruction

¹¹ The improvement in the participants’ spelling errors was analysed in both quantitative and qualitative terms. Quantitative analysis involved using tests that revealed whether or not the results were statistically significant.

framework. Phonemic awareness was stimulated during spelling and writing activities, and word identification strategies were practiced extensively while the participants read text. The EP program provided much more practice than the ADD program in reading and comprehending meaningful text, while the ADD program provided more explicit (down to the articulatory level) and extended practice on phonemic awareness and phonemic decoding skills than the EP program.

(Torgesen *et al*, 2001, p. 35)

Various criteria were also used to select the participants in this study. These criteria included: being identified by their teachers as having serious reading difficulties at the word-level; having average standard scores on two measures of reading at the word-level; having a verbal intelligence over 75; and having a low score in a phonological awareness assessment. Setting criteria also meant excluding some children from the sample (including those for whom English was a second language, those who were adopted, and those having a neurological condition or having a sensory or visual deficit).

In the administration of the two interventions, no control group was used due to the extremely high intensity of the interventions. Teachers who helped to administer the programme had the required knowledge and experience. Training sessions took place in a room provided by the school. The intense treatment was on a one-to-one basis in two 50-minute sessions for each day of the school week. This training lasted over a period of eight to nine weeks, consisting of 67.5 hours of instruction per child in total. There was a battery of both pre- and post-tests for assessing the effectiveness of the two interventions.

ADD and EP were both adjudged to be equally effective instructional techniques for severely dyslexic learners. According to Torgesen *et al* (2001), 'the most striking finding from this study was the size of the gains made by this sample of severely disabled readers, as well as the stability of those gains over the 2-year follow-up period. Both instructional methods produced very large alterations in the children's growth rates for broad reading ability when compared with the rate they had been growing during the previous 16 months' instruction in learning disability resource rooms' (pp. 50-51).

3: Implications of the Reviewed Literature for Scottish Education

It is no surprise that a century of research on dyslexia has produced a substantial body of literature investigating the nature, causes and approaches that can effectively alleviate the conditions of the dyslexic learners. There is no shortage of understanding of both the cognitive and the biological aspects of dyslexia. Today, it is now accepted that ‘there are both genetic and environmental influences on the language skills that contribute to literacy development’ (Snowling & Hayiou-Thomas, 2006, p. 110). Additionally, the vast literature on this topic also helps us appreciate what is becoming more apparent – the synchronised interactions between the behavioural, social and emotional dimensions experienced by learners with dyslexia. What is surprising though is the apparent lack of universal consensus as to what dyslexia really is (Gregor *et al*, 2003; Sawyer, 2006; Simpson, 2000; Vellutino *et al*, 2004). Yet, this is not entirely negative, because as Sawyer (2006) puts it,

Multiple sources of evidence reviewed ... lead to confidence in the conclusion that dyslexia is rooted in difficulties associated with language, but researchers and clinicians remain at the beginning of the journey toward understanding how to act on this knowledge. This is the ongoing quest that will ensure more positive outcomes for children with dyslexia.

(Sawyer, 2006, p. 106)

Ongoing debate on dyslexia is considered healthy in helping to crystallise the concept. It is also noteworthy that a vast and still growing number of psychologists, academics and researchers support the view that the development of dyslexics’ phonological processing skills plays a significant role in helping them how to learn to read.

Having briefly reviewed this literature in the preceding chapters, some conclusions and recommendations are offered for further reflection and discussion.

3.1 Conclusions and Recommendations

- According to the literature reviewed, early intervention is most effective for dyslexic learners. In this respect, identification of children who are at risk of dyslexia as early as possible appears to be advisable and gathering essential clues (eg family history of dyslexia, delay in speech, poor spelling) is crucial.
- Since ‘low self-esteem is often cited as a side effect of dyslexia’ (Burton, 2004, p. 56), it seems likely that programmes will be more successful if, alongside practical support, they emphasise activities and tasks that allow dyslexic learners to see not only their weaknesses but also their strengths and areas of competence (eg athletic or artistic competence). Recognising what they are capable of doing is likely to lead to an enhanced confidence in performing other school tasks.

- The dyslexic child's parents and teachers are often the first people who make the initial diagnosis of the child's condition whilst the specialists at school often give the treatment. A long-term synchronised effort between the teachers and parents in the identification, treatment and provision of continuous support appears to play a crucial role in helping dyslexic learners to function, adapt, compensate for their limitations and improve perceptions and capabilities as a person, as part of overcoming dyslexia. A very practical example given is when a prescribed programme for dyslexia intervention used by the teachers is repeated or supplemented by similar activities at home to reinforce the practical assistance received at school. This example suggests that a close working partnership between schools, parents and dyslexic learners themselves is a sensible approach in providing dyslexic learners with the optimum literacy support required to overcome the difficulties presented by their condition.
- Dyslexia is thought to be a multifaceted learning disorder, and the severity of the condition varies. The research suggests the importance of accurate diagnosis of the child to ascertain the type of intervention that can best help the child. A 'horses for courses' concept can help ensure that dyslexic learners are given learning support that is appropriate, and can make a difference to their learning development.
- The advances made in the area of information and computer technology (ICT) for helping dyslexic learners are very promising. Based on the literature reviewed, most of the larger-scale studies previously undertaken took place in other countries. Further exploration of the role of ICT in overcoming dyslexia in the Scottish context is perhaps worthy of attention.
- The intimation that the overwhelming majority of reading-disabled children 'represent an instructional dysfunction rather than a constitutional disability' (Calfee, 1983 cited in Joshi *et al*, 2002, p. 230; Vellutino *et al*, 2004) is both disheartening and encouraging. It is disheartening that learners fall victim to ineffective educational provision, but it is equally encouraging that appropriate teaching techniques can restore them to becoming normal learners. The review advocates adopting effective reading techniques. On this note, the pedagogies used in teacher education concerning how best to teach children to read (see Moats & Lyon, 1996; Rohl & Greaves, 2004; Spear-Swerling & Brucker, 2004) are worthy of further reflection. Such an approach is supported by a well-known adage: 'Prevention is better than cure'.

3.2 Further Recommendations: Examples of Best Teaching and Learning Practices with Dyslexic Learners

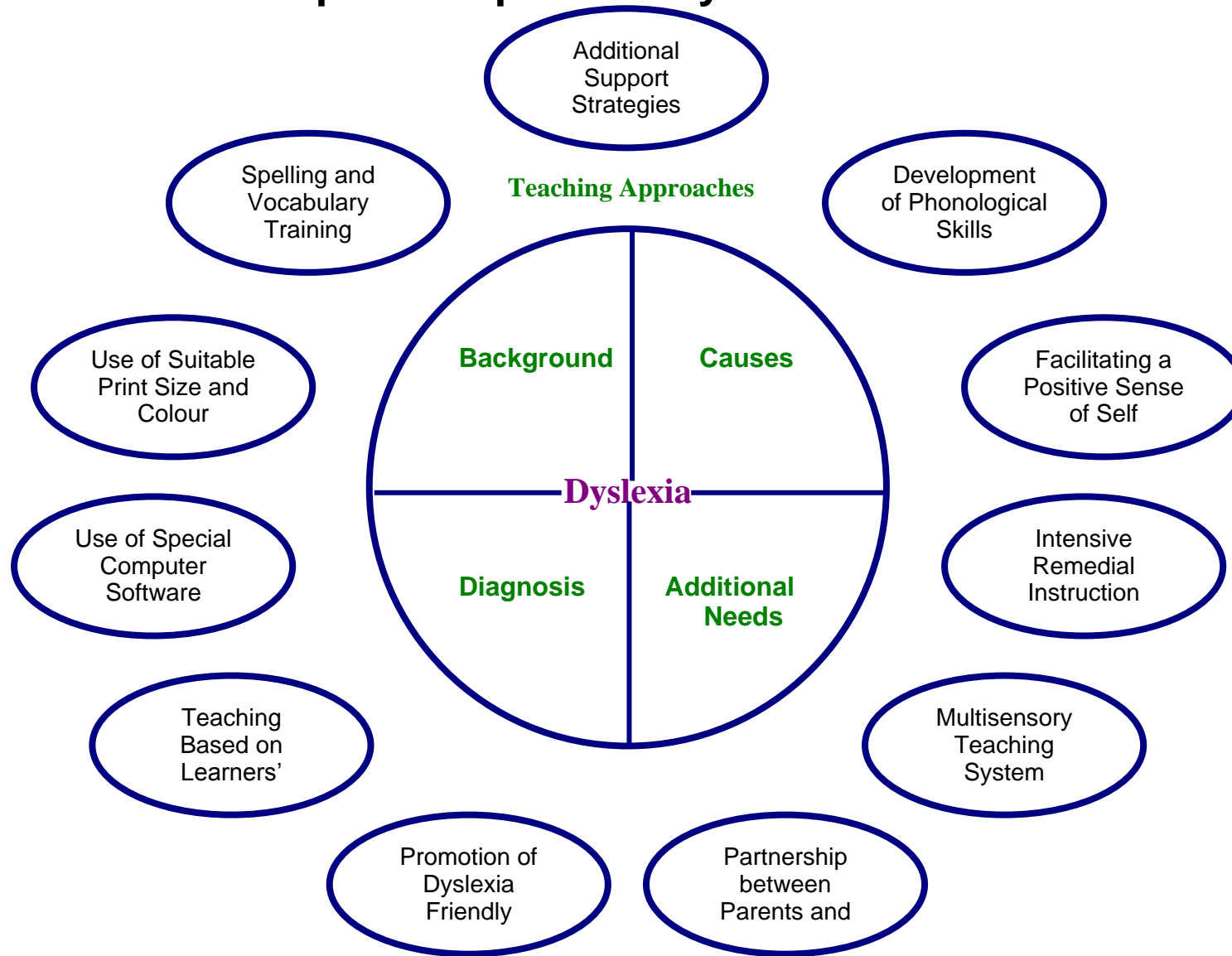
In this section, some very practical lessons gleaned from the selected cases of effective teaching and learning practices and interventions (see Section 2.3) will be highlighted.

- The 'Creation of Self-Esteem Groups' and the 'Flying Start Programme' courses organised for dyslexic learners were beneficial for various reasons. Firstly, the programme was carried out in a relaxed environment and the tasks were both enjoyable and educational. Both the tasks and the way they were presented enabled pupils to realise that despite being dyslexic, they could still be creative and productive individuals. Secondly, knowing that other children were in similar circumstances

created a sense of belonging. Realising that they were not alone in their struggle is also a form of support. Thirdly, organised activities for small groups of pupils are more focused and, therefore, more effective in bringing about changes in attitude and behaviour. It is not surprising that small group interventions have become established practice for a variety of professionals including educational psychologists (Burton, 2004).

- MacKay (2001) at the Fifth British Dyslexia Association International Conference acknowledged that transforming an ordinary school into a dyslexia friendly one presents a big challenge. He agreed that 'changing a school for the benefit of the 10+% of pupils who are dyslexic may be a difficult package to sell' because of the changes it entails. Yet, the encouraging results from a comprehensive high school in North Wales reveal that the benefits encompass all the learners and are not exclusive to those with specific learning difficulties.
- A common factor amongst the three techniques shown to be effective in helping learners with dyslexia (ie the Multisensory Method, the Auditory Discrimination in Depth and Embedded Phonics) is improving the phonological processing skills of dyslexic learners. A number of other studies support using techniques that are phonologically related (see Hatcher, 2000; Joshi *et al*, 2002; Lovett *et al*, 1994; Sawyer, 2006; Simpson, 2000; Snowling, 1998; Snowling & Hayiou-Thomas, 2006; Tijms *et al*, 2003; Vellutino *et al*, 1996; Uhry & Shepherd, 1997). In fact, it was asserted that '[t]he widespread consensus in the field is that phonological processes play a key role in learning to read' (Snowling & Hayiou-Thomas, 2006, p. 116). Perhaps, this is because in the English language '85% of the 17,000 most frequently used words are phonetically regular' (Smith, 2001, p. 4).
- Taking advantage of what modern technology can offer appears to be the main lesson to learn from the use of the Personalised Multimedia Method to help remedy the spelling problems of dyslexic learners. In the UK, as elsewhere, software has been developed in the last ten years for dyslexic learners' use (eg educational software developed by the University of Wales, Bangor). It is not clear though whether or not rigorous evaluation of the effectiveness of this software has already taken place. There is probably a need to raise awareness about the existence of such software and to encourage wider use in schools.

Appendix A: A Conceptual Map of the Dyslexia Review



Appendix B: Review Method

Taking account of the available literature on dyslexia, the policy context for the HMIE evaluation and our experience of conducting reviews, we used the following methods for this review.

- We obtained research evidence relating to the specified topic by searching bibliographic databases, CD ROMs and the internet for relevant journal articles,¹² Government reports, policy documents and conference proceedings. Likewise, hand searching of relevant material was also undertaken where papers were not available in electronic form. In search of pertinent electronic documents, key words were used to access information (eg a combination of 'dyslexia/dyslexic', 'children', 'learning', 'disability', 'teaching/learning approach', 'additional support'). Key word searching was undertaken in a flexible and pragmatic but transparent way as different research indices use slightly different key wording, terms and strategies (see Table 1). Additionally, resources from unpublished or 'grey' literature were also explored through the *Education-line* database. Simultaneously, colleagues/experts in the field were also contacted to acquire further materials (eg conference papers) on this topic.
- Data was organised using an electronic database – Endnote – which we used for the management of the literature references. Codes were attributed to specific questions/issues. When all relevant material was obtained/retrieved, an in-depth review of the literature was undertaken to extract information relating to the specified questions. The most current academic papers, in conjunction with policy documents, were individually examined to develop a comprehensive picture of the phenomenon in question. Then, we selected the resources deemed 'best-evidence'. This combined 'the quantification and systematic literature search methods of quantitative syntheses with the attention to individual studies and methodological and substantive issues typical of the best narrative reviews' (Slavin, 1986).
- We read the literature review data fully and reflectively, taking into account emerging patterns, approaches and the rationale for arguments used as well as trustworthy pieces of evidence. Finally, we conducted an overall analysis and synthesis of the findings to bring out the implications of the literature review for Scottish education and provide examples of best teaching and learning practices with dyslexic children.

In reviewing the literature, we gathered the relevant information as efficiently and effectively as possible. The research team kept in mind the purpose of the review and used a professional approach to produce a coherent report after bringing together the findings from different studies. Figure 1 (p. 39) provides an outline summary of the primary focus for this literature review.

¹² Harlen and Schlapp (1998) suggest using 'published sources, especially articles in refereed journals [since] there has already been some kind of quality control applied'.

Table 1: Literature Search Log

SOURCE (database/interface , eg ERIC/OVID)	DATE CAPTURED AND PERSON LOGGING	SEARCH STRATEGY	NO. OF HITS	NOTES
Social Science Citation Index	23.2.07	(TS=(pupil* OR school* OR student* OR educat* OR class* OR child* OR learn* OR teach*)) AND (TS=dyslexi*)	1,206	Most cited and most recent ONLY were sifted.
Ebsco Professional Development Collection	23.2.07	TI=dyslexi* OR SU=dyslexi*	278	Peer reviewed journals only.
Cambridge Scientific Abstracts: ERIC	26.2.07	(dyslexi*) AND (KW=(school* or pupil* or child* or educat* or teach* or learn*))	524	Peer reviewed journals only. Most relevant articles (sorted by relevance ranking) were sifted.
Cambridge Scientific Abstracts: ASSIA	26.2.07	(dyslexi*) AND (KW=(school* or pupil* or child* or educat* or teach* or learn*))	187	Peer reviewed journals only.

We conducted the above searches, sifted the results and entered them into an EndNote database. In addition, we searched for key documents and papers on the internet, including the DfES and SEED websites, and the BDA website. These sources are listed in the bibliography.

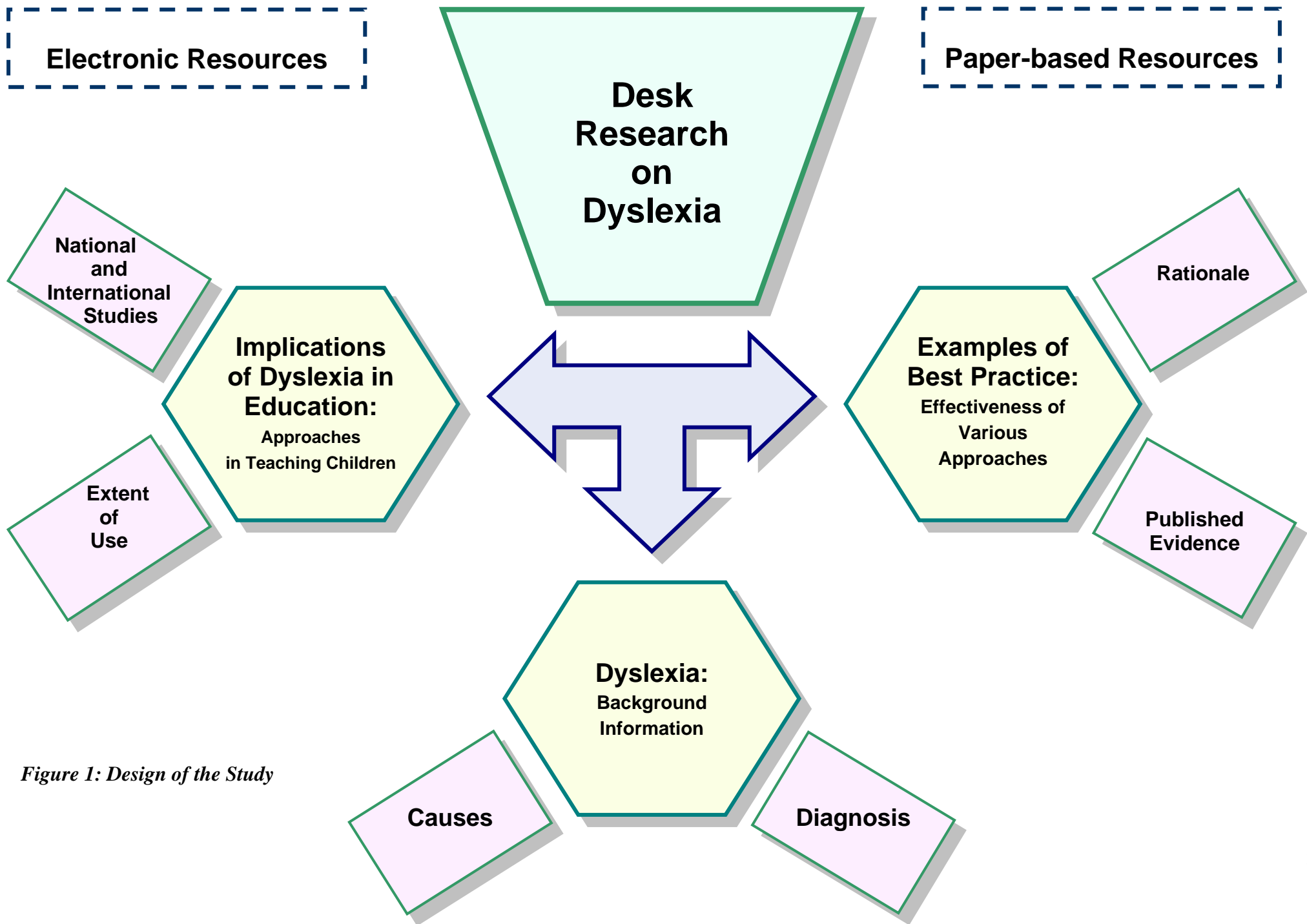


Figure 1: Design of the Study

Glossary

Acquired dyslexia: One of the two major categories of dyslexia, this form of the disorder resulting directly from brain damage usually to the left cerebral hemisphere.

(Colman, 2001, p. 8)

Attention-deficit/hyperactivity disorder: A mental disorder of childhood ... characterized by persistent inattention, hyperactivity, or impulsivity, with some of these signs and symptoms appearing before age 7, causing problems at school or work and in the home, and interfering significantly with social, academic, or occupational functioning.

(Colman, 2001, p. 62)

Developmental dyslexia: One of the two major categories of dyslexia, forms of the disorder that develop during childhood from unknown causes, also called reading disorder.

(Colman, 2001, p. 200)

Dyspraxia: An impairment in ability to perform deliberate movements, not caused by any defect in sensory or motor functions.

(Colman, 2001, p. 227)

Garden-variety poor readers: These children share the phonological deficits of dyslexia but have additional cognitive problems, including poor working memory, poor vocabulary, and difficulties with sentence construction tasks.

(Snowling and Hayiou-Thomas, 2006, p. 122)

Hyperactivity: Abnormal or pathological overactivity; a prominent feature of attention-deficit/hyperactivity disorder and hyperkinetic disorders.

(Colman, 2001, p. 343)

Phonological awareness: the ability to reflect upon the sound structure of spoken words

(Olson et al, 1989 cited in Snowling, 1998, p. 7)

Self-perception: an 'umbrella term' used to describe the thoughts, feelings, attitudes and beliefs that make a person an individual.

(Humphrey, 2003, p. 130)

Opaque language: characterises a language which permits a number of orthographic inconsistencies, eg English. This type of language may aggravate the problems with dyslexia.

(Snowling and Hayiou-Thomas, 2006; Vellutino et al, 2004)

Transparent language: characterises a language that has a more regular spelling system, eg Dutch.

(Snowling and Hayiou-Thomas, 2006)

Bibliography

- Alexander-Passe, N. (2004) 'A Living Nightmare: An Investigation of How Dyslexics Cope in School'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/mon_s6_d_12.shtml, 14 March, 2007.
- Amatangelo, J. S., Roberson, D., Roberson, T., and Roberson, S. (2001) 'Best Practices for Teachers, Administrators, Exceptional Student Populations and Parents of Dyslexic Children'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/thu_s5_d_11.htm, 14 March, 2007.
- Amos, J. (2004) 'Promoting Dyslexia Friendliness in East Sussex Schools'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/sun_p1_c_32.shtml, 14 March, 2007.
- Bos, M. and Reitsma, P. (2003) 'Experienced Teachers' Expectations about the Potential Effectiveness of Spelling Exercises', *Annals of Dyslexia*, 53, pp 104–127.
- British Psychological Society (2005) *Dyslexia, Literacy and Psychological Assessment*. Leicester: The British Psychological Society.
- Burton, S. (2004) 'Self-esteem Groups for Secondary Pupils with Dyslexia', *Educational Psychology in Practice*, 20(1) 55–73.
- Byl, N. N., Byl, F. M. and Rosenthal, J. H. (1989) 'Interaction of Spatial Perception Vestibular Function, and Exercise in Young School Age Boys with Learning Disabilities', *Perceptual and Motor Skills*, 68(3 Pt 1) 727–738.
- Calder, I. (2004) 'Including Pupils with Dyslexia: How can Classroom Assistants Help?'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/mon_s6_b_5.shtml, 14 March, 2007.
- Chan, D. W., Ho, C. S. H., Tsang, S. M., Lee, S. H. & Chung, K. K. H. (2004) 'Screening for Chinese Children with Dyslexia in Hong Kong: The Use of the Teachers' Behaviour Checklist', *Educational Psychology*, 24(6) 811–824.
- Cogan, J. and Flecker, M. (2004) *Dyslexia in Secondary School. A Practical Handbook for Teachers, Parents and Students*. London: Whurr Book Publishers.
- Colman, A. M. (2001) *Oxford Dictionary of Psychology*. Oxford: Oxford University Press.
- Cooke, A. (2001) 'A Non-reader Who Achieved a Degree: A Case-study of a Student with Severe Dyslexia'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/fri_p3_d_14.htm, 14 March, 2007.
- Crombie, M. (1999) 'Foreign Language Learning and Dyslexia', [online] Available at: <http://www.hilarymccoll.co.uk/resources/Dxa1.pdf>, 26 March 2007
- Deponio, P. (2005) 'The co-occurrence of specific learning difficulties: implications for identification and assessment', in Reid, G. and Fawcett A. (Eds), *Dyslexia in Context: Research Policy and Practice*. London: Whurr Publishers. pp 323–333.
- Dodds, D. and Houston, M. (2004) 'Flying Start Programme and Follow-up Study'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/tue_w8_b_2.shtml, 14 March, 2007.
- Duane, D. (2002) *Dyslexia ADHD and Non Verbal Learning Disorders*. Paper presented at Policy in Dyslexia Conference, Uppsala University, Uppsala, Sweden, August 14–16.
- Elliott, J. (2005) 'The Dyslexia Debate Continues – Response', *The Psychologist*, 18(12) 728.
- Exley, S. (2003) 'The Effectiveness of Teaching Strategies for Students with Dyslexia Based on Their Preferred Learning Styles', *British Journal of Special Education*, 30(4) 213–220.
- Fawcett, A. J. (2002) *Evaluating Therapies Excluding Traditional Reading and Phonological Based Therapies: A Review for the Department for Education and Skills, the British Dyslexia Association and the British Dyslexia Institute (2nd Review)*. Available at: <http://www.dfes.gov.uk/sen>, February, 2007.
- Fawcett, A. J. and Nicolson, R. I. (1991) 'Vocabulary Training for Children with Dyslexia', *Journal of Learning Disabilities*, 24(6) 379–383.

- Feeg, V. D. (2003) 'A Public Policy Change Needed for An Invisible Problem: Dyslexia', *Pediatric Nursing*, 29(4) 260.
- Gang, M. and Siegel, L. S. (2002) 'Sound-Symbol Learning in Children with Dyslexia', *Journal of Learning Disabilities*, 35(2) 137–157.
- Gersons-Wolfensberger, D.C.M. and Ruijsenaars, W.A.J.J.M. (1997) 'Definition and treatment of Dyslexia: A Report by the Committee on Dyslexia of the Health Council', *Journal of Learning Disabilities*, 30(2) 209–213.
- Goldstein, B. H. and Obrzut, J. E. (2001) 'Neuropsychological Treatment of Dyslexia in the Classroom Setting', *Journal of Learning Disabilities*, 34(3) 276–285.
- Goswami, U. (2002) 'Phonology, Reading Development, and Dyslexia: A cross-linguistic perspective', *Annals of Dyslexia*, 52, pp 141–163.
- Gregor, P., Dickinson, A., Macaffer, A. and Andreasen, P. (2003) 'SeeWord—A Personal Word Processing Environment for Dyslexic Computer Users', *British Journal of Educational Technology*, 34(3) 341–355.
- Griffiths, C. B., Norwich, B. and Burden, B. (2004) 'Parental Agency, Identity and Knowledge: Mothers of Children with Dyslexia', *Oxford Review of Education*, 30(3) 417–433.
- Grigorenko, E. L. (2001) 'Developmental dyslexia: An update on genes, brains, and environments', *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42(1) 91–125.
- Hales, G. (2001) 'How We Felt and How We Tackled It! – The Experiences of Dyslexic People and Their Parents'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/thu_p1_b_17.htm, 14 March, 2007.
- Hales, G. (2004) 'Chickens and Eggs. The Effect of the Erosion of Self-esteem and Self-image by Treating Outcomes as Causes'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/sun_s7_a_3.shtml, 14 March, 2007.
- Harlen, W. and Schlapp, U. (1998) *Literature Reviews*, Spotlight 71. Edinburgh: The Scottish Council for Research in Education.
- Hatcher, P. J. (2000) 'Sound Links in Reading and Spelling with Discrepancy-Defined Dyslexics and Children with Moderate Learning Difficulties', *Reading and Writing: An Interdisciplinary Journal*, 13(3–4) 257–272.
- Hay, D. A., O'Brien, P. I., Johnston, C. I. and Prose, M. R. (1984) 'The high incidence of reading disability in twin boys and its implications for genetic analyses', *Acta Geneticae Medicae et Gemellologiae*, 33, pp 223–236.
- Henderson, A. and Chinn, S. (2005) 'Dyslexic Pupils and the Key Objectives of the National Numeracy Strategy', in Reid, G. and Fawcett A. (Eds), *Dyslexia in Context: Research Policy and Practice*. London: Whurr Publishers. pp 288–303.
- HMIE (2005) Inspection of the Education Functions of East Renfrewshire Council [online] Available at <http://www.hmie.gov.uk/documents/inspection/EastRenfrewINEARep.html>, 5 April, 2007.
- Ho, C. S. H., Chan, D.W. O., Lee, S. H., Tsang, S. M. and Luan, V. H. (2004) 'Cognitive Profiling and Preliminary Subtyping in Chinese Developmental Dyslexia', *Cognition*, 91(1) 43–75.
- Humphrey, N. (2002) 'Teacher and Pupil Ratings of Self-esteem in Developmental Dyslexia', *British Journal of Special Education*, 29(1) 29–36.
- Humphrey, N. (2003) 'Facilitating a Positive Sense of Self in Pupils with Dyslexia: The Role of Teachers and Peers', *Support for Learning*, 18(3) 130–136.
- Humphrey, N. and Mullins, P. M. (2002) 'Personal Constructs and Attribution for Academic Success and Failure in Dyslexia', *British Journal of Special Education*, 29(4) 196–203.
- Jenkins, J.H. (2005) The Dyslexia Debate Continues – Letter, *The Psychologist*, 18(12) 729.
- Jimenez, J. E., Ortiz, M. R., Rodrigo, M., Hernandez-Valle, I., Ramirez, G., Estevez, A., O'Shanahan, I. and Trabaue, M. L. (2003) 'Do the Effects of Computer-Assisted Practice Differ for Children with Reading Disabilities With and Without IQ-Achievement Discrepancy?' *Journal of Learning Disabilities*, 36(1) 34–47.
- Joshi, R. M., Dahlgren, M. and Boulware-Gooden, R. (2002) 'Teaching Reading in an Inner City School through a Multisensory Teaching Approach', *Annals of Dyslexia*, 52, pp 229–242.
- Kotula, A. W. (2003) 'Matching Readers to Instructional Materials: The Use of Classic Readability Measures for Students with Language Learning Disabilities and Dyslexia', *Topics in Language Disorders*, 23(3) 190–203.
- Lawrence, B. and Carter, J. (1999) 'The Identification and Assessment of Dyslexia: Class Teachers' Perceptions of

- the Usefulness of the Dyslexia Screening Test for Seven to Eight Year-old Pupils', *British Journal of Special Education*, 26(2) 107–111.
- Lee, J. (2004) 'Spelling Logic? Prove It!'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/mon_s4_c_10.shtml, 14 March, 2007.
- Levelt, W. J. (2001) 'Defining Dyslexia', *Science*, 292(5520) 1300.
- Lovett, M. W., Borden, S. L., DeLuca, T., Lacerenza, L., Benson, N. J. and Brackstone, D. (1994) 'Treating the Core Deficits of Developmental Dyslexia: Evidence of Transfer of Learning After Phonologically- and Strategy-Based Reading Training Programs', *Developmental Psychology*, 30(6) 805–822.
- MacKay, N. (2005) 'The Case of Dyslexia Friendly Schools' in Reid, G. and Fawcett, A. (Eds), *Dyslexia in Context: Research, Policy and Practice*. London: Whurr Publishers. pp 223–236.
- MacKay, N. (2001) 'Achieving the Dyslexia Friendly School – The Hawarden Approach'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/wed_s3_c_2.htm, 14 March, 2007.
- MacKay, N. (2004) 'Success Comes in Cans, Not Can'ts – Accelerating Learning for Dyslexic Learners in the Mainstream Classroom through Metacognition and Emotional Intelligence'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/mon_w9_d_5.shtml, 14 March, 2007.
- McIntyre, C. and Deponio P. (2003) *Identifying and Supporting Children with Specific Learning Difficulties: Looking Beyond the Label to Assess the Whole Child*. London: Routledge Falmer.
- McNulty, M. A. (2003) 'Dyslexia and the Life Course', *Journal of Learning Disabilities*, 36(4) 363–381.
- Moats, L. C. and Lyon, G. R. (1996) 'Wanted: Teachers with Knowledge of Language', *Topics in Language Disorders*, 16(2) 73–86.
- Mortimore, T. (2005) 'Dyslexia and Learning Style – A Note of Caution', *British Journal of Special Education*, 32(3) 145–148.
- Norwich, B. and Lewis, A. (2001) 'Mapping a Pedagogy for Special Educational Needs', *British Educational Research Journal*, 27(3) 313–329.
- Oakland, T., Black, J. L., Stanford, G., Nussbaum, N. and Balise, R. R. (1998) 'An Evaluation of the Dyslexia Training Program: A Multisensory Method for Promoting Reading in Students with Reading Disabilities', *Journal of Learning Disabilities*, 31(2) 140–147.
- O'Brien, B. A., Mansfield, J. S. and Legge, G. E. (2005) 'The Effect of Print Size on Reading Speed in Dyslexia', *Journal of Research in Reading*, 28(3) 332–349.
- Organisation for Economic Co-operation and Development (OECD) website (nd) 'Primer on Dyslexia [online]. Available at: <http://www.oecd.org>, 16 March 2007.
- Paradice, R. (2001) 'An Investigation into the Social Construction of Dyslexia', *Educational Psychology in Practice*. 17(3) 213–225.
- Pavlidis, G. T. and Katana, V. (2004) 'Personalised Multimedia Method Significantly Improves the Spelling of Greek Dyslexics'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/sun_p1_c_30.shtml, 14 March, 2007.
- Petrill, S. A., Deater-Deckard, K., Schatschneider, C. and Davis, C. (2005) 'Measured Environmental Influences on Early Reading: Evidence from an Adoption Study', *Scientific Studies of Reading*, 9(3) 237–259.
- Phillips, B. M. and Lonigan, C. J. (2005) 'Social Correlates of Emergent Literacy', in Snowling, M. and Hulme C. (Eds), *The Science of Reading: A Handbook*. Oxford: Blackwell. pp 173–187.
- Pirrie, A., Head, G., and Brna, P. (2006) *Mainstreaming Pupils with Special Educational Needs*. Insight 27. Edinburgh: Scottish Executive Education Department.
- Polychroni, F., Koukoura, K. and Anagnostou, I. (2006) 'Academic Self-concept, Reading Attitudes and Approaches to Learning of Children with Dyslexia: Do They Differ from their Peers?', *European Journal of Special Needs Education*, 21(4) 415–430.
- Pope, D. J. and Whiteley, H. E. (2003) 'Developmental Dyslexia, Cerebellar/Vestibular Brain Function and Possible Links to Exercise-based Interventions: A Review', *European Journal of Special Needs Education*, 18(1) 109–123.
- Regan, T. and Woods, K. (2000) 'Teachers' Understandings of Dyslexia: Implications for Educational Psychology

- Practice', *Educational Psychology in Practice*, 16(3) 333–347.
- Reid, G. (2006) *Learning Styles and Inclusion*. London: Chapman.
- Reid, G., Deponio, P. and Davidson Petch, L. (2005) 'Identification, Assessment and Intervention—Implications of an Audit on Dyslexia Policy and Practice in Scotland', *Dyslexia*, 11(3) 203–216.
- Reid, G. and Fawcett, A. J. (2005) 'An Overview of Developments in Dyslexia', in Reid, G. and Fawcett A. (Eds), *Dyslexia in Context: Research Policy and Practice*. London: Whurr Publishers. pp 3–20.
- Reid, G. and Given, B. (1998) *Learning Styles: A Guide for Teachers and Parents*. Lancashire: Red Rose Publications.
- Riddell, S., Tisdale K., Mulderrigg, J. and Kane, J. (2005) *Literature Review of Educational Provision for Pupils with Support Needs*. Insight 35. Edinburgh: Scottish Executive.
- Riddick, B. (2006) 'Dyslexia Friendly Schools in the UK', *Topics in Language Disorders*, 26(2) 144–156.
- Rogers, C. R. (1983) *Freedom to Learn for the 80's*. Columbus, Ohio: Charles E. Merrill Publishing Company.
- Rohl, M. and Greaves, D. (2004) 'What's Happening with Pre-Service Preparation of Teachers for Literacy and Numeracy Teaching in Australia'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/mon_s7_b_4.shtml, 14 March, 2007.
- Sawyer, D. J. (2006) 'Dyslexia: A Generation of Inquiry', *Topics in Language Disorders*, 26(2) 95–109.
- Schneider, E. and Crombie, M. (2003) *Dyslexia and Foreign Language Learning*. London: David Fulton.
- Schneider, W., Ennemoser, M., Roth, E. and Kuspert, P. (1999) 'Kindergarten Prevention of Dyslexia: Does Training in Phonological Awareness Work for Everybody?' *Journal of Learning Disabilities*, 32(5) 429–436.
- Scottish Executive (2004) *A Curriculum for Excellence: The Curriculum Review Group*. Edinburgh: Scottish Executive.
- Shaywitz, S. E. (2003) *Overcoming Dyslexia*. New York: Alfred A. Knopf.
- Simpson, S. (2000) 'Dyslexia: A Developmental Language Disorder', *Child: Care, Health and Development*, 26(5) 355–380.
- Slavin, R. E. (1986) 'Best-evidence Synthesis: An Alternative to Meta-analytic and Traditional Reviews', *Educational Researcher*, 15(9) 5–11.
- Smith, M. T. (2001) 'Multisensory Teaching System for Reading'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/thu_s3_a_4.htm, 14 March, 2007.
- Snowling, M. (1998) 'Dyslexia: A Phonological Deficit: Evidence and Implications', *Child Psychology and Psychiatry Review*, 3(1) 4–11.
- Snowling, M. J. (2005) 'The Dyslexia Debate Continues – Letter', *The Psychologist*, 18(12) 729–730.
- Snowling, M. J., Gallagher, A. and Frith, U. (2003) 'Family Risk of Dyslexia is Continuous: Individual Differences in the Precursors of Reading Skill', *Child Development*, 74(2) 358–373.
- Snowling, M. and Hayiou-Thomas, M. E. (2006) 'The Dyslexia Spectrum: Continuities Between Reading, Speech, and Language Impairments', *Topics in Language Disorders*, 26(2) 110–126.
- Sonday, A. W. (2004) 'Why Teach Spelling?'. Paper presented at the Sixth BDA International Conference, University of Warwick, March 27–30 [online] Available at: http://www.bdainternationalconference.org/2004/presentations/sun_p1_c_32.shtml, 14 March, 2007.
- Spear-Swerling, L. and Brucker, P. O. (2004) 'Preparing Novice Teachers to Develop Basic Reading and Spelling Skills in Children', *Annals of Dyslexia*, 54(2) 332–364.
- Sunderland, H. and Klein, C. (2001) 'Parents as Teachers – A Model for Helping Parents Support Their Dyslexic Children'. Paper presented at the Fifth BDA International Conference, University of York, April 18–21 [online] Available at: http://www.bdainternationalconference.org/2001/presentations/thu_s7_a_1.htm, 14 March, 2007.
- Svensson, I. and Jacobson, C. (2006) 'How Persistent are Phonological Difficulties? A Longitudinal Study of Reading Retarded Children', *Dyslexia*, 12(1) 3–20.
- The Observer (2002) 'Lost for Wurds' [online]. Published on Sunday 30, June 2002. Available at <http://www.observer.guardian.co.uk>, 28 February 2007.

- Tijms, J. (2004) 'A Process-Oriented Evaluation of a Computerised Treatment for Dyslexia', *Educational Psychology*, 24(6) 767–791.
- Tijms, J., Hoeks, J. J. W. M., Paulussen-Hoogeboom, M. C. and Smolenaars, A. J. (2003) 'Long-term Effects of a Psycholinguistic Treatment for Dyslexia', *Journal of Research in Reading*, 26(2) 121–140.
- Torgesen, J. K., Alexander, A. W., Wagner, R. K., Rashotte, C. A., Voeller, K. K. S. and Conway, T. (2001) 'Intensive Remedial Instruction for Children with Severe Reading Disabilities: Immediate and Long-term Outcomes From Two Instructional Approaches', *Journal of Learning Disabilities*, 34(1) 33–58.
- Tsovili, T. D. (2004) 'The Relationship Between Language Teachers' Attitudes and the State-Trait Anxiety of Adolescents with Dyslexia', *Journal of Research in Reading*, 27(1) 69–86.
- Uhry, J. K. and Shepherd, M. J. (1997) 'Teaching Phonological Recoding to Young Children with Phonological Processing Deficits: The Effect on Sight-Vocabulary Acquisition', *Learning Disability Quarterly*, 20(2) 104–125.
- University of Wales, Bangor 'Educational Software' [online]. Available at <http://www.dyslexia.bangor.ac.uk>, 12 March 2007.
- Vellutino, F. R., Fletcher, J. M., Snowling, M. J. and Scanlon, D. M. (2004) 'Specific Reading Disability (Dyslexia): What Have We Learned in the Past Four Decades?', *Journal of Child Psychology and Psychiatry*, 45(1) 2–40.
- Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Chen, R., Pratt, A. and Denckla, M. B. (1996) 'Cognitive Profiles of Difficult-to-Remediate and Readily Remediated Poor Readers: Early Intervention as a Vehicle for Distinguishing Between Cognitive and Experiential Deficits as Basic Causes of Specific Reading Disability', *Journal of Educational Psychology*, 88(4) 601–638.
- Vernon-Feagans, L. (1996) *Children's Talk in Communities and Classrooms*. Oxford: Blackwell.
- West, T. G. (1997) *In the Mind's Eye*. New York: Prometheus Books.
- Wilson, V., Schlapp, U. and Davidson, J. (2002) *Classroom Assistants: Key Issues from the National Evaluation*. Insight 1. Edinburgh: Scottish Executive.