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THE CONTRIBUTION OF THE MONTESSORI APPROACH TO MULTISENSORY APPROACHES TO EARLY LEARNING DISABILITIES

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Dissertation submitted for the degree of Master of Education at the University of the Witwatersrand, Johannesburg

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ABSTRACT

Learning disabilities have become of increasing concern for educators. More and more children are having difficulty learning to read and write. This dissertation investigates what constitutes a learning disability, its etiology and whether or not it is possible to identify these disabilities in early childhood. The investigation further aims to discover if these learning disabilities are comprised of sub-disabilities and if these can be identified as such. To this end the research aims to determine the most appropriate remedial intervention strategies used for learning disabilities. Multisensory intervention is therefore explored. On the basis of this the Montessori Method is examined to ascertain whether or not the method can contribute to multisensory intervention at the preschool level. It is argued that the Montessori Method is admirably suited to making such a contribution. Further empirical research for these claims is indicated.

KEYWORDS

Learning disabilities; Dyslexia; Montessori Method; multisensory; Orton-Gillingham; early childhood; preschool; literacy.

DECLARATION

I declare that this dissertation is my own unaided work. It is being submitted in fulfilment of the requirements of the degree of Master of Education from the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

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(Name of Candidate)

_____

(Date)

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Chapter One

Introduction

We are often drawn to topics that are personal to us, that seem to have great relevance to central events of our lives. This thesis is one such example. I am learning disabled, my official diagnosis was a visual perception problem and dysgraphia. I am essentially dyslexic. It was fortunate that my problem was diagnosed and remediated while still early on in primary school. I say “fortunate” because had my Grade One teacher not been sensitive to learning problems, I would not have received a year of special education. I fear that my life would have been very different, if this had not been the case.

After that year of remediation, I mainstreamed and coped well academically, excelling in most subjects except mathematics and physical science, which was always a struggle to comprehend. I matriculated with academic honours and went on to study medicine at university. This was the first time I really experienced the problems associated with learning disabilities and failed my first year physics and chemistry courses.

I was forced to re-evaluate what I wanted to do with my life. I’ve always wanted to work with children and I wished to pursue a career in paediatrics; I continued studying and instead followed a path through psychology to education.

I became increasingly interested in learning problems and how to manage them. I often wondered if my problem had been identified sooner would it have made a difference? What would have happened if the problem had not been identified? How was I remediated? What did this label really mean? And what is happening to children like me now in a country whose resources are stretched to the limit just for ordinary school children?

The opportunity to do current research presented itself and I wished to discover if it is indeed possible to pick up these problems as early as preschool; what constitutes a learning problem; and, considering the fact that so few remedial schools are available in South Africa, I sought to find an educational method that could be complementary to the contemporary remedial techniques being used. I was looking for something that could contribute to remediation in a setting that did not pathologise children and had a wider application to meet the needs of a population of learning disabled children who are not currently well-served.

I began researching various school systems, and focused on the Waldorf method developed by Rudolph Steiner and the Montessori Method developed by Maria Montessori. I also researched contemporary remedial techniques and dyslexia. I wanted to know exactly what a visual perception problem and dysgraphia is, and how I was remediated.

In my perusal of the extensive learning disabilities literature, it became clear that the multisensory approach has been widely accepted as effective. The next step was to discern that the multisensory approach and the Montessori Method have much in common. So, one hypothesis suggested itself, that is, that the Montessori Method is an effective multisensory approach to learning disabilities. But a further possibility suggested itself. The Montessori Method is used much earlier on than conventional learning disabilities techniques. Did this mean that the Montessori Method could tap into early manifestations of learning disabilities? If so, recognising and remediating these early manifestations of learning disabilities could pre-empt more serious disorders generally only identified at school-going age. The Montessori Method may serve a dual purpose as a multisensory approach and as an early warning and remediating system.

From this insight gained in the current research, I have a greater understanding of myself and my disability, and the opportunity to pursue a sincere desire to discover something of benefit for others like me. I currently work with children who have autism, pervasive developmental disorders and severe learning disabilities. I have found the application of the research conducted in this dissertation extremely valuable in my attempts to remediate these children.

I have found the application of a multisensory system using the techniques and activities developed by Montessori very effective in firstly, creating the appropriate sensory integration these children require and secondly, assisting these children to acquire the necessary academic skills for Grade One.

In Chapter Two I explore the possibility of whether learning disabilities can be recognised as early as preschool. I then consider if these learning disabilities are made up of sub-disabilities. I try to determine whether it is reasonable to assume that a learning disability does not just appear at some point as a definitive problem but is the end result of an accumulation of smaller problems. If this is so, and these sub-disabilities are identified and corrected then the learning disability could be circumvented and the impact on children diminished.

I explore what constitutes a learning disability and how the symptoms of such a disability are manifested. I consult the literature to discover what professionals in the fields of education, psychology and medicine define as a learning disability. My focus is on problems relating to literacy and therefore I consult the literature on dyslexia.

Thereafter I expand my discussion on dyslexia to include component sub-disabilities. I explore the different categories of sub-disabilities and include research on how these sub-disabilities impact later learning. I consult the literature to explore conventional methods employed to assess these sub-disabilities and learning disabilities in general.

In Chapter Three I explore what research has demonstrated as being the origins of learning disabilities. If the origin of learning disabilities can be established then it is possible to create methods that can circumvent such a learning problem.

In consulting the research on the origins of learning disabilities, two broad categories are evident; learning disabilities that result from genetic influences and learning disabilities that result from neurological abnormalities. Since the focus of the neurological discussion is primarily on dyslexia, I refer to Samuel Orton's theory of mixed dominance. This theory was and continues to be mostly responsible for the development of an effective multisensory intervention programme for dyslexic children.

In Chapter Four I discuss the general purpose of remedial intervention; thereafter I attempt to uncover the best methods to use with learning disabled children. I argue the rationale behind the use of multisensory approaches and give a detailed description of the processes involved in implementing such programmes. I pay special attention to the remediation of dyslexia and in particular the teaching of language.

In Chapter Five I explore the pivotal aspects of Dr Montessori's theory. This is to determine if this is an educational system that provides an opportunity for any possible sub-disabilities to manifest themselves and is a system that recognises these sub-disabilities early in children's lives. For the purpose of my argument this system must also be able to deal with these sub-disabilities using a multisensory method.

After I have given a brief outline of the development of Dr Montessori's theory, I turn my attention to the important aspects of the theory. These aspects include Montessori's view of children, the *absorbent mind*, the *sensitive periods*, Montessori's ideas about learning disabled children, the *prepared environment*, the learning materials and the presentation thereof and finally I conclude with a discussion on the sensory-motor approach.

In Chapter Six, I describe in some detail how the *prepared environment* and learning materials work together in each area of development and enable learning. In this chapter the various areas of development are discussed. These include motor development, perceptual development, and language

development. In each section I refer to the specific activities and learning material used in order to ensure that the development of each area considered is optimally achieved. I also consider the rationale behind the use of such activities and materials as developed by Maria Montessori.

I draw together insights from Chapter Two, to show how the Montessori Method can address early learning disabilities particularly well. In conclusion I demonstrate that both my hypotheses can be answered in the affirmative and suggestions for further research are made.

Chapter Two

Learning Disabilities.

In this chapter I wish to explore the possibility of whether learning disabilities can be recognised as early as preschool. If this is the case, then I wish to discern if these learning disabilities are made up of sub-disabilities. In my view it is reasonable to assume that a learning disability does not just appear at some point as a definitive problem but is the end result of an accumulation of smaller problems. If these sub-disabilities are identified and corrected then the later learning disability could be circumvented and the impact on children diminished.

As a starting point I will explore what constitutes a learning disability and how the symptoms of such a disability are manifested. I consult the literature to discover what professionals in the fields of education, psychology and medicine define as a learning disability. My focus is on problems relating to literacy and therefore I consult the literature on dyslexia.

Thereafter I expand my discussion on dyslexia to include sub-disabilities. I explore the different categories of sub-disabilities and include research that shows how these sub-disabilities impact on later learning. I consult the literature to explore conventional methods employed to assess these sub-disabilities and learning disabilities in general. The Montessori Method is referred to with reference to the way that these sub-disabilities can be remediated. This remediation is explored in Chapter Six. This chapter concludes with a discussion on the early identification of these sub-disabilities.

2.1. The Symptoms of Learning Disabilities

2.1.1 Weaknesses

Learning disabilities influence the lives of children, adolescents and adults, yet the way in which learning disabilities are expressed may vary over an individual's lifetime. This depends on the interaction between the demands of the environment and the individual's strengths and weaknesses (Lerner, 2003; Walcot-Gayda, 2004).

In general terms children are seen as being learning disabled if they deviate from normal physical, intellectual, information processing abilities, emotional or social patterns to such a degree to warrant a degree of special consideration. It is possible for children to deviate from the norm in more than one

area. Consideration may take the form of special or augmented services, special classes or scheduling (Bartholomew, 2002; Lerner, 2003; Pickering, 2003).

Learning disabilities have become an increasing problem for educators. Many students with learning disabilities have underlying language disorders. Among the spectrum of issues of concern, the inability to read and comprehend is a major obstacle to learning and may have long-term educational, social and economic implications. An untreated language disorder may diminish an individual's capacity to experience the full range and depth of communicating through language. Many individuals with learning disabilities manifest some aspect of language inadequacy (Academy of Paediatrics, American Association for Paediatric Ophthalmology and Strabismus and American Academy of Ophthalmology, 1998; Harwell, 2001; Jones, 2001; Lerner, 2003).

The acquisition of language is unique to human beings: although other animals have methods of communication only humans have developed speech. Language fulfils several human functions: it provides a means of communicating and socialising, enables cultural transfer and it is a vehicle of thought (Harwell, 2001; Lerner, 2003).

When children acquire language, in their natural environment, they seem to acquire all aspects of communicative competence in parallel. Children acquire language as it is used with them. It is a gradual process, beginning at birth (Holzman, 1997).

Some aspects of language use are more readily acquired than others, like the first rules of conversation, and are acquired earlier than other aspects of language use. In general comprehension comes before production because the hearer can use the context in which the utterance occurs to help understand a message, while the speaker gets credit only for what is in the utterance (Holzman, 1997).

Reading is the combination of word identification and language comprehension, with both components being necessary for literacy. Children with reading problems often have underlying disabilities in oral language. Young children who exhibit oral language delays as preschoolers usually do acquire oral language skills, but their basic language disorder often reappears several years later as a reading disability (Warner, 1980; Felton, 2001; Harwell, 2001; Jones, 2001; Taller, Allard, et al., 1997; Torgesen, 1998 as cited in Lerner, 2003; Woods, 2003).

Children with learning disabilities often underachieve in relation to their age and intelligence; have problems in processing auditory or visual information. Their reading is hesitant and laboured, their reading tone is monotonous, they often mispronounce words, have difficulty with concept formation and incorrectly apply grammatical rules and syntax (Warner, 1980; Gearheart, 1985; The British

Dyslexia Association Handbook 1995; Johnson, 1997; Pavlidis 1990 as cited in Mee, 1999; Henry, 2000; Harwell, 2001; Bartholomew, 2002; Bright Solutions for Dyslexia, 2003b; Lerner, 2003; Woods, 2003; ADDBE, 2004; Austin Area Branch of the International Dyslexia Association, 2004; Centre for the Study of Learning, 2004; Nangia, 2004).

The auditory sequencing of such children is faulty, they have a tendency to miss or add words and lines, they may read the same line twice, repeatedly lose their place, get confused with similar looking words (e.g. “on/no”, “saw/was”), have difficulty in breaking long words into syllables, an inability to blend letters together, poor comprehension (even if they read correctly), disregarding punctuation and disliking books (Warner, 1980; Gearheart, 1985; The British Dyslexia Association Handbook 1995; Johnson, 1997; Pavlidis 1990 as cited in Mee, 1999; Henry, 2000; Harwell, 2001; Bartholomew, 2002; Bright Solutions for Dyslexia, 2003b; Lerner, 2003; Woods, 2003; ADDBE, 2004; Austin Area Branch of the International Dyslexia Association, 2004; Centre for the Study of Learning, 2004; Nangia, 2004).

Children with a learning problem will show the following problems in spelling and writing; poor written work in comparison to oral work, bizarre spelling (e.g. “kss” for “snake”), cramped, illegible or very slow handwriting, messy work, many crossings out, inability to keep to margins, persistent confusion with letters (e.g. “b”/ “d”, “n”/ “u”), persistent reversals (“saw”/ “was”) beyond the ages of 7-8, lack or have indiscriminate use of punctuation, confusion of similar sounding words (e.g. “accept”/ “except”), omission of letters/syllables/words, inconsistent spelling of the same word (even within the same sentence) (Warner, 1980; The British Dyslexia Association Handbook 1995; Pavlidis 1990 as cited in Mee, 1999; Edwards, 2003; Austin Area Branch of the International Dyslexia Association, 2004).

Some children with learning disabilities have difficulty with gross motor ability and fine motor coordination; they exhibit general awkwardness and clumsiness, behaviour typical of much younger children, poor coordination, poor body image, lack of directionality and spatial problems (Gearheart, 1985; Lerner, 2003; Centre for the Study of Learning, 2004; Walcot-Gayda, 2004). The Montessori Method for dealing with these sub-disorders is considered in Chapter Six.

Children with learning disabilities may also have difficulty with sensory integration involving the tactile, proprioreceptive and vestibular systems. The tactile system involves the sense of touch and stimulation of the skin’s surface. Some children display tactile defensiveness and experience discomfort when being touched (Lerner, 2003; SIRRI Sensory Integration & Learning Centre, 2004).

The vestibular system involves the inner ear and enables the individual to detect motion; this system allows a person to know where the head is in relation to space and how to handle gravity. Children

with disorders in this area fall easily and do not know how to adjust their bodies for the position of their heads or for other body movements (Lerner, 2003; SIRRI Sensory Integration & Learning Centre, 2004). The Montessori Method for dealing with these sub-disorders is considered in Chapter Six.

The proprioreceptive system involves stimulation from the muscles or within the body itself; disorders may include apraxia, difficulties in intentional performance of certain body parts. Children with apraxia cannot plan how to move their bodies without bumping into things; they cannot direct movements such as buttoning, skipping or writing (Lerner, 2003).
The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Students with attention problems may not focus when a lesson is being presented, have a short attention span, be easily distracted, may have poor concentration abilities and may have trouble with short-term memory tasks. These children may also be hyperactive or impulsive. Students with learning disabilities with these characteristics may have co-existing attention deficit disorders. Many children with learning disabilities do not know how to go about learning or studying. These children lack organisational skills and have not developed an active learning style. They have trouble directing their own learning (Gearheart, 1985; The British Dyslexia Association Handbook 1995; Johnson, 1997; Pavlidis 1990 as cited in Mee, 1999; Henry, 2000; Bartholomew, 2002; Lerner, 2003; ADDBE, 2004; Centre for the Study of Learning, 2004; Nangia, 2004).

2.1.2 Strengths

When looking at the problems learning disabled students have it seems that their chances of success may be very limited but just like every other child learning disabled children have weaknesses and strengths. These strengths are very important in the life of learning disabled children because it is these that help children to compensate for their problems.

> Dyslexia is a word that suffocates and disguises the truth of a rather complex matter. Dyslexia is a clumsy term creating an automatically negative focus. It focuses on small weaknesses of a whole mindset rather than incorporating areas of intellectual differences, many of which are strengths (Juggins, 2001, p.1).

Often no mention is made of the possible areas dyslexic children may be gifted in. The reason may be that this has not been the focus of research, although some studies have considered the possibilities. Many dyslexics are creative and have unusual talents in areas like art, athletics, architecture, graphics, electronics, mechanics, drama, music and engineering (Von Karolyi,
2001; Austin Area Branch of the International Dyslexia Association, 2004; Centre for the Study of Learning, 2004).

It has been claimed that dyslexic students have special talent in areas requiring visual-spatial motor integration. In a study by Von Karolyi (2001) a “diverging ability” hypothesis was considered, since it has often been said that dyslexia is accompanied by visual-spatial gifts. In this study it was predicted that the dyslexic group would perform better on global tasks, identifying impossible figures and did worse on feature oriented tasks and matching figures. The hypothesis was partially supported and merits further investigation.

The results did however show that if individuals with dyslexia do excel in the visual spatial arena, they would not be found to excel across the board, but only on certain visual spatial tasks. Future research should explore the nature of these differences and the reasons why such differences in ability exist as well as any other gifts and talents dyslexics may possess (Von Karolyi, 2001).

2.2. Definitions

“Part of the problem in trying to find appropriate measures to help learning disabled children is how to define a learning disability,” according to Dr Sullivan, President of the Learning Disability Association of America. Numerous definitions exist to describe learning disabilities, a few of which are discussed below.

According to the American Federal Definition: Individuals with Disabilities Act (1997) and The American Interagency Committee on Learning Disabilities Definition (1997), the term “specific learning disability” means those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations (Lerner, 2003).

The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. The term does not include a learning problem that is primarily the result of visual, hearing or motor handicaps, of mental retardation, emotional disturbances or of environmental, cultural or economic disadvantage (Lerner, 2003).

The American Federal Definition: Individuals with Disabilities Act (1997) and The American Interagency Committee on Learning Disabilities Definition (1997), also state that a student has a specific learning disability if the student does not achieve at the proper age and ability levels in one or more specific area when provided with proper learning opportunities and the student has a severe discrepancy between achievement and intellectual ability in one or more of these seven areas: oral

expression, listening comprehension, written expression, basic reading skill, reading comprehension, mathematics calculation and mathematics reasoning (Lerner, 2003).

The American National Joint Committee on Learning Disabilities definition and The American Interagency Committee on Learning Disabilities (1997) definition include the above and also state that learning disabilities refers to a heterogeneous group of disorders. These disorders are intrinsic to the individual and are presumed to be due to central nervous system dysfunction and may occur across an entire lifespan. Problems in self-regulatory behaviour, social perception and social interaction may exist with learning disabilities but do not themselves constitute a learning disability. These difficulties with social skills mean that individuals do not learn how to act and talk in social situations. Their social skill deficits make it hard to establish satisfying social relationships and to make and keep friendships (Gearheart, 1985; Bright Solutions for Dyslexia, 2003a; Bright Solutions for Dyslexia, 2003b; The National Joint Committee on Learning Disabilities, 1997 as cited in Lerner, 2003; Walcot-Gayda, 2004).

2.2.1 Definitions of Dyslexia

Under the umbrella of learning disabilities fall disabilities specifically concerning problems with the acquisition of language and language processing. The word dyslexia is derived from Greek, 'dys' meaning poor and 'lexia' meaning word or language. According to the British Dyslexia association the terms "learning disability" and "dyslexia" are often used synonymously (Academy of Paediatrics, American Association for Paediatric Ophthalmology and Strabismus and American Academy of Ophthalmology, 1998; British Dyslexia Association Handbook, 1995; Johnston, 1997 as cited in Mee, 1998; Homsby, 1995: 3 as cited in Mee, 1998; Pavlidis 1990 as cited in Mee, 1999; Juggins, 2001; Bartholomew, 2002; Bright Solutions for Dyslexia, 2003a; Kuwana, 2003; ADDBE, 2004; Centre for the Study of Learning, 2004; Wikipedia, 2004).

According to the International Dyslexia Association's Committee of Members (1994) dyslexia is a neurologically based often-familial disorder, which interferes with the acquisition and processing of language. Varying in degrees of severity it is manifested by difficulty in receptive and expressive language characterised by difficulty in single word decoding reflecting insufficient phonological processing, in reading, writing, spelling and sometimes arithmetic. Dyslexia is not the result of poor motivation, sensory impairment, lack of intellectual ability, inadequate instructional or environmental opportunities or any other limiting conditions, but may co-occur with these. Dyslexia results in an unexpected discrepancy between academic achievement and ability. Although dyslexia is never cured, individuals with dyslexia frequently respond to timely and appropriate intervention (Mee, 1999; AVKO Dyslexia and Spelling Research Foundation, 2003; Bright Solutions for Dyslexia, 2003a;

Lerner, 2003; Kuwana, 2003; ADDBE, 2004; Austin Area Branch of the International Dyslexia Association, 2004; Centre for the Study of Learning, 2004; Healthy Place, 2004; Kaufman, 2004; Nangia, 2004; Victoria, 2004; Walcot-Gayda, 2004; Wikipedia, 2004).

The International Dyslexia Research Committee (1994) include the above in their definition and also state that dyslexia is one of several distinct learning disabilities. The British Psychological Society's (BPS, 1999) working definition concludes that dyslexia is evident when accurate and fluent word reading and/or spelling develop incompletely or with great difficulty. The American Psychiatric Association (1998) adds that dyslexia as a reading disorder is characterised by "distortions, substitutions or omissions", with "slowness and errors in comprehension" during both oral and silent reading. In medical terms dyslexia is referred to as a failure to see or hear similarities and differences in letters and/or words. It is a tendency to substitute words for those that are not seen (Mee, 1999; Smythe, 2001; Bartholomew, 2002; AVKO Dyslexia and Spelling Research Foundation, 2003; Bright Solutions for Dyslexia, 2003a; Kuwana, 2003; Lerner, 2003; ADDBE, 2004; Austin Area Branch of the International Dyslexia Association, 2004; Causes of Dyslexia, 2004; Centre for the Study of Learning, 2004; Healthy Place, 2004; Kaufman, 2004; Nangia, 2004; Victoria, 2004; Walcot-Gayda, 2004; Wikipedia, 2004; Yes Phonics, 2004).

Experts in the field often criticise definitions of learning disabilities for the choice of vocabulary, phrasing and implied ideas. There may never be a universally accepted definition. Several definitions of learning disabilities are required, due to the fact that the study of learning disabilities has now become an established research field and that learning disabilities do not constitute a single condition, the remediation therefore of learning disabilities requires the involvement of various professions and comprises different population groups, ages and degrees of severity (Lerner, 2003; Walcot-Gayda, 2004).

2.3. Formal Assessment of Learning Disabilities

In this section I outline the formal conservative view of assessing learning disabilities. I believe that it is important to understand how learning disabilities have been and are being diagnosed. My view is that early assessment of children should take place before they enter school, where intervention can be applied to precursor skills such as correcting visual perception problems, amongst others, that would normally contribute to reading and writing difficulty.

Skilled educators generally use standardized educational diagnostic evaluations and professional judgment to design and monitor individualized remedial programs. Psychologists may help with

educational diagnosis and classification. Physicians, including paediatricians, onto-laryngologists, neurologists, ophthalmologists, mental health professionals and other appropriate medical specialists, may assist in treating the health problems of these patients. Since remediation may be more effective during the early years as prompt diagnosis is of paramount importance. Educators, with specialty training in learning disabilities, ultimately play a key role in providing help for the learning disabled or dyslexic child or adult (Academy of Paediatrics, American Association for Paediatric Ophthalmology and Strabismus, and American Academy of Ophthalmology, 1998).

Dyslexia is a general term for reading disorders and language disorders; therefore it has been difficult to isolate distinguishing features that would categorize dyslexia as a single condition. Dyslexia has many sub-disorders with a variety of breakdowns. Carlson (1998 as cited in Types of Dyslexia 2004) suggests two broad categories of dyslexia: developmental dyslexia and acquired dyslexia. Developmental dyslexia is caused by biological anomalies, usually genetic, in the brain at various levels (i.e. morphological or synaptic) from prenatal through childhood development, and acquired dyslexia caused by brain trauma that may occur prenatally or later, which leads to similar behavioural characteristics of developmental dyslexia (Harwell, 2001; Types of Dyslexia, 2004).

A formal evaluation is needed to determine if a person is dyslexic. Individuals may be tested for dyslexia at any age. Tests that are selected will vary according to the age of the individual. Young children may be tested for phonological processing, receptive and expressive language abilities, and the ability to make sound/symbol associations. When problems are found in these areas remediation can begin immediately (Bright Solutions for Dyslexia, 2003d; Austin Area Branch of the International Dyslexia Association, 2004).

The evaluation assesses intellectual ability, information processing, psycho-linguistic processing, and academic skills. It is used to determine whether or not children are reading at the expected level, and takes into account the individual's family background and overall school performance (Bright Solutions for Dyslexia, 2003d; Austin Area Branch of the International Dyslexia Association, 2004; Centre for Study of Learning, 2004; Dyslexia, 2004).

Assessment has three main functions: diagnosis, delineation of specific learning difficulties, and guide to remediation. Hence, assessment should be functional (to identify what is getting in the way of learning) and descriptive (to identify what can be done to further learning) (Thomson and Watkins 1990 as cited in Mee, 1998; Bright Solutions for Dyslexia, 2003d; Austin Area Branch of the International Dyslexia Association, 2004; Florida Department of Education, 2004).

The most commonly used test to assess differences between intellectual ability and academic performance in young children is the Wechsler Intelligence Scale for Children (WISC). The WISC is

divided into two parts. The first aims to assess children's intellect by what they can say about things and the second is used to test what they can do in visual and manual tasks that require no speaking (Mee, 1998; Florida Department of Education, 2004).

The verbal tests comprise tests on general information, comprehension, mental arithmetic, similarities, vocabulary and digit span. The non-verbal (or performance) tests comprise tests on picture completion, picture arrangement, block design, object assembly and coding. Taking into account children's ages, a scaled score will be calculated for each of the tests, ranging from 0-20 or 0-19, and the average for each test is 10. The scaled scores (excluding scores for Digit Span) are added up and converted into verbal IQ and performance IQ. The full scale IQ is a statistical conversion of the sum total of the verbal and performance IQ (Mee, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

The Aston Index has a comprehensive series of tests on sub-skills. For example, there are tests on picture recognition, Good Enough Draw-a-Man, copying geometric designs, visual discrimination, children's laterality, visual sequential memory and auditory sequential memory. The nature of children's learning problems can be indicated by the profile of results that represent the summary of diagnostic testing. Besides the Aston index, the SEN Resource Manual for Schools also has useful materials for assessment and remediation (Mee, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

2.3.1 Auditory Processing Problems

As a sub-disorder, auditory processing problems constitute various subtle components that are in interaction with one another. These problems include: auditory perception, auditory reception, auditory discrimination and auditory association.

Auditory perception is the ability to recognise or interpret what is heard and provides an important pathway for learning. These children do not have hearing problems; rather the problem lies in auditory perception. Children may express this by not listening, not paying attention, or pretending to understand what is heard. Children will display symptoms of poor receptive vocabulary, cannot carry out directions and cannot identify sounds correctly (Warner, 1980; Gearheart, 1985; Ball & Blachman, 1991; Stahl & Murray, 1994; Lyon, 1998; as cited in Lerner, 2003; Harwell, 2001). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Auditory discrimination is the ability to hear likeness and difference in sounds. It is not the inability to receive and hear sounds. Children may confuse similar words that differ by one phoneme, children will not be able to identify rhyming words and cannot tell the differences between phonemes. Children

with deficits in auditory discrimination skills usually have a very difficult time with the phonics approach to reading and have trouble associating sounds with their visual symbols, which is important in learning to read and spell (Warner, 1980; Gearheart, 1985; Lerner, 2003). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Auditory discrimination is also associated with articulatory speech disorders; children may have a speech problem, may sequence sounds or syllables in an incorrect manner and may use small words inappropriately (Warner, 1980; Gearheart, 1985; Lerner, 2003).

Auditory association refers to the ability to draw relationships from what is heard or the ability to manipulate linguistic symbols internally. The central process is making the association or of relating what is heard to what is stored and of responding in a meaningful way. Children with a disability in this area probably have problems with abstract reasoning, showing poor concept formation in verbal responses. Children are slow to respond, need time to mull over a question, and may have difficulty in comprehending directions (Warner, 1980; Lerner, 2003). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six

The Goldman-Fristoe-Woodcock Test of auditory discrimination covers ages four to seventy. It consists of two tests, one in an ideal quiet environment and then testing in a distracting setting. The Lindamood Auditory Conceptualisation Test, tests from preschool to adult. This test tests a person's knowledge of concepts such as first/last, same/ different and auditory discrimination of isolated sounds. Tests of auditory perceptual skills are for children four to thirteen. This tests auditory memory for digits, words, sentences, ability to discriminate sounds and the ability to use auditory processing to think and reason (Harwell, 2001).

2.3.2 Sound-Symbol Association Problems

Written English is an alphabetic system with written letters of the alphabet representing speech sounds. If children are unable to reflect about the sound elements of language and to perceive the sounds within words, the alphabet system will remain a mystery. As children become aware of the phonological system, they gain entry to the alphabet system (Torgesen, 1998 as cited in Lerner, 2003).

Johnson and Myklebust (1967, as cited in Types of Dyslexia 2004, p.4) refer to this sub-disorder as auditory dyslexia. Auditory dyslexics cannot link the auditory equivalent of a word to the visual component. Boder (as cited in Types of Dyslexia, 2004, p.3) called the sub-disorder a dysphonetic sub-disorder. He added that the misspellings typical of this disorder are phonetically inaccurate and the misreadings are substitutions based on small clues, and are also semantically incorrect (Types of

Dyslexia, 2004; Wikipedia, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Studies show that letter name knowledge and letter-sound knowledge have different associations. Letter-sound knowledge is more strongly linked with early reading skills and phoneme manipulation than is letter name knowledge. This concurs with Barron and his colleagues (1994), who found that knowledge of letter sounds predicted deep levels of phoneme awareness, but not rhyme awareness (Barron et al, 1994 as cited in Mann & Foy, 2003).

These findings are also consistent with findings by Burgess and Lonigan (1998), who showed that letter sound knowledge in preschool children predicted more growth in performance on a phoneme deletion task than did knowledge of letter names. Unlike letter name knowledge, knowledge of letter-sound relationships appears to be more than knowledge of vocabulary or just another product of effective phonological representation. (Burgess & Lonigan, 1998 as cited in Mann & Foy, 2003).

Treiman and her colleagues (1998) have clearly shown that children bring their knowledge of letter names to the learning of letter sounds, but that in addition phonological skills may be a prerequisite for learning letter sounds. This suggests that letter names, together with phonological awareness measures should relate to letter sounds more strongly than letter names as shown in the study (Treiman et al, 1998; Treiman & Broderick, 1998 p.113 as cited in Mann & Foy, 2003).

What can be concluded from all the various studies and findings is that phoneme manipulation but neither phoneme judgment nor rhyme awareness independently predicted variance in letter-sound knowledge when letter name knowledge was partialed out. Different aspects of phonological awareness bear different relationships to reading and they also bear different relationships to speech skills, vocabulary and knowledge of letters. The research evidence indicates that integration of letter sounds with phonological blending and segmenting is critical for acquisition of beginning word-reading skills (Mann & Foy, 2003; Oudeans, 2003).

The extensive repetition and drill of the sounds provided by a remedial phonics program is probably helpful in making the students with dyslexia more aware of the component sounds of speech. If encoding of sounds and sound combinations is the limiting factor, drill and repetition would support fluency and automaticity. Once children have learned to read by decoding, the emphasis should shift to sight-reading of more common words and speed-reading in general in order to avoid a reduction in fluency due to too much decoding (Badian, 1998; Felton & Pepper, 1995; Torgesen et al, 2001 as cited in Gang & Siegel, 2002).

2.3.3 Phonological Processing

Phonological awareness refers to children's ability to focus on and manipulate phonemes in spoken words. Phonemes are abstract units of language, the smallest units constituting spoken language. Learning to reflect about the phonemes of language is more difficult than learning to understand and use language. Many children who have difficulty in learning to read are not sensitive to the phonemes of language and words (Kuwana, 2003; Adams et al., 1998b; Ball & Blachman, 1991; Lerner, 1990; Lieberman & Lieberman, 1990; Lyon, 1995b, 1996; Torgesen, 1998 as cited in Lerner, 2003; Woods, 2003; EPS, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

A phonological disorder means that children can read familiar words by using the whole word method but has difficulty "sounding out" words that are new or letter-to-sound. Successful beginning readers must be aware of phonemes within words to understand that "cat" and "hat" differ in a single phonemes. Children with poor phonological abilities are unable to differentiate the number of sounds within a word such as "cat". Preschool children generally have no awareness of the phonemic nature of spoken language and their first contact with formal reading instruction acts as a powerful trigger for development of phonemic awareness (Wessling & Reitsma, 2001; Lerner, 2003; Woods, 2003; Types of Dyslexia, 2004).

Research has identified constitutionally based, poor phonological processing ability with its resultant poor decoding skills as the core characteristic of poor reading (Lyon, 1995). According to Shaywitz et al. (1992), of the approximately 20% of school children with poor reading skills, 80-90% (or 17% of all school children) display poor phonological processing ability. Without diagnosis of the problem and specific instructional methods, children do not outgrow their poor reading skills but become adults with the same disabilities (Pennington, 1991; Knight and Randell, 1994; The British Dyslexia Association Handbook 1995; Lyon, 1995; Johnson, 1997; Knight, 1997; Pavlidis 1990 as cited in Mee, 1999; Wessling & Reitsma, 2001; Woods, 2003).

It has been found that phoneme awareness and not rhyme awareness correlates with early reading measures; it has also been found that phoneme manipulation was closely associated with letter knowledge and letter-sound knowledge, where rhyme awareness was linked with speech perception and vocabulary. It is phoneme awareness that is consistently the stronger predictor of emerging reading skill in children on the brink of preschool entry, than letter knowledge (Wessling & Reitsma, 2001; Mann & Foy, 2003; Woods, 2003).

It has been found that differences between phoneme judgment and phoneme manipulation exist. Manipulations of individual phonemes were more strongly linked with reading and letter sound knowledge than were either phoneme judgment or rhyme awareness. Next to phonological awareness letter knowledge is one of the best predictors of children's reading ability (Adams, 1990; Burgess & Lonigan, 1998; Mann, 1984; Wagner, Torgesen & Rashotte, 1994 as cited in Mann & Foy, 2003).

2.3.4 Spelling

Spelling problems mean that children can read individual letters that lead to reading words if given enough time but have problems recognizing the word as a whole and phonetically. The Montessori Method for dealing with this sub-disorder is considered in Chapter Six. Research on traditional class spelling instruction has been concerned with word frequency, word selection, memory technique, generalisability and the organisation of spelling lists and plans for the instructional week. Spelling research focused on learners and learners' errors; this showed in the predictable ways that children's emerging phonemic awareness connects with the increasing demands of orthography. It would seem that children tend to make similar spelling mistakes (Schlagal, 2001; Types of Dyslexia, 2004).

Research has been conducted on connections between phonological awareness and reading; however in discussing training, studies that develop the phonological skills of at risk readers in the context of spelling make the following observations; that teaching children how spelling patterns represent sound patterns improves eventual reading and spelling ability more than teaching phonological skills in isolation (Goulandris, 1994 as cited in Schlagal, 2001).

The idea that atypical scanning may have something to do with faulty spelling receives added support from a variety of convergent sources. In a study of reversed right to left scanning by Grade Five children, the reversed scanning correlated negatively with reading level. Reading deficiency and academic delay have been shown to be associated respectively with less orderly left to right scanning of pseudo-words and unsystematic scanning of nonverbal stimuli (Schwantes, 1979; Locher & Worms, 1981; Eden et al, 1996 as cited in Mather 2003).

To measure spelling ability, the Schonell Graded Word Spelling Test is available. For this test, children are required to spell a number of graded words. Testing is discontinued when ten consecutive words are misspelled. Based on the number of words correctly spelled, a Spelling Age is obtained (Mee, 1998; Florida Department of Education, 2004).

Other spelling tests such as The Parallel Spelling Tests are presented in two banks of items: Tests A (for younger children) and Tests B (for older children). The test items are presented in complete sentences. One pair of sentences is selected from each of the successive groups of six pairs to form a

test of the prescribed length for each age group. The raw scores are converted to spelling ages and quotients (quotients show the relative positions of children who are, within a month, the same age). This test is very suitable for class teachers as it is quick to administer and easy to mark (Mee, 1998; Florida Department of Education, 2004).

Other spelling tests including the Vernon Spelling Test, Peter's Diagnostic Dictation Test and Spar Spelling Test are available. A piece of free writing is also a good source of spelling mistakes (Mee, 1998; Florida Department of Education, 2004).

In general it can be concluded that tests that assess spelling and phonological awareness also test for sound-symbol association problems and auditory processing problems. The reason for this is a direct causal relationship between auditory processing problems, sound-symbol association problems, phonological awareness and spelling. Simply put, auditory processing problems lead to sound-symbol association problems which lead to phonological awareness issues which ultimately result in spelling and reading problems (Mee, 1998; Florida Department of Education, 2004).

Tests that measure phonological awareness are important for a diagnosis of dyslexia. One such test asks students to segment and control sounds in words. For example, if the teacher speaks the word “phlox”, students should respond that there are five sounds: “f”, “l”, “o”, “k”, “s” but students frequently answer one or two. Next, the students are asked to do the following: 1) say the vowel sound, (the first sound in *olive*), 2) remove the first sound, saying the remaining “loks”, 3) remove the second sound, saying the remaining “foks”, 4) remove the last sound, saying the remaining “flok” and 5) moving the fourth sound to the end of the word, saying the newly formed “flos” (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

Children find this task extremely difficult. To raise awareness of the sounds, teachers can lead students through a multisensory exercise. Beginning with the thumb, each sound in a word is tapped with one finger and the whole process is repeated slowly, stretching one sound into the next. Children are made aware of the placement of the tongue, teeth, and lips for each, thus feeling differences among sounds. Using the fingertips to tap out sounds seems to help students to better control and understand the sounds (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

Now, the test of phonological awareness shifts to a test of sound-symbol awareness. Children repeat the same slow, controlled sequence of tapping and sounding as they write each letter with a pencil while simultaneously uttering each sound. Another test asks students to write several words that end with a single consonant such as “m”or “I”. Students must be able to hear the sound of the consonant, know that it needs a preceding vowel, be able to produce a short vowel sound (e.g., the first sound in “eddy”), place it before the consonant sound (e-m), hear the two as one unit (“em”), and use rhyme or

another device to make several words that end the same way (“hem”, “stem” or “emblem”). All of these tasks are extremely difficult for people with poor phonological processing ability. Because their difficulty has been specified and clearly demonstrated, students begin to understand the importance of phonological awareness to language learning (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004). The Montessori Method for developing children’s symbolic awareness is discussed in Chapter Six.

However, there is more to spelling than phonological awareness and knowledge of sound-symbol correspondences. The teacher explains that the learning process involves three areas: (1) auditory memory, (2) visual memory, and (3) linguistic knowledge, and that phonological awareness impinges on all of them (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

The direct result of poor phonological awareness is not only poor spelling, but also poor decoding skills. Tests that ask the student to read one syllable, multisyllable words, and word parts demonstrate dramatically that limited ability to differentiate sounds clearly interferes with decoding. After giving the test, the teacher points to a single error, perhaps a word that the student has read as “lex” instead of “lax”. The teacher says “lax”, “lex”, and “lux” with the written text out of view and asks the student to repeat the three. It is in this exercise that lack of awareness of phonemes and of sound-symbol correspondences is most apparent: some students do not hold the three vowel sounds well in their memory, and the three words are usually repeated incorrectly (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

2.3.5 Speech and Comprehension

A verbal expression disability involves the inability to generate and express ideas or concepts with words. Children with this problem need ample practice in describing attributes of objects, telling stories, completing stories, explanations, use of visual cues and open-ended questions, building vocabulary and engaging children in discussions. To encourage the development of expressive language teach children parts of speech i.e. nouns, verbs, etc (Warner, 1980; Ingram, 1964 as cited in Types of Dyslexia 2004).

Disorders of the speech-sound system or of expressive phonology are the most prevalent communication difficulty observed in young children; however children with expressive phonology disorders constitute a heterogeneous group: some of these children present with isolated speech sound disorders; in contrast, other children have combinations of speech-sound disorders and language problems, such as deficits in phonological processing or in receptive language. Young children with isolated phonology disorders have better prognoses than children with early phonology disorders accompanied by other language disorders (Hall & Tomblin, 1978; Levi et al, 1982; Shriberg &

Kwiatkowski, 1988; Bishop & Adams, 1990; Menyuk et al, 1991; Catts, 1993; Clarke-Klein, 1994; Webster, Plante & Couvillion, 1997; Lewis & Freebairn, 1997; Shriberg, Tomblin & McSweeney, 1998 as cited in Lewis, Freebairn & Taylor, 2000).

To identify any discrepancy between children's intelligence and literacy skills, the BPVS and Raven's Matrices can be used to provide reasonable estimates of verbal and non-verbal abilities. The BPVS measures children's receptive (hearing) vocabulary. It is not a comprehensive test of intelligence since it only measures children's ability to understand and store word meanings. Children are presented with four simple black and white illustrations on a page. The children's task is to select the picture considered to illustrate the meaning of the target word presented orally by the examiner. No reading or writing is required of children, just a verbal or a pointing response (Mee, 1998; Bright Solutions for Dyslexia, 2003d; Austin Area Branch of the International Dyslexia Association, 2004).

Since reading is not a single skill, but a linked series of sub-skills, which leads to information processing competencies, the New Reading Analysis is a very useful test measuring oral reading ability and comprehension skills. Accuracy and comprehension scores are available and a miscue analysis will reveal the types of errors, reading strategies and word attack skills used. Like the New Reading Analysis, the Neale Analysis of Reading Ability also comprises passages of English prose, which have to be read out aloud. Comprehension questions are asked and accuracy, rate and comprehension scores are calculated (Mee, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

2.3.6 Visual Processing Problems

As with the auditory processing disorders, the visual processing disorders also comprise various subtle components that interact with each other. These disorders are problems with perception, discrimination, visual-motor integration and visual-spatial integration. Remediation should take care of input perceptual problems first, if they exist (Warner, 1980; Lerner, 2003).

Visual perception plays a significant role in school learning, especially in reading. Students have difficulty in tasks requiring the visual discrimination of letters, words, geometric designs and pictures, children will probably learn better from auditory information, if auditory processing problems do not exist. Children will have problems learning the traditional way of reading (Warner, 1980; Gearheart, 1985; Lerner, 2003) The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Visual discrimination is the ability to differentiate one object from another. It is the skill that enables matching identical letters, words, numbers, pictures, designs and shapes. The ability to discriminate

letters and words visually becomes essential in learning to read. Children who can recognise letters when they are preschoolers tend to do better at reading (Gearheart, 1985; Harwell, 2001; Lerner, 2003). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Symptoms of a visual discrimination problem include: messy work with poor legibility and spatial planning, reversal or inversion of letters and numbers, awkwardness and clumsiness, transposition of numbers or letter sequences, difficulty with comprehension of pictures, poor spelling, poor memory for what was seen seconds before, slowness and inaccurate copying, poor directional sense, itchy, teary or bleary eyes, complaints that the print is swimming or out of focus and loss of place, skipping or reading of lines when reading (Harwell, 2001).

Tests used to assess visual perception are: the Developmental Test of Visual Motor Integration (4^{th} ed) used for children three to eighteen years of age and the Bender Visual Motor Gestalt Test for children four to eighteen years of age. Both these tests involve showing children a set of stimulus cards. These cards are presented one at a time, with children then being asked to reproduce the design on paper. The drawing is then compared to the stimulus card. Marked distortions of what was shown commonly include rotation, perserveration, shape distortion and incorrect directionality (Harwell, 2001).

Figure-ground discrimination is the ability to distinguish an object from its surrounding background. Children with a deficit in this area cannot focus on the item in question from the visual background; they become distracted by irrelevant stimuli. Visual closure requires a person to identify an object even though the whole stimulus is not present (Warner, 1980; Lerner, 2003). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Children will seem inattentive and unable to keep their place in reading and number work. Children will be distractible, will have difficulty drawing a straight line between boundaries, will have difficulty in finishing a letter when writing and will have difficulty in finding objects (Warner, 1980).

Form constancy is the accurate interpretation of an object as being the same in spite of it being seen in different positions. Children with adequate perceptual constancy will recognise an object, word, letter or number no matter where it is seen. The person is able to recognise a word, letter or number if it appears differently from that which was originally learnt (Warner, 1980). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Children with a poorly developed shape and size constancy not only are likely to be made anxious by the general unreliability of appearance in their world, but will also have difficulties in academic

learning. Such children are constantly deceived by their senses. Learning to read and write becomes the most difficult task for this child (Warner, 1980).

Other difficulties in perceptual processing concern whole and part perceivers. Whole perceivers see an object in its entirety, part perceivers focus on minute detail, missing the big picture. Children need to see both for effective learning. In reading children must be able to move flexibly from the whole to the parts, at times they must see the whole word and at others they need to notice small differences such as "horse" and "house". Children with learning disabilities often exhibit this when colouring pictures (Lerner, 2003).

Visual-Motor disabilities prevent children from learning effectively using visual stimuli. If children have no auditory channel problems, they will learn more effectively using auditory stimuli. Children with this disorder may display the following characteristics: reversals of similar looking letters, inversions of numbers, may display mixed laterality or left-right orientation (Warner, 1980; Lerner, 2003; SIRRI Sensory Integration & Learning centre, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Children with a visual-motor association disability cannot manipulate linguistic symbols internally and do not relate what is seen to visual experiences stored from past experience. Children show poor concept formation in verbal responses, their concrete thinking is better than abstract thinking; they do not comprehend what they read and cannot tell a story from pictures (Warner, 1980; Lerner, 2003).

Visual-spatial difficulties mean that children cannot recognize groups of letters. They may tend to guess words by shape and not by context. Children with this form of dyslexia may also confuse reversible letters, transpose letters in syllables and syllables in words and words in phrases. They have trouble reproducing letters in writing and may confuse letter, syllable and word order. They may also read words backwards. Such children can read words phonetically but have problems with whole word recognition (i.e. "yacht"/ "yatchet") (Types of Dyslexia, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

During the pre-reading stage of development children make perceptual generalisations that an object retains the same name and meaning regardless of the position it happens to be in. When beginning to deal with letters and words, children find that the perceptual generalisations made before no longer hold true. The placement of a line on a circle changes the name of the letter; small line changes and the direction words face all have different meanings. Children with learning disabilities fail to make the necessary amendments to earlier perceptual generalisational rules (Lerner, 2003).

The perception of spatial relations is the ability to perceive the position of two or more objects in relation to oneself and in relation to each other. Children who have difficulty perceiving spatial relationships could have trouble with sequential tasks, they may have trouble stringing sentences and words together, may not be able to distinguish between similar looking letters and words, they may have trouble with prepositions and may not remember the sequence of processes involved in solving problems (Warner, 1980).

This concept is made up of a combination of auditory, visual, kinesthetic senses. If the senses do not work together correctly, children may not have an accurate perception as to their position in space. Children may not understand concepts such as up/down, may perceive "b" as "d" or "24" as "42". This makes it extremely difficult to learn to read, write, spell and do arithmetic (Warner, 1980; SIRRI Sensory Integration & Learning Centre, 2004).

A right-left discrimination disability refers to children being unable to perceive the left and right sides of their body and the concept of left and right in objects and pictures, etc. In addition to confusion of their own body in space, children will have difficulty in developing an awareness of direction of movement (Warner, 1980). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Besides assessing auditory, visual, perceptual, memory and sequencing skills, tests on laterality/directionality are necessary since confusion between left/right may lead to confusion between letters ("b"/ "d") or words ("saw"/ "was") and mirror writing (Mee, 1998; Austin Area Branch of the International Dyslexia Association, 2004).

Boder (as cited in Types of Dyslexia, 2004) referred to this sub-disorder as a dyseidetic disorder, he also added that in this group there are deficits in vision and memory of letters and word shapes. Children are unable to develop a sight vocabulary. However they have the ability to acquire adequate phonetic skills. Johnson and Myklebust (1967 as cited in Types of Dyslexia 2004) referred to this as visual dyslexia. They suggested such children would also have problems with visual discrimination, memory synthesis and sequencing of words. (Ingram, 1964 as cited in Types of Dyslexia, 2004).

2.3.7 Memory and Attention

Bateson (1968 as cited in Types of Dyslexia 2004) identified three categories based on the Illinois Test of Psycho-Linguistic Abilities. They are: good visual memory but poor auditory memory, good auditory memory but poor visual memory, poor visual and auditory memory. In this last case the reading disability is severe and it is difficult to remedy deficits (Types of Dyslexia, 2004).

Auditory memory enables the learner to produce and hold onto the sounds in a word (phonological processing ability), accurately translate them into remembered letters (sound-symbol correspondences), and write them on the page. This requires students to say the word correctly, separate its symbols, and then segment the sounds in each syllable (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

Visual memory is called on to spell words that are unclear and indistinguishable from others. Finally, linguistic knowledge is needed to realize that the letter combinations “ti”/ “si”/ “ci” and “ce” regularly sound like “sh” as in “mention”, “dimension”, “magician”, and “ocean”. To realize that the sound of “sh” exists in all those words; one must be able to hear it and find it (Knight, 1998; Austin Area Branch of the International Dyslexia Association, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

The effect of sound-symbol association training on visual and phonological memory in children with a history of dyslexia was investigated. Deficits in visual and phonological memory and memory for sound-symbol associations were demonstrated in the dyslexic group. Children with dyslexia and compensated dyslexics seemed to have difficulty encoding the novel sounds in memory. As a result they derived less phonological memory advantage and less visual memory interference from training than did typical readers (Gang & Siegel, 2002).

Poor spellers and good readers have difficulty remembering the order of letters within words as well as the order of an array of meaningless shapes. Analogous differences emerge in individuals with reading disabilities during later rather than earlier visual processing stages and appear to reflect less systematic and orderly scanning strategies. Later processing stages may well be more critical for spelling which requires rehearsal from memory than for reading, explaining why orthographic strategies of individuals with dysgraphia tend to fail in spelling and not reading (Morrison, Giordani & Nagy, 1977; Schwantes, 1979; Frith, 1985; Hodgson & Johnson, 1993; Holms & Nagy, 1993; Romani, Ward & Olson, 1999 as cited in Mather 2003).

Rapid Automised Naming is used to refer to children who have difficulty with word finding. Children with this type of language delay cannot quickly and automatically name objects and are slow at recalling the correct words. Slowness in naming and word finding is an accurate predictor of later reading and learning disabilities. This problem is probably due to memory retrieval problems (Lerner, 2003).

Reading involves the correct and rapid identification of visual stimuli with letters and words. The processing of visual stimuli depends not only on the integrity of the peripheral and central visual system but also on the attentional system. In studies done findings tend to reflect a general attentional deficit to visual stimuli in dyslexia, possibly related to problems with recruitment of the necessary cognitive resources for the performance of complex reaction time tasks and for fluent reading: this suggests that the relationship between the two is not yet fully understood (Heiervany & Hugdahl, 2003).

Since the ability to use fine motor skills helps register information leading to long term storage and recall, learning skills in fine motor development should be assessed. This competence is needed in manipulating the book, turning the page and controlling the pencil when writing and spelling. The ocular motor skills required in controlling and moving the eyes from left to right across the page so that children take in the printed word is also important (Mee, 1998).

Children with manual and fine motor skills inadequacies show increased incidence of ocular motor difficulties. The nature and extent of children's working memory difficulties must also be investigated to detect any inadequacy in the links between auditory, visual, motor and semantic aspects of learning (Mee, 1998).

2.3.8 Writing

Dysgraphia, the term used for writing disorders, has similar sub-disorders as dyslexia. Basically, writing involves reading with an output expression using visual imagery and phonetics, as well as memory of letter sequence and muscle motor control (Types of Dyslexia, 2004; Wikipedia, 2004). The Montessori Method for dealing with this sub-disorder is considered in Chapter Six.

The results of Beringer et al. (1997 as cited in Edwards, 2003), demonstrated that handwriting is not just a motor process or penmanship exercise but rather that handwriting draws on letter knowledge. The structural equation modeling conducted by Beringer and Abbott, (1993 as cited in Edwards, 2003), has supported this direct link between letter knowledge and writing letter forms and has even suggested that poor handwriting may be more a result of weak letter knowledge than a result of motor difficulties (Edwards, 2003).

Studies have been conducted to investigate the connections between language by hand and language by eye. The conclusions drawn from these studies show that language by hand and language by eye are separate systems that interact in predictable ways. Much remains to be learned theoretically and instructionally about the relationship of language by hand to language by eye (Beringer, Abbott, Abbott, Graham & Richards 2002).

Other studies have inferred that individuals with dysgraphia and dyslexia share a left hemisphere processing limitation that is not confined to written language. In light of other relevant research findings, it is suggested that this limitation is due to the absence of the disembedding scanning mechanism for converting spatial arrays such as spelling to a temporal form, an impairment putatively caused by attempting to teach written language to children who are late in establishing left hemisphere motor dominance. The research evidence of these studies supports the view that individuals with dyslexia and dysgraphia have a print-scanning deficit in common (Mewhort and Campbell, 1981; Butler, Jared & Hains, 1984 as cited in Mather 2003).

2.4. Early Identification of Learning Disabilities

By understanding and being aware of the possible sub-disorders of dyslexia and the combinations these disorders may manifest in, educators are better able to assess children and provide the appropriate intervention. Children who have phonological problems require a different approach to children with whole-word problems or auditory processing problems. An approach that is able to deal with different problems and is not restricted to remediating a single sub-disorder may be the most effective; I believe this approach is a multisensory approach. Below I explore the Orton-Gillingham Multisensory approach and the Montessori Method.

Formal assessment may provide crucial information about the problems children have, but in my opinion these assessments provide no really useful information as how to assist children. Many of these assessments can only take place once children are of school-going age and is not coping with the academic demands placed on them. My view is that informal observation, such as the observation that the Montessori teacher does in order to establish the best way to assist children could provide as much information as formal assessments can. The Montessori teacher is trained not only in how to teach children according to the Montessori Method, but also how to observe children without prejudice. When learning problems are observed intervention can be applied to the precursor skills for reading and writing (Standing, 1966; Orem, 1969; Orem, 1971).

Identification and assessment mean that at risk children are given the appropriate educational opportunities to reach their potential and become functional, productive members of society. The early childhood years are crucial for all children, but for children who deviate from the norm in terms of mental, physical and behaviour development or learning characteristics, these years are especially crucial. In order to help dyslexics overcome their reading and spelling difficulties, early identification, assessment and remediation are important (Bright Solutions for Dyslexia, 2003c; Lerner, 2003; Florida Department of Education, 2004).

Children do not begin learning when they enter formal schooling at age six. During the first six years of their life, young children learn at a rapid pace: they need continuous and intense learning opportunities from the moment of birth. By the time they reach school age, they should have mastered many kinds of learning (Harwell, 2001; Lerner, 2003).

Accumulating research shows the importance of early identification of young children who show signs of learning disabilities and the value of providing early intervention. Research shows that children who are likely to have difficulty in learning to read can be identified during the preschool years; moreover they can be helped through timely and appropriate instruction (Kirk & Chalfant, 1984 as cited in Lerner, 2003).

Children will often excel in some area of development while displaying significant difficulty with others. The precursors of learning disabilities are predictive of later academic achievement difficulties, but with early intervention some of these potential problems may be overcome or reduced. Young children who have problems with precursor skills have developmental learning disabilities. In later years, difficulty with precursor skills can lead to academic learning disabilities (problems with reading, writing and mathematics) (Kirk & Chalfant, 1984 as cited in Lerner, 2003). This is one of the central arguments of this dissertation.

At the preschool level because the growth rate of children at this age is so unpredictable, educators are generally reluctant to identify preschoolers under a categorical label such as learning disabilities. Very young children who appear to have learning disabilities are categorised as developmentally delayed: however experience and research has shown that intervention for young children is highly effective and that the educational efforts have a high payoff (Kaufman & Hallahan, 1976; Lerner, Lowenthal & Egan, 2003 as cited in Lerner 2003).

2.5. Summary

From the above discussions the following conclusions could be drawn; deviations from normal development displayed by preschool children with learning disabilities may include inadequate motor development, language delays, speech disorders, poor cognitive and concept development (Lerner, 2003).

The Montessori Method for dealing with the sub-disabilities discussed in this chapter and below is explored in Chapter Six. In general the sub-disorders that may result in an impending learning disability discussed in this chapter can be loosely summarised as follows:

Cognitive development involves children's abilities in thinking, planning and concept development. Children are expected to identify colours, name body parts, rote count, show an understanding of one-to-one correspondence, demonstrate place concepts, identify given concepts, name letters, sort by colour, shape and size. When children have problems in developing cognitive strategies according to normal developmental milestones a learning problem should be suspected (Gearheart, 1985; Harwell, 2001; Lerner, 2003; Austin Area Branch of the International Dyslexia Association, 2004).

A common precursor for some children with learning disabilities is awkwardness in gross motor skills, which require children to use large muscles when moving their arms, torso, hands and feet. Young children with gross motor problems appear clumsy in walking, jumping, hopping, running, skipping, throwing and catching skills (Gearheart, 1985; Harwell, 2001; Lerner, 2003; Walcot-Gayda, 2004).

Fine motor activities involve the small muscles used to move the fingers and wrists, hand-eye coordination and the coordination of both hands. Children with fine motor problems tend to be slow in learning to dress themselves, eating, using buttons and zippers and in using crayons; fine motor problems become evident in children having difficulty with puzzles, building games, accomplishing art projects and using scissors. Later issues arise with difficulties in writing (Gearheart, 1985; Lerner, 2003; Walcot-Gayda, 2004).

The ability to interpret what is heard provides an important pathway for learning. Children with reading difficulty showed auditory processing problems as preschoolers. These children can hear, but the difficulty lies in several dimensions of auditory processing abilities, including phonological awareness, auditory discrimination, auditory memory, auditory sequencing and blending (Gearheart, 1985; Harwell, 2001; Lerner, 2003).

Visual processing abilities play a significant role in school learning particularly reading. Children with visual processing problems can see, but encounter problems with the visual discrimination of letters, words, visual memory and visual disclosure. Visual processing problems in young children are early signs of learning disabilities and are predictive of reading problems (Gearheart, 1985; Harwell, 2001; Lerner, 2003).

Difficulty in acquiring speech, understanding and using language are amongst the most common precursors of learning disabilities. The ability to use language to communicate one's thoughts is central to learning. Children with communication and language disorders have difficulty understanding the language of others (listening), responding to instruction, initiating communication, explaining, engaging in conversations and communicating with others. These problems may result in problems with reading and writing (Gearheart, 1985; Lerner, 2003; Walcot-Gayda, 2004).

In this chapter I have shown that it is possible for learning disabilities to first present as a variety of sub-disabilities that should be recognised at the preschool level. Research has demonstrated that these sub-disabilities exist; tests have been developed to assess them. I have given examples of tests used for the sub-disabilities I have discussed. These tests include intelligence tests, tests of pre-literacy skills and literacy skills.

With all the information that exists about this topic I ask the question: Why are so few problems being picked up in preschool? The answer possibly lies in the fact that many preschool teachers are unaware of such sub-disabilities and, if they are aware of these problems and can identify them they have no means of or training to deal with them. Added to this is that in the traditional school system children are only expected to start reading and writing when they enter the formal schooling system.

There seems to be a general reservation amongst preschool teachers to label children as being learning disabled, the argument for this is that children may simply be developmentally delayed. What if it is more than a developmental delay, should teachers not err on the cautious side and prevent the loss of valuable time for intervention? I argue that they should, especially given the power of the Montessori Method to both diagnose and remediate.

Research has shown for example that if children are unaware that the letters represent sounds in spoken language they are more than likely to develop a reading disorder. Even if children do not develop a reading disorder and may just be behind their peers with regards to phonemic awareness, surely correcting this disorder or delay when it appears is more productive than waiting to see if it develops into a bigger problem? A small problem is dealt with and a possibly bigger problem is eliminated or reduced.

An educational system is required that acknowledges these sub-disabilities and is able to deal with them in such a way that children are not pathologised. I believe that such a system is the Montessori Method. I explore this method in great detail in Chapters Five and Six. In the next chapter I explore the causes of learning disabilities, since it is from these investigations that theories about learning disabilities are proposed and remedial programmes are developed.

Chapter Three

Origins of Learning Disabilities

In the previous chapter I argued that learning disabilities are identifiable. Furthermore I contend that sub-disabilities may exist as symptoms of impending learning disabilities. I argue that it is these sub-disabilities that should be recognised as early as preschool. In this chapter I explore what research has demonstrated as being the origins of learning disabilities. If the origin of learning disabilities can be established then it is possible to create methods that can circumvent such learning problems.

In consulting the research on the origins of learning disabilities, two broad categories are evident; learning disabilities that result from genetic influences and learning disabilities that result from neurological abnormalities. Since the focus of this discussion is primarily on dyslexia I refer to Samuel Orton's theory of mixed dominance. This theory is mostly responsible for the development of an effective multisensory intervention programme for dyslexic children.

3.1. The Etiology of Learning Disabilities

Another helpful factor in building a complete picture of learning disabilities is to understand the causes of learning disabilities. By being aware of the etiology, those in the field are better equipped to provide quality intervention and assist in the identification of at risk children. In this section I make reference to some research findings that prove the genetic and neurological basis of dyslexia and learning disabilities.

The etiology of these difficulties is multifactorial, reflecting genetic influences and abnormalities of brain structure and function. Other causes may be related to external factors such as birth trauma, head trauma and the effects of toxic substances (Academy of Paediatrics, American Association for Paediatric Ophthalmology and Strabismus and American Academy of Ophthalmology, 1998; Harwell, 2001; Bartholomew, 2002; Pickering, 2003; Centre for Study of Learning, 2004; Walcot-Gayda, 2004).

3.1.1. Genetic Factors

Several genetic regions on chromosomes have been found that might be linked to dyslexia. In all likelihood, dyslexia is a conglomeration of disorders that all affect similar and associated areas of the cortex. With time, science is likely to identify and classify all individual sub-disorders increasing our

understanding of how low-level genetic flaws can affect the wiring of the brain and enhance or reduce a particular component of human mental capacity (Wikipedia, 2004).

Dyslexia has shown that minor genetic changes affecting the layering of the cortex in a minor area of the brain may impose inborn limitations on the overall intellectual function. At the same time, dyslexia shows that the brain exhibits a strong ability to compensate for its inborn or acquired limitations, and intense training can often result in miraculous turnabout. This is the reason that with timely and appropriate intervention, children with learning disorders can to some degree overcome their disorder (Wikipedia, 2004).

In 1998 Professor John Stein and Professor Tony Monaco of the Welcome Trust Centre for Human Genetics found the approximate site of the genes for dyslexia. This research confirmed an earlier American study, which produced similar findings but was unable to establish such a close link (Causes of Dyslexia, 2004).

Over the past couple of years there have been several projects to map out the entire human genome. In investigating the hypothesis that dyslexia is inherited, the possibility of more than one gene being responsible for dyslexia was discovered. Studies over the past thirty years have identified three possible dyslexia genes: 1) DYX1 in chromosome 15, 2) DYX2 in chromosome 6 and 3) DYX3 in chromosome 2 (Causes of Dyslexia, 2004).

Nöthen from the Institute of Human Genetics, at the University of Bonn, Germany, conducted a linkage study for spelling disability in seven multiplex families from Germany. His work seems to provide proof that there is a dyslexia gene on the long arm of chromosome 15 while some were in the area of 15q21 (Causes of Dyslexia, 2004).

Fagerheim of the University Hospital of Tromso, Norway, and his team investigated a large Norwegian family, with a large proportion of dyslexic members, in which dyslexia is inherited as an autosomal dominant trait. The scientists then took blood samples from all the family members to analyse their genes. They discovered one short sequence of genetic material between markers D2S2352 and D2S1337, Localised 2p15-16, appeared to be causing the family's tendency for dyslexia (Causes of Dyslexia, 2004).

In a study conducted by Tunick & Pennington (2002) the etiological relationship between dyslexia (a reading disorder) and phonological disorder was investigated. These disorders manifest at different ages and have typically been studied apart. However a growing body of evidence suggests that the disorders may overlap at symptomatic, cognitive and etiological levels of analysis. In previous studies

each disorder has been found to be heritable and there is also evidence that reading disorders and phonological disorders run together in families. To date no study has documented if there is a shared genetic influence between the two disorders.

The overall goal of this research was to further investigate the nature of the etiological relationship between reading disorder and phonological disorder. Results of this study support the co-heritability of these two disorders, indicating that at least part of the demonstrated co-heritability of reading disorder and phonological disorder is attributable to genetic influences, therefore children with one disorder are at a genetic risk to have the other (Tunick & Pennington, 2002).

These findings have implications for the early detection and treatment of reading disorders as well as for types of treatments that may be most beneficial for children with phonological disorder. Interventions might include components of treatments that are more typically used with children who have been diagnosed with reading disorder, such cross modality training of phonological skill. The potential reading problems in children with phonological disorder might at least be circumvented through earlier intervention (Tunick & Pennington, 2002).

3.1.2. Neurological factors

> Reading is the single most important skill our children learn - it impacts virtually every aspect of a child's life, said Dr Eden, associate professor of paediatrics and director of Georgetown University's Centre for the Study of Learning. Despite the extraordinary effort that goes into teaching children to read, very little is known about the neurobiology of reading acquisition in children. This study is important because we need to understand the brain basis of learning in kids who read well in order to understand why some children, like those with dyslexia, do not (Nature Neuroscience, 2003, p1).

Language is the outstanding characteristic that distinguishes man from animal, yet when evolution produced speech, no new structure seems to have been created for its control. Instead it was placed in charge of one hemisphere of the brain (Gillingham, 1974).

From a neuro-physiological perspective, dyslexia can be diagnosed by close inspection of the morphology of the brain (usually upon autopsy). There are marked anatomical differences between dyslexic brains and normal brains. Researchers studying the brains of dyslexics have also found that in reading tasks dyslexics show reduced activity in the left inferior parietal cortex. (Bright Solutions for Dyslexia, 2003a; Pickering, 2003; Austin Area Branch of International Dyslexia Association, 2004; Nangia, 2004; Wikipedia, 2004).

Nicolson and Fawcett at the University of Sheffield have developed another hypothesis about the basis of dyslexia. They discovered that dyslexic children have problems doing things that are automated in normal readers, for example simple acts like standing on one foot. They found that dyslexic children could perform automated acts, if they have the opportunity to compensate through vision, but fail if they are blindfolded. Good readers can perform automated acts significantly better (Causes of Dyslexia, 2004).

Their theory says that dyslexic children can only do acts that normally are automated, if they get the opportunity to consciously compensate for their deficit in automatisation and that phonological awareness is an automated skill, which is the basis of reading (Causes of Dyslexia, 2004).

They further claim that this deficit is caused by a cerebellar dysfunction, and they have found this dysfunction in dyslexic children, in neuro-imaging studies, in an area of the brain called the left angular gyrus, an area in the brain which is also connected to the magnocellular system and is also involved in working memory (Causes of Dyslexia, 2004).

One hypothesis for some of the phenomenological symptoms of dyslexia is a lack of overall short-term memory. Typically a dyslexic child will not remember your name, and will suffer an undue amount of difficulty in transcribing (for example) a phone number. These problems could be attributed to difficulty in laying down short-term memories (Nangia, 2004; Wikipedia, 2004).

Another popular hypothesis for the reading difficulties experienced by dyslexics is difficulty in bringing both eyes into focus on the same point. Such problems explain why dyslexic children often confuse the sequence of written letters or numbers, as the end of the word is literally being seen first by one eye, then the beginning of the word is seen by the other eye. Studies involving a technique as simple as teaching reading skills to children with an eye patch have shown very promising results (Wikipedia, 2004).

In 1979, anatomical differences in the brain of a young dyslexic were documented. Albert Galaburda of Harvard Medical School noticed that language centres in dyslexic brains showed microscopic flaws known as ectopias and microgyria. Both affect the normal six-layer structure of the cortex. An ectopia is a collection of neurons that have pushed up from lower cortical layers into the outermost one. A microgyrus is an area of cortex that includes only four layers instead of six (Wikipedia, 2004).

From 1979 to 1985 Galaburda performed autopsies on eight dyslexic brains and found a 15% rate of unusual bilateral symmetry, and 30-100 abnormalities per brain, clustered around the sylvian fissure and mostly in the left hemisphere. He also found abnormal smallness and poor lamination of the folds

and convolutions. Abnormal accumulations of neurons and ectopias (neurons out of place) distorted the surface and were disorganized in the subsurface (Causes of Dyslexia, 2004).

These flaws affect connectivity and functionality of the cortex in critical areas related to sound and visual processing. These and similar structural abnormalities may be the basis of the inevitable and hard to overcome difficulty in reading (Wikipedia, 2004).

Several researchers have worked on the temporal processing hypothesis of dyslexia. Defects have been found in magnocellular (big cell) system between the eye and the part of the brain that processes visual information. The area of the brain that Geschwind and Galaburda focused on, the Planum Temporale is part of this magnocellular system (Causes of Dyslexia, 2004).

Psychologists from Sheffield University, led by Professor Roderick Nicolson, claim to have linked dyslexia with reduced activity in a primitive part of the brain, called the cerebellum that controls movement, co-ordination and balance. The researchers compared the brain activity of six normal and six dyslexic adults using a scanning technique called positron emission topography (PET). These findings contrast with the older, more established view that dyslexia is the result of a problem in the highly developed language centres of the brain found in the cerebral cortex (Causes of Dyslexia, 2004).

In 1998 Dr Caroline Rae and colleagues from Sydney, Australia, and Oxford, UK, used a non-invasive imaging method known as magnetic resonance spectroscopy. The researchers obtained images of the brains of fourteen dyslexic men and fifteen control men aged between twenty-one and forty-one years. The researchers found that in two areas of the brain the ratios of certain chemicals differed between dyslexic and non-dyslexic men. Dr Rae and her colleagues suggest that such differences indicate altered development of the brain of dyslexics (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Centre for the Study of Learning, 2004; Eide & Eide, 2004).

Research has shown that even a few weeks of intense phonological training (e.g. breaking down and rearranging sounds to produce different words) can help noticeably improve reading skills. Unlike in normal adults, phonological training results in an increase in the activity in the right temporoparietal cortex. This part of the brain works in spatial tasks and may be the main compensatory structure in phonological training. This is the sister region of the left temporoparietal cortex responsible for visual-motor processing which is under-active in many dyslexics. (Causes of Dyslexia, 2004; Wikipedia, 2004).

Dr Mahncke, Dr Tallal and Dr Roberts have reported that the region of the brain that processes brief, rapidly successive sounds is functionally abnormal in adults with dyslexia. They suspect that the deficiency contributes to difficulties in early speech and language learning, and leads to a weakness in the subsequent mental leap in abstraction to words on a page that enables people to learn to read (Causes of Dyslexia, 2004; Centre for the Study of Learning, 2004; Eide & Eide, 2004).

The findings indicate that there is a basic problem in signal reception, as complex sound information streams into the cerebral cortical system underlying aural speech representation. The way that the brain processes sound in poor readers is very different from its processing and representation of rapidly changing sound inputs in competent readers. The research indicates that adult dyslexics are representing the sound parts of words by the activation of cortical neurone populations in a weaker and less salient form within their cortical aural speech processing system. It is believed that they, therefore, are not delivering the normal forms of representation of the separable sound parts of words to the regions of the brain involved in speech perception and reading (Causes of Dyslexia, 2004; Centre for the Study of Learning, 2004; Eide & Eide, 2004).

In 1996 brain-imaging studies at the National Institute of Mental Health (NIMH) revealed evidence of a deficit in the brain's visual system in people with dyslexia. While it has been commonly believed that only the language related areas of the brain are affected in dyslexia, this study adds to the growing body of research pointing to dysfunction of another portion of the brain known as V5/MT which is one of 20 areas in the brain associated with speech processing (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Centre for the Study of Learning, 2004; Eide & Eide, 2004).

3.2. Orton’s Theory of Mixed Dominance

Neurologist and psychiatrist Samuel Orton (1879-1948) was a clinician and researcher specializing in remedial reading programs and ways to address speech problems. He was among the first to identify the syndrome of dyslexia and to offer a physiological explanation for its cause. Orton's interest in reading disorders was said to also stem from his daughter's difficulties in learning to read (Gillingham, 1974; Orton-Gillingham, 2000; A Plus Home Tutoring Inc, 2002; Causes of Dyslexia, 2004; Dyslexia, 2004; History of Dyslexia, 2004; Sonday System & Winsor Learning, 2004; SLD Learning Centre, 2004; Yes Phonics, 2004).

Samuel Orton proposed the theory of dominance failure as the cause of dyslexia. The main part of the human brain consists of two halves called the left and the right cerebral hemispheres. They are connected by a bundle of cells called the corpus collosum. Each hemisphere controls the opposite half of the body i.e. the left hemisphere controls the right half of the body. Usually the left hemisphere

controls most of the language function and the right hemisphere controls other functions such as spatial, visualisation and music skills. The hemisphere of the brain that processes language is usually called the 'dominant' hemisphere (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Remediation Plus, 2004).

Most people also have a preference for one side over the other in that they write with their right hand, kick football with their right foot, look through a telescope with the right eye etc. This preference is called laterality. In most people laterality and dominance correspond i.e. the left cerebral hemisphere controls language and the preferred (right) hand. In some cases the right cerebral hemisphere controls language and the preferred (left) hand. (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Remediation Plus, 2004).

In 1917, Dr. Orton read a manuscript on ‘Congenital Word Blindness’ and was intrigued by the discussion of reading problems in bright children. Dr. Orton was fascinated by the striking lack of certain letter sounds with the corresponding letter form. He was equally fascinated by the discrepancy between listening comprehension and reading comprehension and with the consistent error patterns found in the decoding of words. He noted that 50 per cent of his patients not only had reading difficulties but also related language disorders including problems with receptive and expressive language, passage comprehension, spelling and composition (Causes of Dyslexia, 2004; Remediation Plus, 2004).

From his work with brain-damaged adults, Samuel Orton attempted to explain the occurrence of language disabilities in children who had not suffered brain injury yet displayed symptoms similar to those exhibited by the adults who had sustained language loss. Orton's hypothesis was that children who do not establish hemispheric dominance in particular areas of the brain display specific developmental language disabilities such as reading disability (Gearheart, 1985; Myers and Hammill, 1976, p. 258; Wingate, 1997, p. 150 as cited in Duchan, 2001; Causes of Dyslexia, 2004).

In January of 1925, Orton, then a neuropathologist at the State Psychopathic Hospital in Iowa City, set up a 2-week, mobile clinic in Greene County, Iowa. As a part of this ‘experiment,’ local teachers were invited to refer students “who were considered defective or who were retarded or failing in their school work” (Orton, 1925, p. 582). Fourteen of the eighty-eight students were referred primarily because they had great difficulty in learning to read. Orton highlighted the fact that many of these students scored in the near-average, average, or above-average range on the Stanford-Binet IQ test, one had an IQ of 122, four had IQs between 100 and 110, five had IQs between 90 and 100, one had an IQ of 85, and four had IQs between 70 and 80 (Gearheart, 1985; Causes of Dyslexia, 2004; Dyslexia, 2004; Sonday System & Winsor learning 2004; Hallahan & Mercer, 2004).

Another researcher before Orton's time, Hinshelwood (1895) had also noted that many of his cases of congenital word-blindness were intelligent, but with the advent of IQ tests Orton was able to lend a certain degree of objectivity to this notion. He speculated that the IQ score might not always reflect true intellectual ability in students with reading disabilities. In describing what he termed a typical case, a student with an IQ of 71, he stated: "I was strongly impressed with the feeling that this estimate did not do justice to the boy's mental equipment, and that the low rating was to be explained by the fact that the test is inadequate to guage the equipment in a case of such a special disability" (Orton, 1925, p. 584 as cited in Hallahan & Mercer, 2004).

After his seminal article in 1925, Orton continued to study children with reading disabilities over the next several years, his work was summarized in his classic book, *Reading, Writing, and Speech Problems in Children* (Orton, 1937). Although he relied heavily on Hinshelwood's prior work, Orton's views differed from Hinshelwood's (1895) in at least three important respects (Gearheart, 1985; A Plus Home Tutoring Inc, 2002; Causes of Dyslexia, 2004; Dyslexia, 2004; Orton, 1937, as cited in Hallahan & Mercer, 2004).

First, Orton had a much more liberal view of the prevalence of reading disabilities. Whereas Hinshelwood (1895) had bristled at the notion that one per thousand of students in elementary schools might have 'word-blindness,' Orton offered that "somewhat over 10 per cent of the total school population" (Orton, 1939, p. 59) had reading disabilities. He noted that Hinshelwood (1895) had argued for restricting the diagnosis of word-blindness to those cases in which there would be no question about whether there was pathology present. Orton argued, however, that Hinshelwood (1895) did not offer any usable criterion as to how such a separation of the pathological cases could be made, and that their experience in studying and retraining several hundred such cases over a period of years has convinced them that these children cannot be so divided but rather that they form a graded series including all degrees of severity of handicap (Gearheart, 1985; A Plus Home Tutoring Inc, 2002; Causes of Dyslexia, 2004; Dyslexia, 2004; Orton, 1937 as cited in Hallahan & Mercer, 2004).

Second, although they both thought reading disabilities were often inherited, Hinshelwood (1895) pointed to a genesis of the angular gyrus in the dominant hemisphere as the site of the problem. Although Orton considered the angular gyrus of the dominant hemisphere as "essential to maintaining a normal reading skill" (Orton, 1937, p. 39), he viewed reading as a complex activity that involved several areas of the brain. Rejecting the idea of defects in brain development, Orton focused instead on the inheritance of mixed cerebral dominance, or motor intergrading, as being behind many cases of reading disabilities (Gearheart, 1985; Hallahan & Mercer, 2004).

Orton (1937) linked mixed dominance to the major symptoms he frequently observed in the clinic: reversals of letters such as “p”/ “q” and “b”/ “d”; confusion of palindromes such as “was” and “saw”; reading from right to left, manifested by reversals of paired letters, syllables within words, or whole words within sentences; and a propensity to "mirror read and/or write." He theorized that the nondominant hemisphere of the brain stored mirror engrams of the engrams recorded in the dominant hemisphere. For example, in reading the word “was”, the dominant hemisphere would store was in the dominant hemisphere while at the same time storing “saw” in the nondominant hemisphere. In those who have complete hemispheric dominance, the dominant hemisphere controls language and, therefore, the mirrored engrams are suppressed. In the case of mixed dominance, however, the mirrored engrams often emerge causing the child to reverse letters or words (Gearheart, 1985; Orton-Gillingham, 2000; Hallahan & Mercer, 2004; History of Dyslexia, 2004).

Third, Orton's emphasis on cerebral dominance and reversals led him to propose a different term for word-blindness to describe the children whom he was seeing in his clinic. The term ‘congenital word-blindness’ because of its association with the acquired condition and the implications therefrom, does not seem to be properly descriptive of this disability, and he therefore preferred to offer the term ‘strephosymbolia’ from the Greek words, ‘strepho’ meaning twist, and ‘symbolon’ meaning symbol. The prefix ‘strepho’ has been chosen to indicate the turning or reversals. ‘Symbolon’ is used in its original meaning of ‘word,’ ‘sign’ or ‘token,’ Strephosymbolia thus seems nicely suited to his cases in which their analysis points to confusion, because of reversals, in the memory images of symbols resulting in a failure of association between the visually presented stimulus and its concept. (Gearheart, 1985; A Plus Home Tutoring Inc, 2002; Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Dyslexia, 2004; Orton, 1925 as cited in Hallahan & Mercer, 2004; History of Dyslexia, 2004)

A smaller number of subjects however, register and recall the image with about equal facility in the two-mirrored configurations or in a composite of the two. Having formed no clear engram of the word they do not reconfigure it when it appears again and cannot recall it for the reproduction called spelling (Childs, 1968).

In other cases there may be confusion in auditory imagery and in addition to one or both of these there may be a lack of kinesthetic dominance to such an extent that the hand may spontaneously form letters in reverse. The association between visual or auditory and kinesthetic may be so insecure that a letter correctly named may be incorrectly written (Childs, 1968).

In 2003, Orton’s eighty-year-old theory about the neurobiological basis of reading disability has been partly confirmed by researchers using functional magnetic resonance imaging (fMRI) to study brain activity in children. The technique also shed new light on how the activities of different brain regions

change, as children become accomplished readers (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Eide & Eide, 2004).

Dr. Orton hypothesized in 1925 that normally developing readers suppress visual images reported by the right hemisphere of the brain that could potentially interfere with input from the left. Researchers at Georgetown University Medical Centre using fMRI found that children do in fact "turn off" the right side of the visual parts of the brain, as they become accomplished readers. This finding confirms that an aspect of Orton's theory, born out of observations of individuals with reading disability, is correct (Nature Neuroscience, 2003; Causes of Dyslexia, 2004; Eide & Eide, 2004).

For the first time, they also were able to show that different phonological skills are related to activity in different parts of the brain when children read. Phonological skills allow readers to sound out words by correctly associating sounds with written symbols. They are critical for children learning to read and are often found to be impaired in children with developmental dyslexia (Nature Neuroscience, 2003).

The observation adds support to the theory that there may be several neurobiological profiles corresponding to different subtypes of dyslexia - each associated with varying deficits in one or more of these different phonological skills (Nature Neuroscience, 2003).

3.3. Other Causes

The incidence of learning disabilities seems to increase when there is a difficult pregnancy, delivery or the baby is premature, and certain prenatal conditions such as the use of tobacco, alcohol and drugs can harm the fetus by interfering with transmission of oxygen and nutrients to the baby. Early childhood exposure to lead, aluminium, arsenic, mercury and other neurotoxins have been linked to learning disabilities and in some cases shown to have been the cause (Harwell, 2001).

Post birth trauma such as near drowning, head trauma and sustained high temperatures can also result in children experiencing a learning disorder. A factor that seems to act as a red flag is frequent ear infections. Although more research is required to establish the links learning disabled children seem to have deficits in the immune system, which may result in allergies and respiratory disorders (Harwell, 2001).

3.4. Summary

From the above discussion it can be ascertained that underlying genetic and neurological abnormalities cause learning disabilities; these abnormalities cannot be cured or fixed. The brain of learning disabled children perceive information incorrectly, this in turn could compromise children's learning processes and cognitive abilities, affecting children's overall ability to learn. Perception is the interpretation of incoming stimuli from the senses and it is the faulty interpretation of these stimuli, which should be remediated.

From the evidence and research I have presented it would seem that a multisensory approach is the most appropriate because it supports the senses such as visual and auditory with the other senses, in acquiring and interpreting the information they receive correctly. This method also serves to enhance children's memory abilities, since so much of what is learned depends on what came before and the ability to recall this information. In the next chapter I consider intervention programmes that aim to circumvent the effects of learning disabilities, paying special attention to multisensory programmes and the implementation of such programmes.

Chapter Four

Intervention

In this chapter I discuss the general purpose of remedial intervention. Thereafter I attempt to uncover the best methods to use with learning disabled children. From the previous discussions on the symptoms and sub-disabilities manifested by learning disabilities and the research presented on the origins of learning disabilities it would seem likely that a multisensory approach is the most appropriate method to use when dealing with learning disabilities.

I argue the rationale behind the use of multisensory approaches and give a detailed description of the processes involved in implementing such programmes. I pay special attention to the remediation of dyslexia and in particular the teaching of language.

4.1. General Intervention

In overcoming a learning problem the intervention used results in a process of remediation. This relies on an accurate assessment of children's strengths and weaknesses. Remediation focuses on improving the weaknesses while bolstering the strengths to compensate for the shortcomings (Bartholomew 2002; Driscoll, 1998 as cited in North Central Regional Educational Laboratory, 2004).

The underlying premise of early childhood special education is that early intervention makes a significant difference in children’s growth and development. Research has demonstrated that early comprehensive and intensive intervention is beneficial for children with disabilities. Early childhood educational programs should firstly though be able to identify children from birth to five who have special needs and are likely to encounter difficulty in academic learning (Guralnick, 1997 as cited in Lerner, 2003).

Cook & Schirmer (2003) examined according to what degree effective techniques have been developed for students with disabilities; how these techniques are applied and implemented with fidelity and how the utilization of these techniques is unique to special education. It is asserted that special education must develop a number of effective practices for improving the educational outcomes of students with disabilities.

According to Cook & Schirmer (2003), it is seen that special education needs to devise empirically valid instructional practices; special education essentially has to do with the effectiveness of practices.

Despite the effectiveness and uniqueness of the techniques, if they are not used or not used as designed, they do not make a difference in the education and lives of learning disabled students.

Three impediments have been identified that prevent effective remediation: knowledge about neurological underpinnings of learning disabled children and learning has not been adequate, the measurement needed to identify specific process disorders in learning has not been precise enough and matching the subtype of a learning problem with appropriate treatments has not been carried out successfully (Keogh, 1994a; Lyon, 1994 as cited in Vaughn & Linan-Thompson, 2003).

The goals for intervention should be: to provide an educational environment or to adapt existing ones so that they are responsive in ways that do not penalise children for having a disability. Experiences must be brought to children rather than waiting for children to seek out and create their own learning experiences. Children's education should also be individualised (Lewis, 1993; Engelbrecht, Kriegler & Booysen, 1996; Mee, 1998; Juggins, 2001; Bartholomew, 2002; Lerner, 2003; Heward, 2003; Austin Area Branch of the International Dyslexia Association, 2004; Dyslexia, 2004).

The aim of special education is to teach children special skills that help compensate for their disability and help overcome some of the limitations imposed on learning and the normal education activities experienced by other children. It is important to create alternative avenues for learning that circumvent limitations imposed by the disability condition, by using special materials, adaptive equipment and teaching techniques (Lewis, 1993; Engelbrecht, Kriegler & Booysen, 1996; Mee, 1998; Juggins, 2001; Bartholomew, 2002; Lerner, 2003; Heward, 2003; Austin Area Branch of the International Dyslexia Association, 2004; Dyslexia, 2004).

The aim is also to teach children developmental skills that should be acquired but may or may not emerge through the normal events in young children's life because of a disability. Ultimately special education must help children acquire adaptive skills which lead to greater independence and competence so that they can function within the mainstream of society, achieve a sense of self-mastery and develop a positive self-image (Lewis, 1993; Engelbrecht, Kriegler & Booysen, 1996; Mee, 1998; Juggins, 2001; Bartholomew, 2002; Lerner, 2003; Heward, 2003; Austin Area Branch of the International Dyslexia Association, 2004; Dyslexia, 2004).

Early interventions should include strategies for empowering mothers to establish a secure base for at risk children who exhibit various problems; support could include addressing the family environment; improving family cohesion and adaptability with regard to children's developmental delays (Al-Yagon, 2003).

Notions that could possibly enhance special education's effectiveness are: students should be internally motivated to learn, building the student's self esteem is the teacher's primary objective, teaching learning disabled students requires patience, all children learn differently, eclectism is good, a good teacher is creative. In order to further improve effectiveness the following points need to be considered; special education should be viewed as a profession, data should be sought and evaluated for believability, alterable variables should be focused on (Lewis, 1993; Heward, 2003).

Despite the benefits of early intervention, there are potential dangers. Children do not all mature at the same time; readiness may simply be a matter of timing. Some children have developmental lags, which disappear over time; by labelling children educators run the risk of creating a self-fulfilling prophecy. Children who are developmentally delayed and are labelled may begin to believe that they cannot achieve, and therefore they stop trying to do so, if intervention is applied early enough, this problem can be averted (Lerner, 2003). These problems are addressed in the summary in Chapter Two.

There is a phenomenon known as over-remediation, Aylward, Brown, Lewis and Savage (1987 as cited in Lewis, 1993). This is where teachers dwell on the deficit areas of the student, to the point the accomplishment of content suffers. There is also a point past which further practice is not beneficial, and excessive practice may eventually become punitive. Balance in remediation is therefore called for (Lewis, 1993).

Research has also shown that teachers act differently toward children for whom they have low expectations; over time children's behaviour conforms to the teachers' expectations. Assessment also has flaws, many instruments used fail to show adequate reliability and test validity, tests do not consistently test for the same problem and results from these tests are variable, therefore children can be falsely identified or missed (Lerner, 2003).

It should also be noted that structured curricula may impede true learning, teaching discrete skills trivializes education and ignores the whole child, drill and practice limits students' deep understanding and dulls their creativity and teachers do not need to measure student performance. Children essentially only reproduce what has been taught without having any understanding of what has been learnt. These characteristics of special education may limit the effectiveness special education could have in dealing with learning problems (Heward, 2003).

What should be special about special education is delivery of instruction, given that the children's needs are rarely met through general educational instruction alone? Learning-disabled students benefit from explicit and systematic instruction that is closely related to their area of instructional need.

Multisensory approaches seem to fulfill these criteria by working with both children's strengths and weaknesses (Vaughn & Linan-Thompson, 2003).

The management of children who have learning disabilities requires a multidisciplinary approach for diagnosis and treatment that involves educators, psychologists, and physicians. (Academy of Paediatrics, American Association for Paediatric Ophthalmology and Strabismus and American Academy of Ophthalmology, 1998; Bartholomew, 2002; Centre for the Study of Learning, 2004; Dyslexia, 2004).

4.2. Multisensory Approaches to Intervention

> Dyslexic students need a different approach to learning language from that employed in most classrooms. They need to be taught, slowly and thoroughly, the basic elements of their language, the sounds and the letters which represent them and how to put these together and take them apart. They have to have lots of practice in having their writing hands, eyes, ears, and voices working together for the conscious organization and retention of their learning (Austin Area Branch of the International Dyslexia Association, 2004, p1).

As has been shown by research on the etiology of learning disabilities, children with learning disabilities require multisensory learning. This is vital because it stimulates the learning disabled children's learning processes through all the senses. Since all the pathways to the brain are involved, the stronger areas of the brain are used while the weaker areas are exercised. By using the visual, auditory, oral and kinesthetic pathways simultaneously, memory can be strengthened (Gearheart, 1985; Mee, 1998; Knight, 1998; Henry, 2000; Centre for Disabled and Gifted Students, 2001; A Plus Home Tutoring Inc, 2002; Bartholomew, 2002; ADDBE, 2004; Austin Area Branch of the International Dyslexia Association, 2004; Centre for the Study of Learning, 2004; Dyslexia, 2004; Eide & Eide, 2004; Healthy Place, 2004; The Community School, 2004).

In multisensory approaches it is not primarily a matter of developing the senses further but of using all the senses to support the visual and auditory modalities. In better-known multisensory approaches, the assumption is that they are used along with the auditory to support or strengthen the visual channel such as, feeling the shape of the letters. It is important to understand the principle of utilising sensory modalities to assist in the development of normal perception of other modalities (Gearheart, 1985).

There is a growing body of evidence supporting multisensory teaching. Young children in structured, sequential, multisensory intervention programs, who were also trained in phonemic awareness, make significant gains in decoding skills. These multisensory approaches used direct, explicit teaching of letter-sound relationships, syllable patterns, and meaning of word parts. Studies in clinical settings

show similar results for a wide range of ages and abilities (Henry, 2000; Eide & Eide, 2004; Remediation Plus, 2004).

Augur (1985 as cited in Mee 1999, p.1), defined multisensory learning as “learning by the simultaneous use of the eyes, ears, speech organs, fingers and muscles.” According to Hickey (1977 as cited in Mee 1999), multisensory learning enables the individuals to use their own approach to the tasks through utilizing their strong areas and at the same time exercising their faulty ones. They use their visual, auditory, tactile, kinesthetic and oral-kinesthetic perceptual systems to make learning secure (Gearheart, 1985; Mee, 1999; Henry, 2000; Jones, 2001; A Plus Home Tutoring Inc, 2002; Bartholomew, 2002; Vaughn & Linan-Thompson, 2003; Eide & Eide, 2004).

The Orton-Gillingham approach to reading and spelling is the programme most recommended by experts in the field of dyslexia. Modern day research has continued to confirm Dr. Orton's theories about the physiological differences experienced by dyslexics. Early remediation is most effective: however these methods have been successfully adapted for use with older students and adults. The result is the development of lifelong language skills and the wonderful feeling of success in the world of written language (SLD Learning Centre 2004).

The Orton-Gillingham approach has been adapted in recent times and includes programmes such as: 1) The Barton Reading and Spelling System is designed for one to one tutoring of children, teenagers and adults. This is a simplified version of the Orton-Gillingham method. 2) The Herman Method is designed for small groups of children in Grades Three to Six. 3) The Slingerland Method is designed for classroom settings of young children in Grades One, Two and Three. 4) The Multisensory Teaching Approach. 5) The alphabet phonics system is designed for one to one teaching developed at the Texas Scottish Rites Hospital. 6) The Wilson Reading System is designed for one to one tutoring of adults and children from Grades Three and up (Mee, 1998; Bartholomew, 2002; Gang & Siegel, 2002; Bright Solutions for Dyslexia, 2003c; Edwards, 2003; Austin Area Branch of the International Dyslexia Association, 2004; Cook, 2004).

4.3. Descriptions of Multisensory Approaches

4.3.1. The Fernald Simultaneous Multisensory Approach

Fernald predated Orton with respect to advocating for a multisensory approach to reading disabilities. As part of her rationale, Fernald provided a brief history of the use of the kinesthetic modality to teach reading, including references to Plato in the third century B.C., Horace in 65 B.C., Quintilian in 68 A.D., Charlemagne in the 8th century, and Locke in the 17th century. In 1921, she coauthored an

article describing remedial treatment of six cases of students with reading disabilities at the University of California-Los Angeles (UCLA) Clinic School. Fernald and Keller developed what came to be known as the VAKT (visual-auditory-kinesthetic-tactual) method, which is composed of five stages (Fernald & Keller, 1921 as cited in Hallahan & Mercer, 2004; Kaufman & Hallahan, 1976; Gearheart, 1985).

Fernald noted that one of the main blocks to reading skill might be the use of an extremely visual method of teaching, omitting kinesthetic factors. She also noted that perhaps a number of conditions that are often seen as causes of learning disabilities are in reality results of learning difficulties such as emotional instability, visual and auditory perception problems, poor hand-eye coordination, an inability to distinguish between similar stimuli and inversions, reversals and other symbolic confusion. Fernald reasoned that children make such errors when learning to read, but learning to read is in part a process of eliminating these errors. Children who fail to learn to read continue to make these errors (Gearheart, 1985; Fernald, 1988).

Over the years, the UCLA Clinic School expanded and by the early 1940s there were about twenty children admitted each academic year, with an additional sixty to eighty cases seen in the summer. Students received intensive instruction in basic school subjects, with a focus on reading instruction. In 1943, Fernald authored *Remedial Techniques in Basic School Subjects*, in which she summarized work in the clinic as well as in "experimental" classrooms established in the public schools. Some of these contained a high concentration of children for whom English was a second language (Hallahan & Mercer, 2004).

Fernald kept extensive records on the progress of the students. Although lacking control groups, she reported notable gains for reading, spelling, penmanship, foreign language, and arithmetic. In addition, she reported follow-up data for many of the students, which were equally impressive. Whether Fernald's results warrant the following assertion she made in the preface to her book is arguable, but it is interesting to contrast her confident optimism with some of the present-day lamentations about the ineffectiveness of special education.

> Since no abilities are required for the mastery of reading, writing, and arithmetic which are not already possessed by the ordinary, normal individual, it seems obvious that there is no such thing as a person of normal intelligence who cannot learn these basic skills. The follow-up records of our cases over a period of years show that the application of established psychological principles makes success in the fundamentals possible for any normal individual (Fernald, 1943, p. 4. as cited in Hallahan & Mercer, 2004).

Fernald's remedial techniques are not limited to reading or those students with learning disabilities. She provided equally specific procedures for teaching spelling to normal students. She is however best known for her multisensory approach to teaching reading to normal or above average intelligence children (Gearheart, 1985).

Before starting a remedial program, the Fernald procedure requires positive reconditioning. This is based on the assumption that almost all children who have experienced school failure have developed a low self-esteem, particularity relating to anything educational (Gearheart, 1985; Fernald, 1988).

The teacher should avoid calling attention to an emotionally loaded situation, i.e. avoiding urging children to do better. She should avoid using methods that previous experience suggests are ineffective, this is important during remediation and re-entry to the regular classroom. If children are experiencing success in a temporary out of class remedial setting and then must return to a class and to methods by which they were earlier unable to learn, the remedial therapy may be negated (Gearheart, 1985; Fernald, 1988).

In the first stage of the Fernald method children tell a story to the teacher, the teacher then writes each word from the story to be learned down, children trace and pronounce aloud what is written and finally children write each word from memory. In stage two, the tracing is eliminated, children look at a word and then says it to themselves and then write the word from memory. In the third stage children learn directly from the printed word without vocalising or copying. The final stage has been reached when children are able to read new words by generalising (Kaufman & Hallahan, 1976; Lewis, 1993; Mee, 1998).

The first step in the classroom or clinic procedure with such children is to explain that there is a new way of learning words that really works. Children are told that others have had the same problem they are having and have learned easily through this new method. The second step is to ask children to select any word they want to learn and then teach it to them using the new method (Gearheart, 1985; Lewis, 1993).

When teaching words the word chosen is written for children usually with a crayon in plain blackboard writing. In most cases regardless of age, cursive is used rather than manuscript because children will tend to see and feel the word as a single entity, rather than a group of separate letters. Children trace the word with his finger in contact with the paper saying the word as they trace it. This is repeated as many times as necessary until they can write the word without copying (Gearheart, 1985; Lewis, 1993).

They write the word on scrap paper, demonstrating to themselves that it is now their word. Several words are taught in this manner and as much time is taken as necessary to completely master them. When children have internalised the fact that these are their words the instructors then give them words necessary to complete their story. After the story is written, it is typed for them and they read it in its typed form, while it is still fresh in their mind. It is important that this is done immediately (Gearheart, 1985; Lewis, 1993).

After the story is completed and the new words have been used in meaningful ways, the new word is written on a card by children and filed alphabetically in their own individual word file. The word file is used as a meaningful way to teach the alphabet without undue emphasis on rote memory (Gearheart, 1985; Lewis, 1993).

In order to ensure success the word should be chosen by children, finger contact when tracing is essential, children should write the word after tracing several times without looking at the copy, the words should be used in context, children should always say the word to themselves as they are tracing and writing it (Gearheart, 1985).

After a period of tracing, stage one, children move onto stage two, where tracing is no longer required as children simply look at the word in cursive writing, say it to themselves as they look at it and then write it without looking at the copy, they proceed in the same manner as in stage one, in theory now tracing mentally (Gearheart, 1985; Fernald, 1988; Lewis, 1993).

If in stage two they encounter difficulty with a word they should go back to tracing until they have mastered it, as soon as tracing is no longer necessary the large word box of written words is exchanged for a smaller one of typed words (Gearheart, 1985; Fernald, 1988; Lewis, 1993).

At stage three children are able to substitute the printed word for the cursive version for original learning of the word. In stage four, children should have the ability to recognise new words from their similarity to words or parts of words they have learned. Soon after children are able to learn from the printed word they begin to generalise to make out new words from their resemblance to the ones they already know (Gearheart, 1985; Fernald, 1988; Lewis, 1993).

If the case is handled skilfully enough, children should now be eager to read. children are permitted to read as much of whatever they want. It should be noted here that children are never read to, they must do all their own reading. Once children have become proficient, children will begin enjoying learning new words (Fernald, 1988; Lewis, 1993).

They recognise words without being told what they are, as they look at a word the simultaneous association by similarity with words they already know together with meanings inferred from the context gives them instant perception of the word (Fernald, 1988).

If meaning cannot be inferred adults should help. At first children retain new words better if they pronounce them and write them after they are told what they are; at this stage they do this very rapidly. They repeat the word as they look at it, turns to scrap paper and writes the word and moves onto the next one. Eventually children will retain the meaning of the word if they are simply told what it is (Fernald, 1988).

Children are never made to sound out the word when reading nor is it sounded out for them, they point to the word and is told what it is. Any detail that is needed is given by letting them write the word according to the procedure. The writing of the word is merely for the developing word recognition and is done as often as necessary to accomplish this end (Fernald, 1988).

If children recognise the word in print, the writing has done its function, inasfar as reading is concerned and is not repeated. The same word may be written again in connection with children's own stories. It may be important as a spelling word and so learned for that purpose. In the case of spelling a hand habit must be fixed, in reading only word recognition is necessary. Children's reading and spelling problems are therefore corrected (Fernald, 1988).

4.3.2. The Orton-Gillingham Multisensory Structured Approach

Orton and his colleagues began using multisensory techniques at the mobile mental health clinic in Iowa. Orton noted that each child presents an individual problem, not only because of the diverse influence of a considerable number of environmental conditions, but also because the relative part played by each of the three major functions entering into language faculty; vision, audition and kinethesis, varies remarkably in different children as does the emotional reaction to his disability (Orton, 1989; Gillingham, 1974; Orton- Gillingham, 2000; Duchan, 2001; Schlagal, 2001; EPS, 2004; Hallahan & Mercer, 2004).

Orton contended that the first step toward successful treatment is the careful evaluation of extrinsic factors such as economic, social and educational factors, together with extensive analysis of the child's abilities in spoken language, written language and motor skills. The children's limitations and emotional reactions also need to be explored (Orton, 1989).

Orton was influenced by the kinesthetic method described by Grace Fernald and Helen Keller. He suggested that kinesthetic-tactile reinforcement of visual and auditory associations could correct the tendency of reversing letters and transposing the sequence of letters while reading and writing (Orton, 1989; Gillingham, 1974; Orton- Gillingham, 2000; Henry, 2000; Duchan, 2001; Schlagal, 2001; Hallahan & Mercer, 2004).

> Logical training for these children, those with strephosymbolia would be that of extremely thorough repetitive drill on the fundamentals of phonic association with letter forms, both visually presented and reproduced in writing, until the correct associations were built up and the permanent elision of the reversed images and reversals in direction were assured (Could it be Dyslexia, 2004; Orton, 1925, p. 614 as cited in Hallahan & Mercer, 2004).

During his lifetime, Orton directed many research projects dealing with developmental reading disabilities. It was during one of these projects that he met Anna Gillingham (1878-1963), a teacher and psychologist in the field of language disabilities. Together, they developed procedures and comprehensive materials for early identification and remediation of dyslexic children. Their programme is known today as the Orton-Gillingham approach (Kaufman & Hallahan, 1976; Gearheart, 1985; Schlagal, 2001; Could it be Dyslexia, 2004; The Community School, 2004; SLD Learning Centre 2004).

Anna Gillingham and Bessie Stillman based their original 1936 teaching manual for the ‘alphabetic method’ on Dr. Orton's theories. They combined multisensory techniques with teaching the structure of written English, including the sounds (phonemes), meaning units (morphemes such as prefixes, suffixes, and roots) and common spelling rules (Gearheart, 1985; Henry, 2000; Orton-Gillingham, 2000; Duchan, 2001; A Plus Home Tutoring Inc, 2002; Bright Solutions for Dyslexia, 2003c; Could it be Dyslexia, 2004; Sonday System & Winsor Learning 2004).

Anna Gillingham, used modality combinations in her teaching. They included: visual-auditory: translation of visual symbols into sound; auditory-visual: translation of auditory symbols into visual image; auditory kinesthetic: translation of auditory symbols into muscle response for speech and writing; kinesthetic-auditory: movement of a passive hand by another to produce a letter form; visual-kinesthetic: translation of visual symbol into muscular action of speech and writing; and kinesthetic-visual: the muscular feel of the speaking or writing of a letter, in order to lead to association with the appearance of that letter (Childs, 1968; Gearheart, 1985; Orton-Gillingham, 2000; Myers & Hammill, 1976, p. 263-264 as cited in Duchan, 2001; Sonday System & Winsor Learning 2004).

The Orton-Gillingham approach is a structured, multisensory phonics approach. It is systematic; proceeding from the simple to the more complex and it is cumulative in that new information builds

on that which has been previously learned. Multisensory reinforcement and practice cement new learning into long-term memory (Kaufman & Hallahan, 1976; Lewis, 1993; Knight, 1998; Henry, 2000; Jones, 2001; Schlagal, 2001; Bright Solutions for Dyslexia, 2003c; Firchow, 2003; Sonday System & Winsor Learning, 2004; Remediation Plus, 2004; Yes Phonics, 2004).

The student is directly taught reading, handwriting and written expression as one logical body of knowledge. Learners move step by step from simple to more complex material in a sequential, logical manner that enables students to master important literacy skills. This comprehensive approach to reading instruction benefits all students (Kaufman & Hallahan, 1976; Orton-Gillingham, 2000; A Plus Home Tutoring Inc, 2002; Bright Solutions for Dyslexia, 2003c; Sonday System & Winsor Learning 2004; SLD Learning Centre 2004).

In the initial stages of the remedial program, each new phonogram is taught by a series of procedures, referred to as linkages, which involve associations between visual, auditory and kinesthetic symbols. After these linkages are firmly established, sounds are blended into whole words and words into sentences and sentences into stories (Kaufman & Hallahan, 1976; Warner, 1980; Lewis, 1993; Knight, 1998; Henry, 2000; Bright Solutions for Dyslexia, 2003c; Firchow, 2003; Sonday System & Winsor Learning, 2004; Remediation Plus, 2004; Yes Phonics, 2004).

4.3.3. The Orton-Gillingham Procedure

The procedure of teaching each symbol occurs in the following way: the card is exposed to children and the name and sound is spoken clearly and is repeated by them. It is here where emphasis should be placed if there is a speech defect. The teacher carefully makes the letter and its form, orientation etc is explained. It is then traced, copied and written with eyes averted while the teacher watches. Many children whose letters are fairly well made, begin at the wrong spot and move the pencil in the awkward direction. It must be noted that tracing and copying with eyes averted are not equivalent processes neurologically (Childs, 1968; Lewis, 1993; Knight, 1998; Orton-Gillingham, 2000; Duchan, 2001; Firchow, 2003; Could it be Dyslexia, 2004; Sonday System & Winsor Learning 2004; Remediation Plus, 2004).

The letter is shown and children are asked to name it. Sometimes children's hands are moved over to form the letter without looking. The letters are named and children write from dictation. The letters are again exposed one by one with the question, "What does this letter say?" children's eyes should be averted. The sound of the letter is asked, the name being given. The letter is named from the sound. The sound is given and the letter written (Childs, 1968; Lewis, 1993; Knight, 1998; Orton-Gillingham, 2000; Duchan, 2001; Firchow, 2003; Could it be Dyslexia, 2004; Sonday System & Winsor Learning 2004; Remediation Plus, 2004).

Phonemic awareness is essentially the first step. Children must be taught how to listen to a single word or syllable and break it down into individual phonemes. Children must also be able to take individual sounds and blend them into a word, change the sounds and compare sounds and delete sounds all in the head. These skills are easiest to learn before the printed letters are introduced (Lewis, 1993; Knight, 1998; Orton-Gillingham, 2000; Duchan, 2001; Harwell, 2001; Bright Solutions for Dyslexia, 2003c; Could it be Dyslexia, 2004; Sonday System & Winsor Learning 2004).

After phonemic awareness is introduced, phoneme/grapheme correspondence is the next step. Children are taught the sounds which are represented by the letters and how to blend those letters into single syllable words. The six types of syllables that compose the English language words are taught next, if children know what type of syllable they are looking at, they will know what sound the vowel will make, conversely when they hear a vowel sound, they will know how the syllable must be spelled to make that sound (Lewis, 1993; Knight, 1998; Bright Solutions for Dyslexia, 2003c; Firchow, 2003; Yes Phonics, 2004).

Probabilities and rules are then taught. The English language has several ways to spell the same sound: learning disabled children need to be taught these rules. Root and affixes and morphology are taught to expand the students vocabulary and ability to comprehend unfamiliar words i.e. once children know the Latin root ‘tract’ means to pull they can work out words e.g. “extract” means to “pull out” (Lewis, 1993; Bright Solutions for Dyslexia, 2003c; Yes Phonics, 2004).

Letters should be introduced with a keyword. These keywords must always be given by the pupil whenever a phonogram is introduced e.g. when the letter “b” is shown children should respond with “boy”. Children must learn to recognise and explain the difference between the vowel and consonant sounds. The Gillingham consonant drill cards are printed on white and the vowels are printed on pink. Children must understand differences in the manner in which vowels and consonants are formed by the vocal cords and the mouth (Gearheart, 1985; Yes Phonics, 2004).

Drill cards must be presented so as to utilise the associative process. The following associative process teaches each new phonogram: the two part association of the visual symbol with the name of the letter and the sound of the letter. This is accomplished by exposing a card with the letter while the teacher says the name of the letter and children
repeat it, as soon as children have learned the name, the sound is made by the teacher and repeated by the pupil (Gearheart, 1985; Yes Phonics, 2004).

Association is first visual auditory and auditory kinesthetic, kinesthetic referring to the use of the vocal cords, secondly association of the sound represented by a letter with the name of the letter, is done by the teacher making the sound and asking children what letter has that sound, since the card is covered the association is auditory (Gearheart, 1985; Henry, 2000; Remediation Plus, 2004).

Thirdly a two-part association of the form of the letter with how it feels and looks, the teacher carefully writing the letter and then explaining its form accomplishes this. Children then trace the letter moving over the teacher's lines. After tracing the letter children copy it, writes it from memory and writes it while not looking at what they are doing. The association is visual-kinesthetic and kinesthetic-visual (Gearheart, 1985; Henry, 2000; Remediation Plus, 2004).

The first group of letters presented to children must include only unequivocal and non-reversible forms such as "a", "h", "k", "t" then "b", "i", "m" then "f", "j", "p" are first presented. The writing procedure must be applied in a specific way with all the letters, including the teacher first writing the letter, then children trace it, copy it, write it from memory and finally without looking (Gearheart, 1985; Remediation Plus, 2004).

Experience indicates that cursive writing is to be preferred to manuscript. Other specific suggestions on writing procedures mention not using the target word before and after in giving instructions, this is because learning disabled children will have trouble with concepts around reversals (Gearheart, 1985).

Children should learn to spell a few days after sound blending has taken place. The teacher first says the word slowly, emphasising its phonetic parts, making certain children hear all the letters in the word, and then the teacher pronounces it again. Children repeat the word, name all the letters, write the word naming the letters as they write it and read the word they have just written. This is referred to as the four-point programme (Gearheart, 1985; Sonday System & Winsor Learning, 2004; Yes Phonics, 2004).

The naming of the letters aloud as each one is written is featured as a point that Orton favoured to establish visual-auditory-kinesthetic association. It is actually simultaneous oral and written spelling, but because its unique feature is the oral spelling it is referred to as the simultaneous oral spelling (SOS) program (Gearheart, 1985; Knight, 1998; Mee, 1999; Henry, 2000; Sonday System & Winsor Learning, 2004).

It is used as a linkage between sound and letterform and was used by Gillingham to teach non-phonetic words through impressing the letter sequence. SOS is recommended throughout the remedial programme (Gearheart, 1985; Mee, 1999; Henry, 2000; Firchow, 2003).

Once children learn to write and read a three letter, perfectly phonetic word, sentence and story writing begins. Gillingham believed that although these first stories are simple ones, they are not inhibiting (Gearheart, 1985; Sonday System & Winsor Learning, 2004).

Syllable concepts are specifically taught to remedial pupils of all ages. Gillingham teaches detached syllables such as “pel” and “vil” before teaching actual words separated into syllables. It is stressed that just as short words are built from letters, longer words are built from syllables (Gearheart, 1985).

Specific spelling rules for building words with syllables are taught and systematic exercises are provided. Jingles, drills and tricks teach non-phonetic words because there is no logic to non-phonetic words in the English language. It then becomes necessary to learn them through a mnemonic process (Gearheart, 1985; Sonday System & Winsor Learning, 2004).

Writing to dictation is encouraged and a specific procedure is outlined. Towards the end of the program of building reading ability by introduction and understanding of phonograms, some sight words are introduced. Students may learn to exercise sight recognition of words already acquired through the phonetic approach; they should rather learn new words by the alphabetic rather than the sight word approach (Gearheart, 1985; Sonday System & Winsor Learning, 2004).

The Orton-Gillingham approach to reading and spelling ensures success by developing multisensory techniques for memory and retrieval. It encompasses the following main characteristics: it teaches phonological awareness, (the ability to manipulate speech sounds) through explicit teaching exercises, teaches language structure through a systematic phonics program, introducing students to sound-symbol relationships and six syllable patterns, uses multisensory pathways for instruction taking into account both the learning strengths and weaknesses of the individual, spelling rules and generalizations are presented in a multisensory way designed to enhance an individual's spelling and writing ability and because lesson plans progress from simple to complex and are sequential and cumulative, a student's chances for success are increased (A Plus Home Tutoring Inc, 2002; Orton-Gillingham 2004; SLD Learning Centre 2004).

4.4. Summary

McCarthy and McCarthy (1969 as cited in Kaufman & Hallahan, 1976) classified techniques of teaching children with learning disabilities into two categories, those reflecting a process orientation and those reflecting a tool subject orientation.

The perceptual motor approaches and some others reflect a process orientation. They attempt to identify the learning process underlying academic performance and apply remediation to that more basic level. The linguistic approaches, the Orton-Gillingham, Fernald methods are tool oriented, designed to teach the tool subjects of reading, writing and spelling (McCarthy & McCarthy, 1969 as cited in Kaufman & Hallahan, 1976).

In this chapter I have argued that a multisensory approach to remediation of learning disabilities seems to be the most appropriate. A problem still remains though; these methods are all used on school-going children who exhibit disabilities in reading and writing. Remediation then attempts to go back and correct the sub-disabilities I discussed in the second chapter.

In the second chapter I argued that these sub-disabilities are evident in the preschool children and should therefore be recognised. Is it not then possible to use multisensory intervention when sub-disabilities become evident to circumvent the impending learning disability? An education system is required that is able to deal with these issues when they arise. This system should recognise and be able to identify the sub-disabilities when they arise and be able to provide a multisensory approach to the intervention of these sub-disorders. I believe that the Montessori Method could fulfil these criteria; in the following chapters I aim to discover if this is a plausible hypothesis.

Chapter Five

The Montessori Method.

In order to have a thorough understanding of the Montessori Method I explore the pivotal aspects of Dr Montessori's theory in this chapter. This is to determine if this is an educational system that provides an opportunity for any possible sub-disabilities to manifest and is a system that recognises these sub-disabilities early in children's life. This system must also be able to deal with these sub-disabilities using a multisensory method.

After I have given a brief outline of the development of Dr Montessori's theory, I turn my attention to the pivotal aspects of the theory. These aspects include Montessori's view of the children, the *absorbent mind*, the *sensitive periods*, Montessori's ideas about learning disabled children, the *prepared environment*, the learning materials and the presentation thereof and finally I conclude with a discussion on the sensory-motor approach.

5.1. Maria Montessori's Educational Theory.

Maria Montessori was a revolutionary: her ideas concerning education and her beliefs regarding children were alien to accepted thought at that time, the late nineteenth and early twentieth centuries. Montessori's educational vision has not only survived into a new century, it is thriving as never before. Many of her once radical ideas, including the notions that the children learn through hands-on activity, that the preschool years are a time of critical brain development and that parents should be partners in their children's education are now accepted wisdom (Brendtro, 1999; Shute, 2002).

The Montessori method is continually changing, expanding and finding new application. The Montessori system is both a philosophy of child development and a rationale for guiding this development. It is based on children's need for freedom within the limits of a carefully prepared environment, which guarantees exposure to the materials and experiences through which to develop intellectually, psychologically and physically (Standing, 1966; Orem, 1971; Miller, 2004).

To fully understand the enormous contribution these theories have made in education and especially still make in special education, I will firstly discuss the development of Montessori's educational theory and secondly I will discuss the underlying premises that guide the practical aspects of the Montessori method, which will be discussed in the next chapter. During this discussion I will attempt to show the contribution this theory could make to special education.

Dr Montessori was born in 1870, of humble origins; she fought doggedly for the right to study medicine, becoming Italy's first female physician. She became interested in 'idiot' children while working as assistant doctor at the university psychiatric clinic. At the asylum, she came in contact with children labelled 'deficient and insane,' though most were more likely autistic or retarded. Locked all day in a barren room, they would scuffle over crumbs of bread on the floor. Observing them, Montessori realised that the children were starved not for food but for stimulation (Orem, 1969; Plekhanov, 1992; Seldin, 1996b; Brendtro, 1999; Anonymous, 2000; Shute, 2002; Brown, 2003, Bodrova, 2003; Nexen, 2003; Sobe, 2004).

Montessori based her assumption on how children develop and mature as a learning creature on her observations of children's behavioural responses to the material she presented. Montessori (1912) stated, " The method used by me is that of making a pedagogical experiment with a didactic object and awaiting the spontaneous reaction of the child." She thus went through a set of inductive operations and derived certain conclusions from the observations (Orem, 1969; The Montessori Foundation, 1996a; Seldin, 1996b; Brendtro, 1999; Anonymous, 2000).

She began studying philosophy, anthropology and educational theory. Montessori was greatly influenced by the work of Jean Itard and Edourd Seguin. Jean Itard is credited with contributing to the theory of sensitive periods, another important aspect of Montessori's theory, which I will discuss later. The idea of presenting two contrasting stimuli rather than one came from Seguin, who also developed the three period lesson to associate an object of quantity with its name (Orem, 1969; Plekhanov, 1992; The Montessori Foundation, 1996a; Brendtro, 1999; Bodrova, 2003).

Seguin's method can be described as "to lead the child, as it were, by the hand, from the education of the muscular system , to that of the nervous system and the senses." He maintained that " the idiot hand is as idiotic as the brain" and suggested "frequent hand exercises, in which the powers of perception, volition and execution would be drilled to their utmost rapidity and precision". Because of Seguin, Montessori "realised that the sense of touch, the basis of all the other senses, was the great interpreter of vision and guide to accuracy of perception" (Plekhanov, 1992; Seldin, 1996b; Sobe, 2004, p.6).

Itard is often associated with the wild boy of Averon, a child who was seemingly raised by wolves. Itard took the child in who at that stage was in his early teens and attempted to rehabilitate him. Despite the intense effort that was made the child never spoke properly, this led him to believe that a period exists in children's lives in which they are primed to learn language (Seldin, 1996b; Brendtro, 1999).

Montessori also travelled widely to study the then current practices for teaching deaf mutes and other 'deviant' children. This experience enabled her to observe the effectiveness of these practices; Orem (1969) claims that this is reflected in the comprehensiveness of her methodology.

Mental deficiency, she decided, was often a pedagogical problem. Experimenting with various material, she developed a sensory rich environment, designing beads and puzzles that the children could manipulate, and simple tasks such as mat weaving that prepared them for more challenging ones. After working with Montessori for two years, some of the 'deficient' children were able to read, write and pass standard public school tests (Brendtro, 1999; Anonymous, 2000; Shute, 2002).

If retarded children could conquer such exams, Montessori wondered, what results would her methods have on normal children in traditional classroom settings? She visited schools and found students "like butterflies mounted on pins," she wrote, "fastened to his place the desk, spreading the useless wings of barren and meaningless knowledge which they have acquired." (Shute, 2002, p.3).

Montessori's own barely formed vision combined Jean-Jacques Rousseau's philosophy of the nobility of children with a more pragmatic view that work and through it, the mastery of children's immediate environment was the key to individual development. Montessori was concerned with the whole child, their total development and physical well being. She was interested in children's diet, exercise and mental health as well as their social and intellectual development (Orem, 1969; Brendtro, 1999; Shute, 2002).

Later I will go into greater detail, discussing Montessori's final vision and belief of who children are. Early on, Montessori maintained that in order for children to achieve individual development, children must be free to pursue what interests them most at their own pace but in a specially prepared environment. This concept will also be discussed in detail, as it is one of the cornerstones of Montessori's methodology (Shute, 2002).

Montessori's chance to act on her philosophy came in 1906 when a group of real estate investors asked her to organise a programme for the children in a slum area of Rome, so that the children, whose parents were away working all day, would not deface building walls. The investors gave Montessori a room in one of the buildings and fifty preschoolers, aged two to six. She asked society women to contribute money for toys and materials and hired the daughter of the building's porter to assist her (Cohen, 1990; The Montessori Foundation, 1996a; Seldin, 1996h; Brendtro, 1999; Anonymous, 2000; Giovannini, 2000; Shute, 2002; Dugan, 2004).

The Casa dei Bambini, or Children's House, opened January 6 1907. At first Montessori simply observed. Montessori spoke of observation as a form of pedagogy. She noticed that the children came to prefer her teaching materials to toys and would spend hours putting wooden cylinders into holes or arranging cubes to build a tower. As they worked, they became calmer and happier. As the months passed, Montessori modified materials and added new activities, including gardening, gymnastics, making and serving lunch, and caring for pets and plants. Children who misbehaved were given nothing to do (Orem, 1969; Seldin, 1996b; Today's Parent, Toronto, 1997; Anonymous, 2000; Shute, 2002; Bodrova, 2003; Nexen, 2003).

The children soon started asking Montessori to teach them to read and write. So she devised sandpaper letters that they could touch and trace, pronouncing the sounds as they did so. One day during a break, a five-year-old boy cried excitedly, "I can write!" and wrote the word "mano" (hand) with chalk on the pavement. Other children began writing, too, and news of the miraculous four and five year olds who taught themselves to write travelled quickly (Shute, 2002; Nexen, 2003).

Montessori made a breakthrough in the education of children when she realised that the way to teach a skill is not to have children try something over and over but to prepare children to learn skills by teaching the movements and actions necessary to perform them (Brendtro, 1999; Anonymous, 2000).

> When we took the personality of the child into account in and of itself and offered it full scope to develop in school where we constructed an environment that answered the needs of his development, did he show us a personality different from the one previously taken into account, the child showed a greater intelligence than previously presumed, it is therefore obvious that in a traditional system of education the child instinctively resorts to dissembling in order to conceal his capabilities and conform to the expectations of the adults who suppress him (Montessori, 1932 as cited in Epstein, 2003a, p.2).

The aim of her educational program is to free individual children's potential for self-development in a prepared environment. This approach is based on the premise that children are not only capable of but also motivated toward 'auto-formation' and 'auto-education'. Each child is permitted to learn at their own rate, at their own level, in their own way. Children are aided in developing a sense of self worth, while learning to enjoy their success (Standing, 1966; Orem, 1971; Brendtro, 1999; Miller, 2004; Ward & Dahlmeier, 2004).

5.2. Montessori's Beliefs about the Child.

In this section, the first of four important concepts pivotal to Montessori's theory will be discussed. It is my contention that in order for any kind of education to be effective children's needs must be paramount.

Children need to feel valued, especially special needs children, who at some point do realise that they are different from other children. Fostering self-confidence and self-belief by acknowledging children from the very beginning goes a long way to alleviating the emotional problems that so often accompany learning disabilities (The Montessori Foundation, 1996e; Seldin, 1996e).

Montessori described the newborn child as a "spiritual embryo" and understood children's nature as a whole system, including the subsystem of vital energy (the *absorbent mind*), physical body and mind. She described these subsystems as interrelated and interpenetrated
(Seldin, 1996a; The Montessori Foundation, 1996e; Marshak, 2003).

Montessori contended and demanded that children must be respected as different from adults and individuals in their own right. Children are growing and changing both mentally and physically. In the time that Montessori started teaching children were considered unimportant "to be seen and not heard" (Fisher, 1966; Orem, 1971; The Montessori Foundation, 1996e; Seldin, 1996a; Seldin, 1996e; Miller, 2004).

Children were often underestimated in their ability to learn and comprehend, a clean slate that needed to be written on. Children were seen as passive learners that needed to be forged into competent adults, when only then did they have value. "We must never forget that the child is potentially a much higher being than we have till now imagined and we must always treat them as such". Elements of culture must therefore be presented to them in ways that correspond to this newly revealed and elevated nature (Fisher, 1966; Standing, 1966; Orem, 1971; Dahlmeier, 1996; The Montessori Foundation, 1996a; The Montessori Foundation, 1996e; Brendtro, 1999; Marshak, 2003; Nexen, 2003).

The most important years of growth are from birth to six years of age, as this is the time when unconscious learning is brought to a conscious level. Children are believed to be open to and primed for absorbing and learning from their environment; this is different from the adult in both quality and quantity. Watching young children discover and learn about their environment, children are seen to have a deep love and need for purposeful work. Childhood is regarded as a process in which a definite

but hidden plan of nature emerges as children work to create their adult persona (Fischer, 1966; Orem, 1971; The Montessori Foundation, 1996a; Seldin, 1996a; Bodrova, 2003; Miller, 2004).

If we are to assume that children are active learners and not passive recipients of information, then children become responsible for their learning. All growth must come from the voluntary action of children themselves. Children decide on their action under the prompting of natural laws. If children are to exercise this power, it is clearly necessary that they not be directed by someone telling them what to do every moment of their life (Dahlmeier, 1996; Seldin, 1996f; Nexen, 2003; Montessori, 1989, as cited in Ward & Dahlmeier, 2004).

The educational system must fit children; children should not be expected to fit the educational system, therefore the educational system is required to change. The teacher is therefore required to 'follow' children through observing children interacting with the learning materials. From this observation the teacher is better able to direct lessons that best suit children's level of development (Fisher, 1966; Epstein, 1996b; Brendtro, 1999; Perry, 2004; Ward & Dahlmeier, 2004).

Children are born explorers; everyday objects fill children with surprise and fascination. The children's ceaseless quest for experience is not idle curiosity, but a profound urge of the intellect to understand cause and effect. Froebel described this as the need to create inner connections (Standing, 1966; Ward & Dahlmeier, 2004).

The emphasis of the Montessori method is not on how much children can achieve and how quickly, but rather on giving children the opportunity to gain mastery at their own speed in all areas of their life. Growth of children can be seen as a series of steps to total independence. In order for children to walk they must first be able to sit upright, then crawl and finally stand. Each previous developmental stage must be mastered in order for the next to be attempted (Orem, 1971; Nexen, 2003).

Montessori thus places great emphasis on children being able to repeat exercises as many times as they wish, as this refers to a process of inner development, where children learn to make connections between what they experience and classifications and hierarchical categories they have formed. This in turn enables children to act upon their environment. Children should be the final judge of their own competence; once the children's interest subsides they are ready to move on to the next activity (Standing, 1966; Brendtro, 1999; Sobe, 2004).

Montessori observed that when children enter the formal educational system they seem to lose their curiosity. The reason proposed is that the children's desire to discover is stifled by the restrictive

nature of teaching. Children are expected to sit behind a desk and listen to what the teacher is instructing them to learn (Standing, 1966; Epstein, 1996b; Brendtro, 1999).

She suggested that children's lives be arranged in such a way so as to give this spirit of inquiry full play in the classroom. According to Standing (1966) in her teaching method children are given just enough information about a specific learning activity to pique their interest and enable him to use the equipment properly.

Montessori believed that children's love of knowledge surpasses any other kind; to have learned something new becomes a point of departure for children. Punishment and external reward have no place in children's education because it results in unnatural and forced effort. Motivation to learn is intrinsic in young children; the true reward is the joy of discovery and the satisfaction of success (Orem, 1971; Brendtro, 1999; Nexen, 2003).

The functions that children need to establish fall into two groups: 1) the motor functions where he learns to control his balance, learn to walk and coordinate movement. 2) The sensory functions through which receiving information from the environment, they lay the foundations of their intelligence through a process of observation, comparison and judgement (Orem, 1969).

5.2.1. The 'Absorbent Mind'

The base of Montessori's theory is that children's capacity to learn is fundamentally different from that of an adult. This is best evidenced in the way children and adults learn languages, children have an unusual capacity for learning skills such as language, which is lost in adulthood. Children appear to simply be able to absorb, through activity, without much effort, certain complete and precise abilities (Gettman, 1987; Stoops, 1996; Nexen, 2003).

Montessori referred to this as the *absorbent mind*, which is seen as "combining into itself", creating the necessary connections between impressions and experiences to enable children to function in their environment. It is the vital force that is active within children that guides children in their efforts to reach his goals of development (Gettman, 1987; Kirby, 2003; Marshak, 2003).

Montessori's view on the nature of intellect and the development of the mind is embodied in her concept of the *absorbent mind*. As the *absorbent mind* receives impressions, it processes, categorises and interprets them. The impressions are fitted into an inherited intellectual structure. This intellectual structure is not static, but changes and unfolds as children grow. The pattern of unfolding is seen to

take place in a similar manner in most children. When this does vary it is due to the different experiences the mind is exposed to (Standing, 1966; Stoops, 1996).

The intellect is the principle of order in mental development; it is of its very essence there to create order. This is achieved by seeking and binding together like with like and like with unlike according to the principles of identity and contrast (Standing, 1966).

According to Montessori learning itself is the act of joining previously acquired information in a way that it is bound with meaning and have a place in a larger system of meanings or uses. The *absorbent mind* is active in the first six years of children's lives and is divided into two stages (Gettman, 1987; Stoops, 1996; Marshak, 2003).

From birth to the age of three children absorb as many available impressions as possible, in the fullest detail possible. They acquire all impressions, simple or complex with equal ease and accuracy. Children primarily respond to human stimuli, especially the voice. Within the full range of human activity children are impartial and non-selective, that is, they do not make distinctions or favour a particular experience over another, accepting whatever they receive from the environment through their senses (Gettman, 1987).

Children use every sense to perceive the entire emotional, behavioural and cultural environment. This is an unconscious yet active process, children learn without seeking out certain learning experiences. This learning involves children in imitation, movement and manipulative play. In the first three years of life the *absorbent mind* helps create children's basic human abilities, such as walking and talking. These abilities appear suddenly as a result of continual inner development (Gettman, 1987; Ward & Dahlmeier, 2004).

Although the first stage is unconscious and not directed, children's unfolding structure makes special use of certain aspects of the impressions it absorbs. It is the effect of the absorbed experience on the underlying structure that creates children's intellectual abilities (Gettman, 1987).

From the age of three to six, the *absorbent mind* continues to function. Impressions are now focussed through intentional interaction with the material and human environment, children now seek out specific learning opportunities, such as learning to dress themselves or eat on their own. This helps to integrate abilities learnt earlier, such as practising gross and fine motor control. Interaction with the environment is now conscious, with children preferring certain activities to others. This phase is characterised by open and continuous maturation of skills, as opposed to the inner development of the first stage (Gettman, 1987; Stoops, 1996).

During the second stage the structures that have developed give children enough mental faculty to express interest consciously. children can therefore show preference for certain types of stimuli needed to refine and integrate the basic abilities created from birth to three (Gettman, 1987).

The first stage involves absorbing certain component parts, which if completed create motivation for learning. During the second stage the mind solidly binds, through repeated and controlled activity certain previously absorbed phenomena. This allows for clear distinctions to be drawn creating a unified concept. Finally children are able to apply the concepts learned to tasks and situations. This will give the concept a meaningful place in the children's world. The use of language is the most common process used to create meaning (Montessori, 1912; Orem, 1971; Gettman, 1987).

5.3. The Concept of Sensitive Periods.

The term *sensitive period* is used to refer to, certain determining conditions in the environment that are able to bring about different results, according to whether they are applied at different stages in the individual's development. According to Montessori *sensitive periods* are conditions that are favourable to development during a certain stage and may become ineffectual or even unfavourable, during a later period (Standing, 1966; The Montessori Foundation, 1996a).

Children's conquests of independence are the basic steps in what is called their 'natural development' Montessori contended; "If we observe natural development with sufficient care, we see that it can be defined as the gaining of successive levels of independence" (Montessori, 1995, p.84 as cited in Kirby, 2003). Children allowed to follow their inner urge are naturally developing their own self. Montessori saw development as unfolding the sequence of stages pre-programmed in the human species (Epstein, 1996b; The Montessori Foundation, 1996a; Bodrova, 2003; Sobe, 2004).

When children do exercises which correspond to the needs of their present sensibility, they advance and reache a degree of perfection which is inimitable in other moments of life and even without fatigue increases their own strength, thereby providing the joy which comes the satisfying of a real need for life (Montessori as cited in Standing, 1966).

Montessori (1948 as cited in Howard Loeffler 2003) remarked that at each stage of normal development children are different and yet the same, the same in the sense that the universals found in the early years are still present, but different in the ways that the characteristics are manifested at each new age. If children's development has not been nurtured and respected, the characteristics may be stunted and deformed, hiding the possibilities and potential that may exist.

The importance of these *sensitive periods* to the teacher cannot be over-estimated because in each of them children can learn a particular thing better and with less effort than any other time in the children's life (Standing, 1966; Epstein, 1996b; Marshak, 2003; Perry, 2004).

Montessori contended that successive levels of education must correspond to the successive developmental stages of children. She compared this process to the metamorphosis of an insect; only with children the changes are not as distinct as those of an insect (Montessori, 1912; Epstein, 1996b; Today's, Parent Toronto, 1997).

Children are seen as a spiritual embryo alive with the possibility to grow spiritually, morally and psychologically. It is the responsibility of the adult to understand the psychological needs of children and develop children's sense of self-acceptance through respect of children (Seldin, 1996a).

To create a fully functioning human being, Montessori believed that three things were necessary: the underlying intellectual structure, the predetermined unfolding of the intellectual structure over time and the experiences and impressions children are exposed to. Nature makes self-evident what needs to be done next by awakening and enabling children to exercise their will (Montessori, 1912; Nexen, 2003).

The spontaneous ascent from the concrete to the abstract occurs when two factors are present, firstly a certain general maturity of the mind has taken place and secondly great clarity with regard to the particular concrete process in question (Standing, 1966).

5.3.1 The Sensitive periods

In this section I give a brief description of the sensitive periods as Montessori described them.

The age of sensation lasts from birth to six years of age. Varying in intensity, children are fascinated with all that occupies the senses. Children become interested in things as well as the qualities of things. This is a time when children need to exercise all sense faculties fully. At about two and a half when children should start school, the senses are the main instruments for learning. They can be sharpened in a way that can never be done again. Children learn letters, geometrics, pitch, colour, dimensions etc, in a natural and effortless manner. The use of the Montessori sensory apparatus helps to build a foundation for more imaginative creations and clearer abstract ideas (Standing, 1966; Orem, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a; Ward & Dahlmeier, 2004).

The age of language acquisition lasts from about three months to about five and a half years. In this time period children are fascinated with the mouth and the human voice. The fact the children do not absorb any other sound in the environment is proof of this claim. In the Montessori method the sounds of the letters are introduced first, then they are connected into words. Children express themselves by writing stories using the movable alphabet long before they can manipulate a pencil. The study of grammar and sentence construction follows later (Orem, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a; Pickering, 2004a; Ward & Dahlmeier, 2004).

The age of order lasts from a year of age to about three years of age. At this time impressions are being placed in ordered patterns, therefore external order can aid in the development of this internal order. Here the reference is to the order of things as well as the relationship things have to each other and the child. Essentially children are attempting to construct order out of chaos, making thousands of connections and classifications. The Montessori apparatus helps children to classify and discover relationships (Orem, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a; Pickering, 2004a).

The age of small detail begins around two years of age. In the previous three sensitive periods it is evident that each sensitive period aids in the unfolding of children's inner structure, although attention to small detail may not yet be evident. The role this sensitive period plays is to awaken children's sense of attention. This enables children to broaden their field of observation and tighten concentration of the inner intellectual structure in processing what is being absorbed (Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a).

The age of coordinated movement begins at birth lasting to about four years of age. The purpose of this sensitive period is to bring the body under control. children seem inclined to perform and repeat different physical actions. This period ensures that children are physically capable of pursuing activities that help in the unfolding of the intellectual structure. To aid this Montessori provides various practical life exercises and creative movement activities to refine gross and fine motor control (Orem, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a; Ward & Dahlmeier, 2004).

The age of social relations begins at about two and a half years and extends to about five years of age. This sensitive period orients children to intellectual development after the age of six. During this time children acquire social and cultural knowledge, the effect their behaviour has on others, how others behaviour affects children, cooperative play and the absorption of the basic rules of interaction. A real social life seems to develop quite naturally and spontaneously in the Montessori classroom (Standing, 1966; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a).

Children's mental development is marked by the sensitive periods, the time when a particular type of learning is most readily acquired. These times of creative sensitivity are but one manifestation of the children's great powers (Orem, 1969; The Montessori Foundation, 1996a).

From birth to six children pass through a number of sensitive periods. Rather than waiting to teach children to read at six the teacher informally exposes the children at three to sandpaper letter, the movable alphabet in order to guide language development. The young children's *absorbent mind* possesses a remarkable capacity for indirect learning. The children are described by Montessori as a creature with special powers and sensitivities unique to the interval of life at which they are (Orem, 1969; Cohen, 1990; Stoops, 1996).

During the formative period from birth to six years of age many defects may be acquired in learning, for example language, if proper attention and aid are not given to children's development. To be most effective education must begin at birth and assist children as they are forming themselves in interaction with the environment (Orem, 1969).

Perhaps if children with a predisposition toward minor learning disabilities received the opportunities provided in the Montessori classroom during the period of the absorbent mind (three to six years), some of the learning weaknesses could be strengthened or avoided (Gitter, 1971; Orem & Coburn, 1978).

5.4. Montessori's View of the Learning Disabled Child

Since I will be discussing the contribution of the Montessori method to multisensory intervention, I feel it is important to understand Montessori's view of learning disabilities and what she regarded as constituting them.

Montessori did not describe learning disabilities precisely or define them because she believed that the standards we employ to gauge normal development are misleading and sub- normal. That is, given scientific child rearing coupled with truly individualised education in a prepared environment, children would according to Montessori reveal new standards of development and achievement, new norms far above our present expectations (Orem, 1969).

Montessori was particularly intrigued by children who did poorly in school. She noted that educationalists were more interested in classifying human abnormalities than discovering ways to

prevent them. Therefore she began a major effort to develop educational approaches that would captivate the interest of learning disabled children (Brendtro, 1999).

Montessori saw patterns of behaviour that today would be called disabilities as normal human variations. She was the first to identify two basic types of problems in children (those who act out conflict and those who retreat from conflict). Children who cannot cope are given psychiatric labels; she termed them strong and weak (Brendtro, 1999).

Montessori therefore preferred to use certain guidelines indicating developmental delay, inferring the possibility that learning disabilities could result if these developmental delays exist. The developmental delays are the following:

Language: Children do not speak clearly or at all, have difficulty, understanding directions, cannot name objects and is not interested in stories (Orem & Coburn, 1978).

Movement: Children are late in sitting, crawling, standing and walking, have trouble with climbing stairs or riding a bike, drops things, are clumsy and often falls, lack control of body and hands and when colouring do not colour in the lines (Orem & Coburn, 1978).

Independent functioning: Children cannot put on or take off simple clothing, cannot eat fairly neatly, cannot remember the steps required to wash hands and are overly dependent on their mother (Orem & Coburn, 1978).

Behavioural problems: Children are restless and overly excited, cannot adhere to any task for any length of time, often have temper tantrums and are easily frustrated, are withdrawn or listless and are unable to fit in the group at nursery school (Orem & Coburn, 1978).

Perceptual problems: Children have problems seeing, hearing, feeling, or tasting properly, perceive surroundings as moving rather than stable and are unable to move in their environment comfortably (Orem & Coburn, 1978).

Medical problems: Children are susceptible to allergies, ear infections and upper respiratory problems and when infants were lethargic and inactive (Orem & Coburn, 1978).

Children who may be predisposed to having learning disabilities may have problems with attention, order and organisation, gross and fine motor skills and perceptual confusions causing poor concept

formation. There may also be issues with oral language development, language processing, learning to read and write and difficulty in understanding the abstractions of mathematics (Pickering, 2004a).

Montessori stressed the vital importance of the early formative years in children's development. The prepared environment is conducive to exposing problems of a developmental nature in their early stages, while they may yet be remediated. The *prepared environment* is therefore also a diagnostic environment.

The Montessori approach provides a programme, which allows diagnostic teaching in all areas and a hierarchy of skills with which the teacher may assist children to match work to the children's specific developmental level. It also provides a model in which the teacher can present the materials to learning disabled children one-to-one, which Montessori frequently mentions as important for these children (Orem & Coburn, 1978; Pickering, 2004a).

> I am fortunate in having both gifted and learning disabled children in my classes. They thrive along with the other children in the informal, non-competitive atmosphere of the classroom. The fascination of teaching these children lies in the revelation of the learning process, which they represent. The spectrum of this process is spread before the observer. The learning disabled, no matter their IQ, have blocked passages that create a stop-start, slow motion learning pattern (Lillard, 1997, p.155).

Education for learning disabled children should consist of help toward positive development rather than expensive, fragmentary and often ineffective remediation. Reduction of defects through proper education should be given top priority. Ideally education is an intrinsic process of doing by children to develop themselves (Gitter, 1971; Orem & Coburn, 1978; Pickering, 2004a).

Traditional education has largely been an external process of doing; the educator should rather help children do it themselves. The Montessori *prepared environment* offers learning disabled children a world in which they can teach themselves free from the demands and distractions of an adult-centred environment (Gitter, 1971; Orem & Coburn, 1978).

Children live and learn at their own pace without depending on adults. The ground rules, didactic materials and other features of the *prepared environment* offer the framework for free activity and provide a dynamic balance between spontaneity and structure so needed by learning disabled children (Gitter, 1971; Orem & Coburn, 1978; Dahlmeier, 1996).

The freedom of the *prepared environment* permits children to choose for themselves and to pace themselves while the organisation inherent in the materials provides sufficient structure. The teacher will prepare the environment, take care of it, observe the children and discern and plan for their needs. An important advantage of allowing learning disabled children to learn through direct contact with material is frees the teacher much of the time to observe how and what children are learning (Gitter, 1971; Orem & Coburn, 1978; Dahlmeier, 1996).

Montessori recognised that children need to work to master the challenge of interesting tasks; she also understood that the classroom must be reasonably prepared before being expected to cope successfully with these tasks. By providing learning disabled children with preparation, the Montessori teacher can teach success. Children must also be given the opportunity to finish what they have started and to repeat it as often as they wish. Completing and repeating help children to develop their *powers of concentration* and for Montessori concentration is the key to all learning (Gitter, 1971; Orem & Coburn, 1978; Rule & Barrera III, 2003; Pickering, 2004a).

Although children learn through their senses and have combinations of strengths and weaknesses in the sensory areas of seeing, hearing and touch, the traditional classroom has not provided sufficiently for these differences. Often material to be learned is presented in only one manner to a whole group. In the Montessori *prepared environment*, a multisensory approach is employed, enabling children to express their individual sensory preference and style of learning (Gitter, 1971; Orem & Coburn, 1978; Pickering, 2004a).

Children who learn by doing or through their own experience assimilate mathematics readily by manipulating concrete materials such as the rods and beads and less readily through spoken and printed word. The Montessori sensori-motor education provides experience in comparing and classifying as a base for further intellectual development (Gitter, 1971; Orem & Coburn, 1978; Dahlmeier, 1996).

Learning-disabled children need but generally do not receive, the orderly exposure to sensory stimuli afforded by the Montessori didactic materials. The Montessori self-teaching exercises and materials tap learning disabled children's interests and abilities during their formative years. They enable them to correct their errors and encourage the development of inner discipline by diminishing the need for teacher control (Gitter, 1971; Orem & Coburn, 1978; Pickering, 2004a).

The responsibility for control of error is largely shifted from the teacher to the materials. Montessori spoke of the importance of spirit in teaching reflected in the teacher's patience, humility and respect

for children, desire to observe and willingness to diminish as children expand. Most of the teaching is indirect, but can be more direct if necessary. If the teacher is prepared to assume a new responsibility in education as a directress of human development, her preparation must reflect a new teacher education (Gitter, 1971; Orem & Coburn, 1978; Pickering, 2004a).

Lessons are individualised for children's learning abilities and levels just as in the regular classroom. Individualisation is even more important to learning disabled children, who usually have uneven learning abilities and several levels of achievement. The teacher needs to plan individual lessons for each child. As children are ready, they are taught some more subject matter (Orem & Coburn, 1978; Pickering, 2004a).

Choice leads to interest, which leads to increased attention span, repetition, mastery, success and concentration; the same principles apply to learning disabled children. To aid the development of concentration, some children will need access to a quiet place to work (Orem & Coburn, 1978; Pickering, 2004a).

The regular Montessori classroom must be simplified and made less distracting. The class size should be reduced from twenty-five to thirty children to eight to ten children. The age groups change from to three to six, six to eight, seven to nine etc. children are placed according to social and academic skills (Orem, 1969; Orem & Coburn, 1978; Pickering, 2003; Pickering, 2004a).

Children learn in the same manner as normal Montessori children. The class is very structured as it gives children comfort. Children need to know that their rights will be protected and that they are obliged to follow the rules. Freedom of choice, movement and conversation are then allowed to evolve (Orem & Coburn, 1978).

The classroom is smaller with fewer displayed materials. There are also specific places for children to work quietly without distraction. The teacher observes the children, studies the records and test results received on the children and confers with the parents to determine the specific learning goals for the children. She continues to observe, diagnose and give lessons necessary to the children's progress, using the children's learning strengths. As the children feel more confident, she encourages choice and independence (Orem & Coburn, 1978; Pickering, 2003; Pickering, 2004a).

Although much of the material is familiar today, its use for disabled children has been abandoned, so to use them on learning disabled children they need to be made simpler and have far greater contrasts.

The Montessori material can be the basis for curriculum development but should be supplemented with other material designed for learning disabled children (Orem, 1969; Gitter, 1971; Orem & Coburn, 1978; Pickering, 2004a).

Regular Montessori materials are used, but they are supplemented with other materials to strengthen specific learning abilities and skills. These include developmental learning material, the Peabody Language Kits, Gillingham, Frosting and Controlled Reader. Material to introduce the children to public school work such as textbooks and workbooks are also used (Orem & Coburn, 1978; Pickering, 2003).

The Montessori system of activities and apparatus can help special children in the following ways: 1) by providing the necessary order and structure, 2) by improving motor behaviour, coordination and body imagery, 3) by improving perceptual functioning, 4) by increasing independence through the acquisition of self help skills, 5) by developing concentration and attention, 6) by developing social skills and self discipline and 7) by improving receptive and expressive language (Orem, 1969).

Depending on the children's developmental status the focus should be on sensory differentiation, categorisation and oral communication. By having materials available to the children in labelled open shelves, their use in an atmosphere of freedom with responsibility should be encouraged. Therefore only work-oriented behaviour should be encouraged when the children are using the materials (Orem, 1969).

Repetition is important for learning disabled children, by having relatively few materials available for each educational goal but allowing them to be flexible enough to provide graded difficulty sequences and opportunities for transfer of concepts to different objects. Verbal stimulation should be coordinated with sensori-motor activity (Orem, 1969).

The teacher should have training in special education and teaching experience in a normal Montessori classroom. Other professionals should be available for consultation. Learning disabled children can achieve their potential if they are provided special teaching to match their own pattern of needs (Gitter, 1971; Orem & Coburn, 1978; Pickering, 2003).

From the above discussions certain guidelines can be assumed when converting the normal Montessori program into a remedial method: it is important for teachers to know themselves and the children, by evaluating their skill and development on the basis of specific behavioural attainments, recording the children's current level of development, identifying appropriate goals to work towards and tracing the children's progress. Although Montessori is one answer for learning disabled children, it is not the whole answer (Orem, 1969).

Next I will discuss the practical aspects that developed from Montessori's underlying theory. These are the prepared environment, the learning materials, presentation of the materials and the sensory motor approach.

5.5. The Prepared Environment

By understanding children and the way learning takes place Montessori attempted to elevate children and follow children according to their natural way of being. This reduces the stress that children experience associated with learning. This stress is also a contributing factor to some children's inability to learn (Brendtro, 1999; Perry, 2004).

This is the second concept pivotal to Montessori's theory that children should be given a secure place with everything they need in order to flourish. For learning disabled children the organised environment gives them a place free from over-stimulation that can cause confusion and enough stimulation to encourage learning and the development of self-confidence (Seldin, 1996b; Perry, 2004; Pickering, 2004a).

Normal children by the age of three will have developed the ability to attend and be able to filter out distracting sounds and sights. Attention, focus and concentration are functional for learning to take place. Learning disabled children must be taught to pay attention (Seldin, 1996f; Pickering, 2004a).

The teacher must help children reach a level of attention that is within the learning range and use techniques during presentations to help maintain it. The adult has to help children learn to make choices or they may wander around and do little meaningful work. The Montessori classroom structure, presentation procedures and the silence game all help children develop the ability to attend (Seldin, 1996f; Pickering, 2004a).

Montessori focused on creating an environment that was within the children's control, filled with materials that were dependent on the children's ability to interact with them. The prepared environment implies a place for everything and everything in its place with responsibility for order of the environment shared by the teacher and the children. The resulting order helps the children feel more secure (Orem, 1969; Gitter, 1971; Epstein, 1996b; Seldin, 1996d; Marshak, 2003; Miller, 2004; Perry, 2004; Pickering, 2004a).

Each activity is set-up on a separate tray or appropriate container. Each container is placed on a shelf. Each shelf defines an area of curriculum. All language activities are grouped in order of difficulty on

shelves in one area of the room. Within this area there may be the structures, language activities, a reading corner, a listening corner, a tape/cd player with earphones and possibly activities with a computer. The independent usage of each of these activities has been presented carefully; then the children are encouraged to bring their own special talents to the work (Pickering, 2004a).

The children look forward to all the jobs required to keep the room attractive and orderly. The housekeeping tasks, part of the practical life exercises, offer great satisfaction especially for children who have had little success, these duties encourage responsibility, pride of work and pleasure of an orderly environment, while developing hand eye coordination at all levels (Orem, 1969; Gitter, 1971; Seldin, 1996d; Marshak, 2003; Miller, 2004; Perry, 2004).

Order is implicit to the *prepared environment*. The intellect seeks order in its sensations with regard to colour, shape, size and texture. Prepared paths to culture enable the children's intellect to discover various forms of ordered knowledge in the various occupations of the prepared environment. Connected to this are the exercises in practical life that create order and coordination of the muscular-sensory system and help in the maintenance of outward order (Standing, 1966; Epstein, 1996b; Seldin, 1996d; Nexen, 2003).

Order in the advanced materials continues once the children have outgrown the sensorial materials. The prepared paths lead to more order as each path leads to some definition of a school subject. Radiating from the sensorial material each pathway contains a principle of order within it. The order of the environment enables children to discipline themselves and to regulate themselves, creating an optimum state for learning (Standing, 1966; Seldin, 1996d; Perry, 2004).

The *prepared environment* caters specifically for the sensitive period for order, where normal children will through this environment and the orderly and sequential presentation of the learning activities develop an organised work ethic; for learning disabled children this may be difficult (Epstein, 1996b; Pickering, 2004a).

The environment must be prepared to meet the needs of the children at every stage in development and in every area of development. The environment should be a place that satisfies the requirements of the *absorbent mind* and the *sensitive periods*. Everything in the environment is constructed to correspond to the size of the children. (Standing, 1966; Orem, 1969; Orem, 1971; Gettman, 1987; Epstein, 1996b; Seldin, 1996d; Nexen, 2003; Ward & Dahlmeier, 2004).

The early childhood classroom is designed to correspond to the period where children are interested in the sensory qualities of materials predominates. It is a bright, cheerful atmosphere where specially selected learning and cultural activities are introduced when the children are ready (Standing, 1966; Orem, 1971; Gettman, 1987; Seldin, 1996d; Nexen, 2003).

In this environment the teacher does not teach the children directly and collectively, but indirectly and individually through the teaching materials. The prime duty of the adult is to prepare and protect the environment. This ensures that children will feel loved and secure whilst learning through discovery and exploration (Standing, 1966; Orem, 1971; Neubert, 1973; Seldin, 1996d; Brendtro, 1999; Cox & Rowands, 2000; Bodrova, 2003; Perry, 2004; Ward & Dahlmeier, 2004).

The teacher is a calm, supportive person who waits for the children to understand or finish the activity. She requires that children wait when it is their turn to present, and she does not interrupt the children when it is their turn. She requires that the children act appropriately in the context of the group. The classroom is relatively quiet with a hum reflecting involved activity (Neubert, 1973; Seldin, 1996; Cossentino, 2003; Pickering, 2004a).

Children are free to choose the activities that they wish to engage with. This choice making evolves throughout childhood and is the foundation stone for learning at every phase. Montessori, 1989, (p.5 as cited in Ward and Dahlmeier, 2004) contended, “our teaching must only answer the mental needs of the child, never dictate them.” She implied that authentic choice is essential for children and that it in fact prepares them for life better than teacher directed choice (Bodrova, 2003; Kirby, 2003; Ward & Dahlmeier, 2004).

The adult in the Montessori environment serves as a caretaker, a facilitator of the children’s interaction with the materials and as an observer of the children’s development and work. The teacher need only be concerned with the periphery, the outer motor activity at the periphery of the personality. The centre of profound invisible creative processes occurring in the children will take care of themselves (Standing, 1966; Orem, 1971; Neubert, 1973; Gettman, 1987; Seldin, 1996d; Marshak, 2003; Ward & Dahlmeier, 2004).

> Montessori talked about the teacher’s role: “ the teacher’s principal duty in the school may be described as follows: She should explain the use of the material. She is the main connecting link between the materials, that is, the objects and the children. The teacher must be able to choose an object suitable for a particular child and place it before him in such a way that he understands it and takes a keen interest in it” (Neubert, 1973; Montessori, 1988, p.151 as cited in Kirby, 2003).

The children can work directly with the didactic material they have chosen, at their own pace for as long as required. The teacher moves about the room observing and giving individual lessons where needed. The schedule for each child is flexible, dictated by the child's interests and needs. The schedule is not imposed; no two children need follow the same curriculum. Each child displays his unique pattern of potentials and progress. The individual follows the lead of his own inner teacher (Seldin, 1996d; Orem, 1969; Ward & Dahlmeier, 2004; Nexen, 2003; D'Innocenzo, 2003).

> Dr Montessori says: " in voluntarily doing a thing we must first know what that thing is. We cannot choose a thing without knowing it first, the child spontaneously chooses amongst a large amount of stimuli, but should only choose those things that he knows. This is real choice, true choice is something from within. It is often said that it is curiosity, which urges them, because, when he has understood a thing, he no longer has intellectual curiosity with regard to it. So it is just when curiosity is satisfied that there begins the real expansive activity of the child. He does not now act so that he may know, but that he may grow, because he has need of action to reinforce and expand his mind" (Standing, 1957, pp. 285-286 as cited in Kirby, 2003).

Children are free to move and work in an atmosphere of order, which is made possible by ground rules and absorbing the didactic material. The didactic material and ground rules of the Montessori environment provide a flexible structure and organisation of work. This enables the children to occupy themselves constructively in relative freedom (Epstein, 2003b; Nexen, 2003; Ward & Dahlmeier, 2004).

The classroom consists of three age groups; this encourages social interaction and mentorship. The stress of conforming to a specified rate of learning is also then eliminated. Academic achievement is a by-product and is not stressed outside of its relationship with the total development of the children (Orem, 1971; Cohen, 1990; Seldin, 1996d; Seldin, 1996e; The Montessori Foundation, 1996c; Miller, 2004; Ward & Dahlmeier, 2004).

The emphasis is on the intrinsic reward of self-development, rather than on prizes or punishment. Children are free to help another if invited to do so. The three-year age span of the class offers the advantage of a non-graded situation. The older children can help the younger ones and act as role models. Montessori children admire each other's work, they share responsibility for school-keeping tasks and are able to work in small or large groups as circumstances dictate (Orem, 1969; Seldin, 1996d; D'Innocenzo, 2003; Nexen, 2003; Ward & Dahlmeier, 2004).

The Montessori class for normal children is bigger than the traditional, yet functions more effectively. The children are able to immerse themselves in the materials and exercises that are created to motivate activity, Montessori termed this their allure. The ground rules protect each child's work from interruption along with the long blocks of time, which enable the child to concentrate on a task for as long as they wish (Orem, 1969; Seldin, 1996d).

Within the prepared environment are the learning materials: the two cannot exist exclusively, and without the one the other is useless in achieving the optimal results that Montessori intended.

5.6. The Learning Materials and Activities

This is the third concept in Montessori's theory and probably the most unique. The materials in early childhood development focus on the senses and cover almost every aspect of learning necessary to create the foundation from which later learning springs (Seldin, 1996e).

With regard to learning disabled children, it has been established that early intervention is vital if remediation is to achieve its full potential. When learning disorders are broken down into their component parts such as a reading disorder that may include problems with sequencing, visual perception and discrimination. Montessori's learning materials find their greatest application in this area because they are systematic, structured and multisensory (Standing, 1966).

The purpose of the didactic materials is to create order by ordering the impressions children have already received, since true knowledge consists not in the awareness of isolated facts but in an ordered system of related facts (Standing, 1966; Dahlmeier, 1996; Seldin, 1996d).

The great value of the Montessori materials is that they present the nature of the outer world in an orderly manner. This is designed to assist in the development of the children's intellect and is guided by the principle of order within the mind, creating structure in hierarchical concepts. This helps the children to recognise order in the outside world. If children are uninterested or bored, it is presumed to be due to the manner of teaching. Obstacles exist to block the intellect from functioning as it should, spontaneously (Standing, 1966; Seldin, 1996d).

Learning disabled children often have difficulty with ordering work tasks and working in a sequential way. These children often start a task as presented and then seem to lose the pattern after a while. All the activities in the Montessori classroom are designed to assist children in developing organisational skills and habit of completing a task in sequence. Children with learning difficulties require more presentations and direct instruction in organisation (Pickering, 2004a).

Every child is unique and therefore needs freedom to grow and explore at his own normal pace and in response to his inner motivations. The significance of spontaneous repetition in childhood, serves to develop an increased sensibility, keener sensorial discrimination and more perfect muscular adjustment. Children must not be forced into an average mould. The spontaneous interest in any given subject at any given time differs between children, just as the sensitive periods do (Standing, 1966; Seldin, 1996d; Orem, 1971).

The Montessori didactic material provides for systematic sensory education, muscular coordination and language development. Montessori follows the ideas of a cosmic curriculum of knowledge through a multisensory approach. The variety of exercises and the children's choice of which activity they wish to do prepare the children for future learning (Orem, 1971; Seldin, 1996d; Seldin, 1996e; Perry, 2004; Ward & Dahlmeier, 2004).

With the didactic materials and exercises the children can apply several senses to a particular learning task. The children are not limited to the verbal learning channel; for example with the sandpaper letters he can touch, trace, see, and hear the letter. One sense can reinforce another in the learning situation. Children who favour a particular style or mode of learning have the opportunity to express this preference (Orem, 1969; Seldin, 1996d).

Children can exercise their sense of touch fully with the large selection of readily available materials that enable them to learn intuitively various principles and rules of mathematics and language. Children are able to move to more abstract exercises after sufficient practice and preparation (Orem, 1969).

The effectiveness of the materials is due to the way in which Montessori was able to isolate the particular sensory stimuli so well. She did this by making the particular object identical in every aspect except that particular quality on which the mind is being concentrated, for example size or colour (Standing, 1966; Seldin, 1996d).

Most of the materials contain the control of error, enabling children to immediately recognise when they have made a mistake. Children are then able to try an alternative response without waiting for the teacher to help them (Orem, 1969; Seldin, 1996d).

The first thing done in teaching any subject by auto-education is to analyse the various differences and then present these in isolation. With this analysis the aim is to seek and find the difficulties the children may experience according to the children's psychological order rather than along lines of

logic. This means that the order of presentation of any part of a subject depends not so much on a logical approach to that subject as on a study of the sensitive periods, which happen to be dominant in the children's mind at any particular moment (Standing, 1966; Seldin, 1996d).

In teaching any subject or stage of subject we should give, firstly, an idea of the whole in an ordered comprehensive way, showing at the same time a general view of the interrelated parts and secondly, arrange things so that the children can now pass onto a study of the separate details (Standing, 1966; Seldin, 1996d).

Exercises in practical life are aimed at the internal processes of children. They are there to develop a more complete unity between the body and the mind, to enrich the personality with more power and efficiency and thus present it with an ever more perfect instrument for carrying out the children's wishes (Standing, 1966; Seldin, 1996d; Cox & Rowands, 2000; Perry, 2004).

Children usually first encounter the area of practical life, caring for themselves and the environment, developing social relations and controlling their movements. In the area of sensorial experience, children's senses are developed to a high degree and lay the groundwork for future manifestations of the children's natural creative abilities. The area of language allows children to develop to a degree that they will learn to write and communicate effectively (Orem, 1971; Seldin, 1996d).

Through the exercises in practical life children learn to take care of their person and the environment. Children do not have to rely on someone else to do things for them, therefore children develop a pride in their own grooming and doing their share to maintain the attractiveness of the environment (Orem, 1969).

All Montessori activities are arranged in such a way, that children can acquire a great deal of knowledge spontaneously and by discovery. This is often evidenced in the way children make sudden discoveries for themselves (Standing, 1966; Seldin, 1996d).

During prolonged activity with the Montessori materials, the children are preparing for the next stage of development. This developmental process is evidenced when children have a sudden ability to do something they could not (Standing, 1966; Seldin, 1996d).

Children who have failed in other settings are afforded the chance to experience success in the Montessori class. Children can begin with simple basic tasks that match their current level of competence. This will gradually lead to mastery of more challenging tasks.

In Chapter Six I will discuss the learning materials in greater detail, showing how each specific material works and to what educational end they are intended.

The didactic material, in fact, does not offer children the “content” of the mind, but the “order” for that “content”. It causes them to distinguish identities from differences, extreme differences from fine gradations and to classify, under conceptions of quality and of quantity, the most varying sensations appertaining to surfaces, colours, dimensions, forms and sounds. The mind has formed itself by a special exercise of attention, observing, comparing and classifying (Gitter, 1971).

The mental attitude acquired by such an exercise leads children to make ordered observations in their environment, observations which prove as interesting to them as discoveries, and so stimulate them to multiply them infinitely and to form in their mind a rich ‘content’ for clear ideas (Gitter, 1971).

5.7. Presentation of Activities.

Equally as important as the prepared environment and the learning materials are, is the way they are presented to children and can be determinate of learning. The array of Montessori materials by itself provides no guarantee of optimum learning with normal or special children. Needed in addition are certain teaching techniques that are used at the energy level of the class, beginning with motor exercises and continuing through sensorial work to academic work (Orem, 1969; Gitter, 1971; Gettman, 1987).

Special children present a variety of special problems that must be met before positive learning can take place. The children may be upset by extraneous objects or by the stimulation of too many words, because they lack the ability to discriminate between relevant and irrelevant stimuli (Orem, 1969; Gitter, 1971).

Ways need to be found to isolate the material by creating an environment that will not distract them from the material to be learnt. The teacher must make sure that children show interest in the work, if not she must wait for a more opportune moment, the teachable moment and proceed from the beginning. Once the material has been presented the children may work with it for as long as they wish, after the correct use of the material has been demonstrated (Orem, 1969; Gitter, 1971; Dahlmeier, 1996; Seldin, 1996d; Pickering, 2004a).

Rather than using complicated verbal instructions, the teacher should use appropriate gestures at an unhurried pace to show what needs to be done. With special children a great deal of showing may be

necessary, the teacher should also be aware of children showing need for further instruction (Orem, 1969; Gitter, 1971; Seldin, 1996i; Cossentino, 2003; Pickering, 2004a).

The teacher must demonstrate the primary purpose for the material, saving variations for later when the children's interest is peaked. Once the lesson is completed the material is returned to its proper place. This is the fundamental lesson in the Montessori classroom and prepares the children for more challenging tasks (Orem, 1969; Gitter, 1971; Gettman, 1987; Dahlmeier, 1996; Seldin, 1996i; Kirby, 2003; Pickering, 2004a).

The Montessori curriculum is organised into five subjects: practical, sensorial, language, mathematics and culture. Everything children do is preparation for something they will do later, this follows the principle of indirect preparation and is achieved in three ways. Firstly the introductory activity is separated into two or three activities, which will become the component parts of a later activity. Secondly, children are trained in physical skills that will be built into more complex skills. Thirdly, children are taught broad abilities that will be important later. Every activity has a special place in the sequence because it satisfies some transitory need that will arise in the children's development. This also provides at least one form of indirect preparation for future learning (Gettman, 1987; The Montessori Foundation, 1996b; Seldin, 1996d).

When presenting the material for the first time, it is shown to the children and named, and then there is a demonstration to show the concept or connection embodied in it and how to use it. Finally the activity is given application and the concept embodied in its context. This is called the three period lesson (Gettman, 1987; Kirby, 2003).

This breaks the learning of new materials into three steps. This offers a number of advantages in teaching special children, by limiting the material to be learned at any one time provide a focus of interest for the children and permits a close check of error. The concrete Montessori material makes it possible for the teacher to observe the children's progress from no comprehension to comprehension (Orem, 1969; Gitter, 1971; Orem & Coburn, 1978).

The young learner needs time to repeat an activity until it is mastered. Montessori spoke of young children's love of repetition. It was the observation of a child working with wooden blocks and cylinders that inspired her to plan out a special method for the education of children (Gettman, 1987; Kirby, 2003).

Montessori observed that if the environment was prepared and presented properly and allowed the children enough freedom to respond to it as an individual pace, then a kind of space for natural growth is opened in the children's lives (Gettman, 1987; Dahlmeier, 1996; Kirby, 2003).

Children who enter the environment for the first time are often incapable of working on something for very long, moving from one activity to the next, either in a frenzied manner or completely withdrawn. Presentations are used to arouse the interest of children and the children are protected from distractions and are able to repeat the exercises as often as they please. The children develop a daily routine and become able to work for a prolonged time. Perseverance becomes a habit and calmness and serenity a part of the children's behaviour (Gettman, 1987; Kirby, 2003).

5.8. The Sensory-Motor Approach

The three-part Montessori method includes education of the senses, which employs a systematic methodology and materials; the other two parts are motor education and intellectual education featuring language development. Sensory education is interwoven with language development (Orem, 1969; Early Childhood Today, 2000; Kirby, 2003).

The education of children's five senses through specially designed sensorial materials aims at improving the children's capacities for discrimination and classification. It is only through movement and manipulation and through thinking with the senses that children proceed to later abstract thinking. The didactic materials are simply constructed, inherently interesting and self-correcting to inspire children to master them and to seek relationships between sensorial materials in his environment (Orem, 1969; Gitter, 1971; Plekhanov, 1992; Early Childhood Today, 2000).

Children may learn to use a piece of material by having the teacher give them a presentation or explanation or children can learn by imitation. Children need to move as they learn and they need to coordinate their movements therefore the carpeted workspace, exercises in practical life and light movable furniture encourage movement (Orem, 1969; Early Childhood Today, 2000; Kirby, 2003).

In children's exploration of the sensorial material, it is crucial that the teacher respect the children's attempts to classify the material on the basis of their previous experience. Basically the aim of sensorial education is the development of the whole child, encouraging self-attainment and self-mastery through the understanding of one's environment (Gitter, 1971; Kirby, 2003).

There are specific material and exercises that improve children's sensory abilities, seeing, hearing and touching. Children are encouraged to make ever finer sensory discriminations involving colour, size,

shape, sound and texture. All the while learning the precise language. Many special needs children with sensory problems can benefit from the Montessori materials and methods, which were originally developed for ‘deviant’ children (Orem, 1969). The learning materials are discussed at the beginning of Chapter Six.

Sensory development leads to self discipline which liberates children, it develops self awareness, appreciation of the self which leads to appreciation of others, develops children’s powers of observation by refining the senses, connects the internal workings of children to the physical world and creates an orderly mind from children’s chaotic sense impressions (Gitter, 1971).

Children are encouraged to discover their environment by touching. The materials progress from concrete to abstract concepts. At each stage in the learning process children are preparing for the next more challenging task. Piaget and other researchers have shown how important early extensive motor experience is to the development of higher mental processes (Orem, 1969).

When talking about sensorial education Montessori contended that the education of the senses is primarily aimed at the refinement of the different perceptions received from different stimuli by means of repeated exercises. The didactic material developed by Montessori works equally well for normal and learning disabled children, although modifications are required, which will be discussed at a later time (Gitter, 1971).

Montessori referred to this function of the didactic material and its effectiveness by saying “The same didactic material used with deviants makes education possible, while with normal children it provokes auto-education” (Gitter, 1971).

5.9. Summary

In the above discussions it is clear that the Montessori Method has something to offer special education. In the discussion of the development of the theory it is evident that this system was created in response to the needs of learning disabled children. Montessori’s view of children is sympathetic to the needs of children with the underlying idea that in order for children to learn effectively they need to be supported.

The concept of the *absorbent mind* offers an explanation as to how children learn and what is required to enhance this learning. The sensitive periods help to direct teaching by asserting that children are primed to acquire certain aptitudes at different ages.

The *prepared environment* and the learning materials were developed to aid learning in such a way that it is supportive of children. The sensory-motor approach is aimed directly at the education of children's bodies and senses. This approach is very helpful for the learning disabled child since it deals with perception of incoming stimuli. This method is multisensory as it employs most of the senses to bring about learning and aids in the correct interpretation of the stimuli received by children. The senses are used to support each other and therefore make learning more effective.

The chapter that follows explores in some detail how the four pivotal aspects of the Montessori Method (the *absorbent mind*, the *sensitive periods*, the *prepared environment* and the learning materials) come together to enable learning in all areas of children's development. Areas of development that are considered are physical, perceptual, behavioural and language development.

Chapter Six

Montessori Education in Practice

Traditional whole-class education exerts a levelling, limiting influence; so Montessori proposed an educational methodology that is individual. This methodology includes self-teaching materials and an indirect role for the teacher. The usual classroom of the time lacked organisation of work in freedom necessary for auto education. The Montessori prepared environment offers a flexible format designed to aid children's development. A disorderly environment interferes with learning and promotes insecurity. Children need the opportunity to concentrate on tasks for long periods of time (Orem, 1969).

In the spontaneous, expansive, active education a secure, stimulating environment aids the natural drive of children to self-development. The extensive Montessori apparatus and activities provide a "cosmic" curriculum of three parts; systematic sensory education, motor and muscular development and cultural and intellectual development, which together allow children to develop to their full potential (Standing, 1966; Orem, 1969; Cox & Rowands, 2000; Seldin, 2003d; Perry, 2004; Pickering, 2004a).

The concept of Montessori's auto-education involves self-teaching through interesting tasks with self-chosen didactic materials. These materials contain a built-in control of error, which enables children to correct their mistakes when they happen (Standing, 1966; Orem, 1969; Seldin, 2003d; Pickering, 2004a).

The movable materials, specifically chosen and manipulated by young children, enable children to absorb a lot of abstract content inductively. Montessori's practical approach to teaching language features multisensory materials, programmed preparation and lots of practice in practical application (Orem, 1969; Orem, 1971; Seldin, 2003d; Perry, 2004; Pickering, 2004a; Ward & Dahlmeier, 2004).

The teacher can learn from observing the children, how to assist them. The Montessori teacher takes a non-judgemental approach to learning problems, focussing rather on the children instead of the problem. Montessori education presupposes an active learner, motivated inwardly to form their personality and make intellectual conquests. The Montessori Method recognises children's potential for auto-education and inner discipline and it is the interaction between this and the Montessori Method that is responsible for Montessori's results, yet the fact remains that most importantly the Montessori method is able to tap into this potential. The Montessori Method has a unique ability to

meet children at their own particular point of need and then assists children to progress from that point (Standing, 1966; Orem, 1969; Orem, 1971; Neubert, 1975; Gettman, 1987; Marshak, 2003; Seldin, 2003d; Ward & Dahlmeier, 2004).

In this chapter, I describe in some detail how the prepared environment and learning materials work together in each area of development and enable learning, especially for learning disabled children.

The various areas of development will be discussed. These include motor development, perceptual development, and language development. In each section I refer to the specific activities and learning material used in order to ensure that the development of each area considered is optimally achieved. I also consider the rationale behind the use of such activities and materials as developed by Maria Montessori.

I also reiterate all the sub-disorders mentioned in Chapter Two and consider how the Montessori *prepared* environment and the learning materials and activities are able to remediate these sub-disorders.

6.1. Motor Development

Movement is vital to mental development; Montessori children are allowed to move as they learn. Motor and muscular education is designed to help children learn to move and act in a coordinated efficient way (Orem, 1969).

The sensitive period of coordinated movement begins at birth lasting to about four years of age. The purpose of this sensitive period is to bring the body under control. Children seem inclined to perform and repeat different physical actions. This period ensures that children are physically capable of pursuing activities that help in the unfolding of the intellectual structure (Orem, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996a; Ward & Dahlmeier, 2004).

To allow for the sensitive period of coordinated movement every occupation in the Montessori classroom involves some kind of bodily movement. This movement is not random; but rather it is directed to some intelligent end. Aristotle taught that “there is nothing in the intellect that was not in the senses first”; in the Montessori classroom movement is added to the equation as an important door to learning. As children pass from one stage to the next children become less interested in purely sensorial activities and more concerned with elements of culture (Standing, 1966).

Motor education includes areas such as posture, coordination, dexterity and motor skills. Provided is an analysis of movement, children are taught to move in an orderly manner. The ultimate goal is precision and the mastery of movement (Orem, 1969).

Children who develop normally would have developed the gross-motor skills of running, jumping in place, walking on tiptoe, kicking a ball forward and throwing a ball by the age of three; by five children can walk on a line forward and backward, balance on one foot for five seconds, hop on one foot, throw a ball with direction, walk up and down stairs alternating feet and do a somersault (Harwell, 2001; Pickering, 2004a).

Fine-motor skills that should have developed by the age of three proceeds from turning pages singly, snipping with scissors, holding a crayon with the forefinger and thumb, using one hand consistently and making circular, vertical and horizontal strokes, to cutting continuously on a line, copying a cross, circle, square and letters at five (Harwell, 2001; Pickering, 2004a).

Children with learning difficulties seem to have trouble reaching these milestones; in gross motor performance they may lag behind in control of the large muscle groups. At seven years of age children may still battle to alternate feet while skipping and may have problems in fine-motor exercises such as tying, pouring, cutting, colouring and later in writing (Harwell, 2001; Pickering, 2004a).

The aim of muscular education is to bring the individual to some useful labour for society; this labour must be executed by means of the muscles whether manual, speaking or writing. The intelligence must subject the muscles to its own purposes and the muscles must be equipped for such obedience. It is necessary to prepare them by some kind of education that will reduce them to some kind of coordination (Gitter, 1971).

Children can move about the room to explore and lay out their work on a carpeted floor, rather than be confined to desks. There are many gross and fine motor exercises to aid motor coordination. The emphasis is on active learning and active inner discipline rather than passivity and external discipline (Orem, 1969; Pickering, 2004a).

Children are given exercises to improve walking, breathing, etc and are encouraged to develop a positive self-esteem. The liberty of children is considered with the children being able to work on the floor. The furniture is designed to suit the children’s physique. Children can participate in outdoor activities, manual work, creative arts, manipulative materials and exercises in practical life (Orem, 1969; Pickering, 2004a).

Exercises that lead to improved motor coordination should be a regular part of the Montessori classroom, including special children. Walking the line is such an exercise. A line in the form of an oval is formed on the floor. Children space themselves equidistant on the line and follow the teacher as they walk on the line in gradually smaller and smaller steps, till they are walking heel to toe, in a slow regular rhythm. Music may also be used. This is an example of an exercise that may aid in the improvement of vestibular problems (Orem, 1969; Gitter, 1971; Pickering, 2004a).

As mentioned in Chapter Two the vestibular system involves the inner ear and enables the individual to detect motion; this system allows a person to know where the head is in relation to space and how to handle gravity. Children with disorders in this area fall easily and do not know how to adjust their bodies for the position of their heads or for other body movements (Lerner, 2003; SIRRI Sensory Integration & Learning centre, 2004).

Muscular education for learning disabled children is aimed at the stimulation and coordination of useful movements. It prepares children for exercise, for activities of domestic value, for manual labour, and for language. The preparation consists in bringing children to tonic quiescence in standing posture. Children must first learn to stand erect, head up, eyes forward (Gitter, 1971).

This relates to remediating children who have proprioreceptive problems mentioned in Chapter Two. The proprioreceptive system involves stimulation from the muscles or within the body itself; disorders may include apraxia, difficulties in intentional performance of certain body parts. Children with apraxia cannot plan how to move their bodies without bumping into things; they cannot direct movements such as buttoning, skipping or writing (Lerner, 2003).

From the position of tonic quiescence (the child being comfortable in his own body), we pass to exercises in imitation. Tonic quiescence is reached using a variety of procedures, the variation depending on the individual. Sluggish and apathetic children need to be stimulated and hyperactive children must be calmed. Children with tics and paresis need to be corrected.

Medical education may precede pedagogy itself. It may be a case of applying medical gymnastics for both active and passive movements. Today occupational therapy replaces medical gymnastics: aside from the many benefits occupational therapy provides, it aids in the remediation of proprioreceptive problems, which in turn is supported by the effectiveness of the muscular education in the Montessori classroom (Gitter, 1971).

The inability to perform local movements such as the inability to move fingers, the tongue, lips etc may affect certain children. From such defects arises the possibility of performing certain simple manual tasks such as taking hold of an object, producing certain words, learning to contract the lips and control the sphincter muscles (Gitter, 1971).

Atony (the inability to move) and hyperactivity (the inability to remain still) may be overcome by using appropriate educational remedies, for example, by stimulating active movements in atonic children until they are able to stand erect, then stimulating simple movements until the children are able to gradually move onto more complex movements. Hyperactivity can be overcome to some degree by using techniques such as brushing the skin or applying deep pressure to the joints, thereby creating a calming effect for the children, enabling them to remain still (Gitter, 1971).

The Montessori curriculum, activities and environment provide ample opportunity not only for the development of fine and gross motor skills, but also for intervention in cases where children have difficulty developing fine and gross motor skills, which as mentioned in Chapter Two, may be sub-disorders of an impending learning problem.

6.1.1. Practical Life Exercises and Activities

The practical life exercises are exercises in which children are engaged in domestic chores. These exercises have many learning purposes in a Montessori class: care of the environment, the need for order in the environment, fine and gross motor development, independence, sequencing, left-right movement in individual tasks and building concentration (Orem & Coburn, 1978; Gettman, 1987; Plekhanov, 1992; The Montessori Foundation, 1996b; The Montessori Foundation, 1996d; Seldin, 1996d; Seldin, 1996g; Kirby, 2003).

The practical life exercises are valuable in helping to remediate some of the sub-disorders mentioned in Chapter Two; fine and gross motor problems, left/right discrimination problems, visual-motor problems, visual-spatial problems as well as supporting the remediation of general visual processing problems. The practical life exercises include: pouring rice to develop fine motor control and make children aware of neatness in action, pouring water to foster independence. Washing a table contains more than fifty steps in sequencing; polishing silver and polishing mirrors, watering plants, dusting, woodworking and painting all develop sequencing and fine motor control (Orem & Coburn, 1978; Gettman, 1987; Plekhanov, 1992; The Montessori Foundation, 1996b; Seldin, 1996d; Seldin, 1996g; Kirby, 2003).

Care of the self includes: dressing frames where the children practice buttoning, zipping, snaps, tying and lacing. These all develop independence, fine motor control, sequencing and visual motor skills (Orem & Coburn, 1978; Gettman, 1987; Plekhanov, 1992; The Montessori Foundation, 1996b; The Montessori Foundation, 1996d; Kirby, 2003).

Other practical life activities include cutting, peeling carrots, setting the table, cleaning your space. Responsibility for the general order and cleanliness of the classroom is shared amongst the children, in particular the return of the materials to their proper place. These activities ensure that the children are self-sufficient, improving self-confidence, which is crucial for learning disabled children (Orem & Coburn, 1978; Gettman, 1987; Plekhanov, 1992; The Montessori Foundation, 1996b; Kirby, 2003).

6.2. Perceptual Development

Children learn through their five senses. The eyes, ears, skin, nose and tongue bring sensory impressions to the brain, where this information is interpreted. The process of interpretation of sensory input is perception (Pickering, 2004a).

A typical child in the Montessori classroom is able to match and discriminate sensory information that relates to the visual perception of size, shape, colour, the auditory input of pitch, rhythm and the intensity of sound, the feel of texture, weight, temperature, shape, the taste of sweet, sour, salty, bitter and the sense of smell. The child perceives patterns in shape, colour and number (The Montessori Foundation, 1996b; Pickering, 2004a).

Montessori placed great emphasis on sensory education and perceptual development and it is for this reason that the Montessori method is effective at helping to remediate the auditory and visual processing sub-disorders outlined in Chapter Two. Aside from the visual-motor, visual-spatial and left/right discrimination sub-disorders, discussed in the previous section, the method is helpful for visual and auditory perception, reception, discrimination and association problems, as well as being helpful for foreground/background problems and form constancy problems.

A lack of perceptual proficiency often indicates problems with perceptual development. This relates to issues with the ability to discriminate sensory information. Children with these problems may be over-sensitive to certain stimuli or not sensitive enough to others. Perceptual problems often appear in the inability to discriminate and associate numbers and letter-sound correspondences (Orem, 1969; Pickering, 2004a).

For example, in order to foster perceptual development children are educated to observe their environment. The children are given exercises to develop their speed and accuracy in perception, through exercises that isolate the senses; the children are given practice in comparing and classifying (Orem, 1969; The Montessori Foundation, 1996b).

The three-period lesson, originally suggested by Seguin takes children through the typical language development stages of identity, recognition and recall. In the identity stage the teacher verbally labels the object for the children, at the recognition stage she assesses receptive language and at the recall phase she assesses the children's expressive language (Gitter, 1971; Pickering, 2004a).

The three-period lesson, in which the children learn the name of an object, is then required to point it out receptively and finally label it themselves expressively, is used to great effect in this area. Perceptual training is linked with motor activity and language development. The children are seen as explorers making their own discoveries in the environment, since the children's house is rich in sensory experiences, the discoveries they make reinforce their perceptual development (Orem, 1969; Gitter, 1971).

A test group of twenty-five children were enrolled in a program of perceptual-motor training involving a developmental progression of gross motor and fine motor exercises. Another group of twenty-five children were used as a control group. The children participated in the programme for seven months. Those in the programme tested significantly higher in measures of sustained concentration and ability to control their actions. The other group with no perceptual-motor training showed no improvement (Gitter, 1971).

Developments in special education have tended to a similar conclusion. Children with learning disabilities have been helped to overcome handicaps through courses of training, which involve education of gross and fine motor movements. The opinion is that the mechanism through which perceptual-motor training methods work leads to more efficient cognitive function involving developing children's capacity to concentrate (Gitter, 1971).

6.2.1. Sensory Materials and Activities

The aim of the sensorial material and exercises is to aid children in the process of classification within and orientation to their environment and to develop the children's perceptual abilities. The sensorial material offers children experiences from which they are able to draw abstract knowledge. This maniputable equipment encourages both fine and gross motor development and utilises children's

visual, auditory, kinesthetic and tactile senses as he deals with colour, size, texture, quantity and shape. With these materials, children manipulate, pair, grade, compare and match, drawing their own conclusions according to their level of ability and perceptions (Orem & Coburn, 1978; The Montessori Foundation, 1996b; Pickering, 2004a).

Due to the sensorial materials and exercises provided in the Montessori classroom remediation of the visual and auditory processing sub-disorders discussed in previous sections and in Chapter Two is possible. Not only are ample opportunities provided for the development and improvement of visual and auditory processing abilities, but also plenty support is provided by the development of the other senses. This is a truly multisensory approach.

When presenting sensory education, certain techniques should be remembered. In presenting the stimulus to the children the teacher should proceed from few stimuli, strongly contrasting, to many stimuli in gradual differentiation, always more fine and imperceptibly so (Gitter, 1971; Pickering, 2004a).

The materials should be readily available to the children. When children indicate that they are ready for the material, only then should they be presented. Children must be taught proper care and respect for the materials (Gitter, 1971; Kirby, 2003).

Teachers must keep in mind the sensitive periods for the refinement of the senses. When this period occurs the children's right to non-interference and interruption while working with the materials must be protected (Gitter, 1971; Pickering, 2004a).

These materials are designed to help the children's mind to focus on some particular quality and by active manipulation leads to a comparison of these objects along the line of that particular attribute. The materials isolate difficulty, contain points of interest, contain a control of error, encourage auto-education, are graded to ensure children have a reasonable chance of success and challenge; they begin with the concrete emphasis and lead to abstract emphasis. Finally these materials teach concepts rather than facts (Gitter, 1971; Plekhanov, 1992; Pickering, 2004a).

When teaching sensory education the procedure is as follows: 1) recognition of identities (the pairing of similar objects and the insertion of solid forms into places which fit them), 2) recognition of contrasts (the presentation of the extremes of a series of objects), 3) discrimination between objects very similar to each other (Gitter, 1971; Pickering, 2004a). These materials and exercises are especially valuable in assisting in the remediation of visual perception and discrimination sub-disabilities as discussed in Chapter Two.

Visual discrimination and form constancy are developed using the following materials: the solid cylinders, the pink tower, the brown stairs, red rods, binomial and trinomial cubes (Orem & Coburn, 1978; Plekhanov, 1992).

As an example of exercises that assist children develop their visual and auditory processing abilities the Colour Box is used. Colour recognition and discrimination is taught as follows; first children are shown only two strongly contrasting colours, such as red and blue. The teacher, while holding up the colour, pronounces the name. When children have grasped this concept, children are asked to indicate a colour. Children then begin to match the colours together, initially the colours are the same, but gradually the children begin to match the varying shades of the coloured tablets (Fisher, 1966; The Montessori Foundation, 1996b).

To develop tactile and visual discrimination the geometric solids, geometric cabinet, knobless cylinders and constructive triangles are used. To develop the tactile sense rough and smooth touch boards and tablets are used. To further the development of the stereognostic sense the mystery bag and progressive exercises isolating the sense of touch are used. The auditory sense is developed through the use of sound boxes (Orem & Coburn, 1978; Plekhanov, 1992; The Montessori Foundation, 1996b).

Additional equipment used in the remedial setting include: inch cubes and pattern cards, parquetry blocks and pattern cards, peg boards and pattern cards, simple large knobbed puzzles, building blocks, clay, tinker toys, washing pegs, food colouring, beads and string, nuts and bolts of different sizes and screw lid bottles (Orem & Coburn, 1978; The Montessori Foundation, 1996b).

6.3. Language and Communication Development.

The main purpose of language is to communicate, that is to let each other know what we are thinking. The most natural way of conveying this thought is through speech, but we often wish to preserve this thought for future reference so the question becomes how to give speech permanence. Cultures have developed oral traditions and others have developed symbol systems to convey and preserve this thought (Gettman, 1987; Lerner, 2003).

Just as speech is our natural response to wanting to communicate, children’s acquisition of speech is a natural part of growing up human. Hearing children living around speaking adults will almost inevitably learn to speak in the first few years of life. Unlike speaking, reading and writing are not universal or natural human activities; they are instead cultural adaptations of the natural activity of speaking. As cultural adaptations, reading and writing must be taught (Gettman, 1987).

Children's success at school can largely be determined by the children's language background. Many varied language experiences are necessary to build and enrich children's foundation for learning to read and write. In Montessori a unified approach to language development is adopted. The importance of the early formative years for absorbing language is recognised. The sensitive periods for reading and writing are utilised. There are materials and exercises designed to impart and improve skills in listening, speaking, reading and writing (Orem, 1969; Hainscock, 1971; Epstein, 1996b; The Montessori Foundation, 1996b; Seldin, 2003d; Pickering, 2004a).

Through work with the sensorial materials children have a prepared mind and well-developed hand-eye coordination. This enables children to begin writing often before they can read. Montessori's language activities therefore presume that children will spontaneously begin to speak with meaning and the purpose of the language activities is largely to cultivate reading and writing. Also, since reading and writing are an adaptation of speech, the strategy Montessori uses to develop these is to build on the sounds of which speech is made (Hainscock, 1971; Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996b; Seldin, 2003d).

The earliest language activities prepare children for reading and writing by first augmenting the toddlers existing speaking skills. These preparatory language activities may begin as soon as children are talking with meaning in phrases and short sentences. In the first two years of life, young children see, hear and experience many things without thinking about them in a rational and descriptive way. All these hundreds or even thousands of impressions are stored up waiting to be identified and understood (Gettman, 1987; Epstein, 1996b; The Montessori Foundation, 1996b; Pickering, 2004a).

The teacher begins to further the process by asking "when", "what", "where", "how" and "why" questions in the conversation lessons. By trying to answer these questions children begin to build concepts into their vocabulary. Children also expand their vocabulary by listening to stories, songs and poems. To reinforce the children's growing vocabulary and to assist children in learning to read and write, Montessori developed a particular sequence to enable children to learn to read (Gitter, 1971; Epstein, 1996b).

Learning disabled children may or may not have oral language difficulties. When children do not have oral language problems, language problems usually only become evident when the children are trying to learn to read or write. Other children may exhibit problems with articulation. Auditory discrimination and memory problems may also cause children difficulties with language (Pickering, 2004a).

6.3.1 Reading Preparation

Reading preparation is conducted as follows: 1) hearing words being built, sounded out phonetically, 2) matching the words built from the movable alphabet to the corresponding picture or model, 3) seeing the teacher write the sounds of the word on paper that match the word previously built, 4) realising that the built word and written word have the same meaning because they match the same picture or object, 5) matching a new label to a picture without the use of the movable alphabet, 6) repeating the exercise as often as the children wish (Fisher, 1966; Gitter, 1971).

Environmental literacy contributes to reading preparation in the following ways; 1) labelling the shelf of each set of apparatus, 2) labelling each child's chair with their name, 3) labelling every object in the room with its name and 4) labelling objects with their corresponding colour (Fisher, 1966; Gitter, 1971).

The very first language activity, the classified pictures, helps young children define and organise the multitude of impressions by tying each impression to a clear and simple category. Children are then able to name these impressions, associate related ones and distinguish unrelated ones. The early language activities together with the sensory activities help to remediate children who have difficulty with visual and/or auditory processing abilities. The activities and materials also assist in the development and improvement of auditory and visual memory (Gettman, 1987; The Montessori Foundation, 1996b).

The 'I Spy' game is used to make children aware of the sounds in spoken language, and to show how to analyse these sound in words. The sounds used are phonograms and are pronounced phonetically. This exercise fosters phonological awareness (Gettman, 1987; The Montessori Foundation, 1996b).

This game consists of various stages: 1) An object is shown to the children and the children are asked what sound that object's name begins with. 2) Two unfamiliar objects are shown and the sound that one begins with is given. When the children get the name correct, the word and sound are repeated. 3) This stage is similar to two, only the field of objects is wider, such as a corner of the classroom gradually expanding to the entire visible environment. 4) This is similar to the previous one, except now the first and last sounds of an object are given. 5) Start with stage four, selecting a small word with three sounds and limiting the field of possible objects so that this word is the only correct answer, emphasising all three sounds once the children get the word correct. This is expanded to larger words, without children needing to play the initial 'I Spy' game. 6) Children are now asked to think of a word with a certain sound in it, expanding to several sounds (Gettman, 1987; The Montessori Foundation, 1996b).

Following the ‘I Spy’ game The Word Game is then implemented. This game consists of a box with folded slips of paper containing phonetic words of three or more letters. Children use this by themselves, choosing a slip, opening it and reading the word aloud. They continue in this manner with as many slips as they choose. New words are added to increase children’s vocabulary. This exercise expands children’s phonological awareness (Hainscock, 1971; The Montessori Foundation, 1996b).

The action cards give further introduction to reading by conveying the thought of an action through written symbols learned for sounds. There are about fifty action cards with simple intransitive verbs written on them representing an action children can perform. Phonological awareness and sound-symbol association are once again reinforced with this exercise (Hainscock, 1971; Gettman, 1987; The Montessori Foundation, 1996b).

As children progress in becoming more competent with reading, the reading folders are introduced. These help children learn the various spellings commonly found in English for the phonograms already learned, so as to enlarge children’s reading and writing vocabulary. In a box, thirteen red reading folders in clear plastic envelopes are found. On the cover of each folder is printed the phonogram as spelled on the sandpaper letters, of a sound that is often spelled other ways in English. The goal of this exercise is to explicitly teach spelling and is very valuable with children who have spelling disorders (Gettman, 1987; The Montessori Foundation, 1996b).

Following the reading folders puzzle words are introduced. These words are to help children, in stages, become familiar with common words that cannot be sounded out, and to reinforce this learning with texts that are fully decipherable for children at each stage. Once again in a graded system children are exposed to more difficult spelling. For learning disabled children this is very valuable because these words are presented in a way that they can be explicitly learnt (Gettman, 1987; The Montessori Foundation, 1996b).

The object boxes are used to introduce children to reading, by conveying the thought of an object through the written symbols learned for sounds. The first box contains objects whose names are three letters and can be spelled phonetically; the second contains objects whose names contain a double letter phonogram (the diagraph boxes). In total there are about eighty objects in the first box and thirty in the second. Corresponding to these objects are cards with the name of the object written on it. This activity assists with visual and auditory processing and memory sub-disabilities as well as phonological awareness and spelling (Hainscock, 1971; Gettman, 1987; The Montessori Foundation, 1996b; Rule & Barrera III, 2003).

6.3.2 Writing Preparation

Montessori children spend a lot of time preparing the hand for writing. Throughout all the sensory exercises the hand, whilst cooperating with the mind in its attainments and in its work of formation, was preparing its own future. The direct preparation for writing also consists in exercises of the movements of the hand. There are two series of exercises, very different from one another. Montessori analysed the movements, which are connected with writing, and she prepared them separately from one another (Gitter, 1971; The Montessori Foundation, 1996b).

Writing preparation is conducted as follows: 1) the cards and dress materials which have taught the fingertips to touch objects understandingly. 2) The tablets of different weights, which have awakened sensitivity and a sort of comprehension in the palms of the hands. 3) The geometric insets, which have helped understanding of form. When children put their fingers around the edge of a triangle or a square, the touch goes forward a step toward a real sensation of form. 4) The filling in of the geometrical forms which, Montessori says, is more an indirect preparation to writing than the filling of dozens of pages of the old time copy books; and finally, the sandpaper alphabet, by means of which children learn to associate the sound of the letter with its form (Gitter, 1971; The Montessori Foundation, 1996b).

The Montessori Method through a multisensory approach is able to remediate dysgraphia as mentioned in Chapter Two. The method considers fine and gross motor development as well as visual, auditory, kinesthetic and tactile processes involved in remediating a writing problem (Types of Dyslexia, 2004; Wikipedia, 2004).

Montessori observed when she was working with children that the manipulation of the pen was one of the obstacles most difficult to overcome. After the children had learned to trace the letters with their fingers and know them by sight, they still did not have the ability to copy them correctly because their muscles were not sufficiently well-trained to hold and direct a pen and pencil (Gitter, 1971; The Montessori Foundation, 1996b).

To help children develop the muscular strength and coordination necessary for handling a pen, they begin working with the buttoning or dressing frames. There are eight frames, any of which can be used effectively without the association of the others. On six wooden frames are six pieces of cloth of varying textures to be joined by means of large buttons and button holes, automatic fasteners, small button holes, hooks and eyes, coloured ribbons for bow tying and lacing through eyelets (Fisher, 1966; The Montessori Foundation, 1996b).

Children learn to hold their hand correctly over a horizontal surface when touching the rough and smooth touch boards, when taking the cylinders of solid insets and placing them in their apertures, and when with two fingers children touch the outlines of the geometrical forms. This encourages the development of the coordinating movements for writing (Gitter, 1971; Epstein, 1996c; The Montessori Foundation, 1996b).

The exercises with the geometrical insets follow upon the first exercises in touch. The geometrical forms are made to fit into square wooden tablets, each inset being easily removed from its frame by a button fixed in the centre. With the geometrical insets children's already trained sense of touch learns to follow a great variety of contours – a very decided step toward the art of writing. When children begin working with the forms they should initially be taught to make motions from left to right, in the direction of reading and writing (Fisher, 1966; Gitter, 1971; Epstein, 1996b; Epstein, 1996c; The Montessori Foundation, 1996b). The geometrical insets help to establish children's awareness of symbolism as mentioned in Chapter Two.

Exercises with the metal insets develop and strengthen the muscles of the fingers to hold a pencil. The teacher places the frame of one of the insets e.g. the circle, on a sheet of coloured paper of identical size, and shows children how to draw round the contour of the empty centre with a coloured pencil (Fisher, 1966; Gitter, 1971; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Pickering, 2004a).

The frame is removed and the inset itself is placed on the outlined figure of the circle, tracing round the inset with a pencil of another colour. The teacher removes the inset and shows that two different coloured lines reproduce the figure. She then shows children how to hold the pencil in the correct manner for writing and to fill in, with up and down strokes in the circle, with one coloured pencil and to fill in the shape of the frame with another coloured pencil (Fisher, 1966; Gitter, 1971; Gettman, 1987; The Montessori Foundation, 1996b; Pickering, 2004a).

On this exercise the children are actually making hundreds of strokes. As they delight in this occupation of tracing the different forms of the insets with a variety of coloured pencils, their fingers are becoming more and more strengthened until the strokes are firm and regular (Fisher, 1966; Gitter, 1971; Gettman, 1987; The Montessori Foundation, 1996b).

Montessori lays great stress upon the value of the work with the wooden insets. The primary object is that children learn form and develop the ability to discriminate between various objects. Once this exercise is mastered children will begin to see and describe the forms they have learned in the environment (Fisher, 1966; The Montessori Foundation, 1996b).

After final mastery of the geometric insets, children are given a series of cards, representing the same forms as the insets. In the first of these three series, the forms are cut out of solid blue paper and mounted on white cards, in the second the forms are cut out of heavy line drawings and mounted on the cards and in the third the outline or form is represented only by a thin blue line (Fisher, 1966; The Montessori Foundation, 1996b).

The cards are mixed up and matched to the corresponding inset, children no longer have the sense of touch to guide them, and gradually learns the meaning of the line, passing from the solid blue form to the form merely drawn in outline (Fisher, 1966).

After playing with the various cards for some time children will have acquired a very definite sense of symbolism. They can now understand how a series of lines can stand for an object. Montessori believed that children should understand symbolism before the alphabet is taken up. When children have mastered all of the various exercises with these geometric cards and thus gained a definite understanding of symbolism, it will be comparatively easy for them to understand the relation between a written word and the object which that word represents (Fisher, 1966).

6.3.3 Teaching Reading and Writing

After this early preparation, the activities that actually introduce writing and reading are conducted at the same time. This is because it is easier to appreciate someone else's thoughts if the children experience the satisfaction of recording their own thoughts. Also, words children have written will be readily recognised in reading and words read often will naturally become part of children's repertoire of words to write. Reading and writing are necessary components of each other and complementary to each other (Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b).

The movable alphabet and the sandpaper letters help children develop the skills necessary for handwriting in the following ways: 1) develops hand-eye coordination, 2) association of letters names with form, 3) association of capital and small letter forms, 4) associating type and manuscript form, 5) learning the similarities and differences between the letters and 6) developing memory of letter forms through sensory imagery (Gitter, 1971; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Seldin, 1996c; Seldin, 1996g; Pickering, 2004b; Woods, 2004).

The process used to teach the sandpaper letters employs the visual, auditory, kinesthetic and tactile senses, to make an association between the specific sound and image of a letter, to make words.

Children see the letter, hear its name as the teacher pronounces it, repeat the name, trace the letter with two fingers, traces the letter blindfolded. Children with sound-symbol association problems cannot link the auditory equivalent of a letter/word to the visual component; therefore the sandpaper letters can assist in remediating this problem by providing kinesthetic and tactile reinforcement (Gitter, 1971; Orem & Coburn, 1978; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Seldin, 1996c; Seldin, 1996g; Rasanova, 2003; Pickering, 2004b; Woods, 2004).

At this point children are provided with the bridge between the spoken word and the written word: the component sounds in spoken words are individually associated with particular visual and tactile images that is the letters. The sandpaper letters are effective in dealing with sound-symbol association sub-disorders and phonological awareness sub-disorders as discussed in previous sections and in Chapter Two (Gettman, 1987; Woods, 2004).

When children have learned to trace and distinguish sandpaper letters, they undoubtedly know the movable alphabet. When they can make the syllables with the sandpaper letters, they can do so with the movable alphabet, the difference being that they no longer need to touch the letters but recognise their form instantly, so the making of words is not difficult. The movable alphabet serves to reinforce the remediation of sound-symbol association problems, phonological awareness sub-disorders as well as visual and auditory processing and memory sub-disabilities (Fisher, 1966; Gitter, 1971; Hainscock, 1971; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Seldin, 1996c; Woods, 2004).

The movable alphabet exercises follow the sandpaper letter exercises in the period before reading. The movable alphabet thus becomes an important bridging tool between readiness for writing and the actual ability to control a pencil (Fisher, 1966; Gitter, 1971; Hainscock, 1971; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Seldin, 1996c; Woods, 2004).

With the movable alphabet children can reproduce words they have read, can form the words they speak, can compose their own stories and see them before them; finally, they can then read these stories back as part of their work on reading (Fisher, 1966; Gitter, 1971; Hainscock, 1971; Gettman, 1987; Epstein, 1996c; The Montessori Foundation, 1996b; Seldin, 1996c).

Once the sandpaper letters and the movable alphabet are mastered children are introduced to the art of reproducing the shapes of letters and numbers. Together with the sandpaper letters and the blackboard and chalk the teacher shows children how to write the letters. The teacher first feels the sandpaper letter and says its sound and then slowly the teacher draws the letter on the board. Children are then asked to do the same (Gettman, 1987; The Montessori Foundation, 1996b).

Finally children are introduced to the proper positioning of the letters written in a row. Here the equipment is a board or mat with three pairs of perfectly printed horizontal lines wide enough to contain the ‘o’ from the sandpaper letters and the small movable alphabet. The blackboard has the same lines appearing on it. Children are instructed to find all the letters that fit between the lines, then those that go above and below. Then children are given practice writing each group on the board (Gettman, 1987; The Montessori Foundation, 1996b).

Once children have mastered the lower case letters, the capital letters are introduced using the capital sandpaper letters and the big movable alphabet. First children are shown how to compare the capitals to the lower case letters, starting with those that appear the same in capital and then those that are different. This helps children associate the speech sounds with the capitals. The same process for teaching the letters is followed as with the lower case letters, again using the three period lesson (Gettman, 1987; The Montessori Foundation, 1996b).

Soon children start to write the words and read them. Work on the sandpaper letters and the movable alphabet can continue for several months. Children are then introduced to blending and sight words, which follow no set rule. Children then begin to read simple books and progresses to more advanced books (Orem & Coburn, 1978; Epstein, 1996c; The Montessori Foundation, 1996b; Woods, 2004).

Through the use of the sensorial materials and activities and the language materials and activities the Montessori Method can through its multisensory approach remediate the sub-disabilities of ineffective sound-symbol association, phonological awareness problems and spelling problems as discussed in Chapter Two.

6.4. Summary

The Montessori Method can remediate all the sub-disabilities discussed in Chapter Two through the muscular educational programme, the sensory educational programme and the language programme. This multisensory system is graded, the sub-disorders are remediated and then the successive levels of education reinforce this remediation.

The muscular education in the Montessori Method aids in the development and remediation of gross and fine motor problems, vestibular problems, coordination and balance. Montessori uses exercises that isolate specific problems and therefore create ample opportunity for their remediation.

Combined with occupational therapy children with proprioreceptive problems are able to move around the classroom and are therefore given plenty opportunity to develop and bring the muscles of the body under control.

The practical life exercises further reinforce remediation in fine and gross motor development, hand-eye coordination, visual-motor problems, visual-spatial problems and left/right discrimination problems. These exercises also improve children's independence skills.

Perceptual development in the Montessori Method is aimed at creating specific opportunities for children to discriminate and process incoming sensory information, which ultimately is the point from which all learning stems. The development of discrimination of each sense occurs in isolation: that is, visual discrimination is specifically developed as its own skill, with its own exercises and materials and not in combination with the other senses. This applies to all the senses.

The exercises and materials therefore create ample opportunity for the diagnosis and remediation of visual perception problems, visual discrimination problems, figure-ground problems, problems with form constancy, visual-motor problems, visual-spatial problems, left/right discrimination problems, auditory perception problems, auditory discrimination problems, auditory and visual memory problems.

Essentially if children have problems in these areas the chance that they will have problems in reading and writing is increased; therefore if these problems can be remediated then the chance of foreseen reading and writing problems could be short-circuited.

Problems with sound-symbol association, phonological awareness, spelling and writing can all be remediated with the use of Montessori's reading and writing preparation. The classified pictures give children further practice in discrimination and categorisation. The 'I Spy' game introduces and develops children's phonological awareness. The object boxes and geometrical insets introduce children to symbolism by teaching them that objects can be represented by symbols, which is later reinforced with the sandpaper letters and the movable alphabet which show that sounds are represented by letters, reinforcing phonological awareness. The reading folders and puzzle words explicitly teach words that cannot be spelt phonetically. This process then also aids in the remediation of spelling problems.

Writing is developed through first preparing the hand to write through plenty of fine motor development. The sandpaper letters develop the tactile and kinesthetic senses which enable the hand to

form the letters. Placement and positioning of the letters is taught using the movable alphabet. Children are able to concentrate on developing this skill without having to think about writing the letters.

Although speech problems cannot specifically be remediated using the Montessori Method and requires the intervention of speech therapists, the Montessori Method supports children's speech therapy by providing opportunities to develop verbal expression through the conversational exercises and in the development of vocabulary.

The strength of the Montessori Method in remediating sub-disorders that may be the precursors to impending learning disabilities, in that the specific skills required to address each sub-disability is taught explicitly using multisensory reinforcement. I trust then that the central theme of my argument has been demonstrated.

Chapter Seven

Conclusion

It is possible for an idea's time to come and it would seem that this is such a case. Pickering and I concur that the Montessori Method has a valuable contribution to make in the field of learning disabilities. In a series of articles, Pickering (2004a & 2004b) drew the following conclusions concerning the Montessori Method and learning disabilities; the Montessori Method contributes to the development of attention, gross- and fine-motor skills, visual and auditory perception and reading and writing. This contribution is made effective through a hierarchical curriculum which a trained teacher may, though observation, match to children's developmental level, and in the case of learning disabled children, work with areas of difficulty.

According to Pickering (2004b), the Montessori Method enhances the above mentioned development through a classroom structure which provides a method of individualising tuition through children's interaction with the didactic materials. The children are able to learn at their own pace.

The manipulative materials provide children with multisensory perceptions, which help them to conceptualise abstractions. The Montessori Method provides specific techniques for increasing gross-motor, fine-motor and hand-eye coordination (Pickering, 2004b).

I, however, concentrate on the value that the Montessori Method has as a multisensory method and as an early warning system. In its ability to recognise and remediate the possible sub-disabilities of an impending learning problem, thereby circumventing the effects of such at a later stage.

In Chapter Two it was discovered that preschool children whose development deviated from the normal such as in poor motor development, language delays, speech disorders, inadequate cognitive and concept development often exhibit learning disabilities. These learning disabilities were found to be comprised of a variety of sub-disorders, such as the following (Lerner, 2003):

Poor concept formation and the inadequate development of cognitive strategies may be indicative of a possible learning problem. Indicators of such a sub-disorder are when children battle with age appropriate tasks such as identifying colours, naming body parts, rote counting, showing an understanding of one to one correspondence, demonstrating place concepts, identifying given concepts, naming letters, sorting by colour, shape and size (Gearheart, 1985; Harwell, 2001; Lerner, 2003; Austin Area Branch of the International Dyslexia Association, 2004).

Another common precursor for some children with learning disabilities that was discovered is awkwardness in gross motor skills that require children to use large muscles when moving their arms, torso, hands and feet. Young children with gross motor problems appear clumsy in walking, jumping, hopping, running, skipping, throwing and catching skills (Gearheart, 1985; Harwell, 2001; Lerner, 2003; Walcot-Gayda, 2004).

Fine motor activities involve the small muscles used to move the fingers and wrists, hand-eye coordination and the coordination of both hands. Children with fine motor problems tend to be slow in learning to dress themselves, eating, using buttons and zippers and in using crayons. Fine motor problems become evident in children having difficulty with puzzles, building games, accomplishing art projects and using scissors. Later issues arise with difficulties in writing (Gearheart, 1985; Lerner, 2003; Walcot-Gayda, 2004).

The ability to interpret what is heard provides an important pathway for learning and it was discovered that children with reading difficulty in school showed auditory processing problems as preschoolers. It was found that these children could hear: their difficulty lay in the several dimensions of auditory processing which include phonological awareness, auditory discrimination, auditory memory, auditory sequencing and blending (Gearheart, 1985; Harwell, 2001; Lerner, 2003).

Visual processing abilities were also found to play a significant role in school learning, particularly reading. Children with visual processing problems could see, but encountered problems with the visual discrimination of letters, words, visual memory and visual closure. It was determined that young children with visual processing problems are displaying the early signs of a possible learning disability and are most likely to have reading problems later on (Gearheart, 1985; Harwell, 2001; Lerner, 2003).

In the investigation of possible sub-disabilities that may indicate a learning problem it was discovered that one of the most common precursors to a learning disability is a difficulty in acquiring speech, understanding and using language. The ability to use language to communicate one's thoughts is central to learning. Children with communication and language disorders have difficulty understanding the language of others (listening), responding to instruction, initiating communication, explaining, engaging in conversations and communicating with others (Gearheart, 1985; Lerner, 2003; Walcot-Gayda, 2004).

It could be deduced from Chapter Two that it is possible for learning disabilities to first present as a variety of sub-disabilities that should be recognised at the preschool level. With all the information that exists about this topic I ask the question: Why are so few problems being picked up in preschool? The answer possibly lies in the fact that many preschool teachers are unaware of such sub-disabilities but, if they are aware of these problems and can identify them, they have no means or training to deal with them. Added to this, is that in the traditional school system children are only expected to start reading and writing when they enter the formal schooling system.

There seems to be a general reservation amongst preschool teachers to label children as being learning disabled. The argument for this position is that children may simply be developmentally delayed. What if it is more than a developmental delay, should teachers not err on the cautious side and prevent the loss of valuable time for intervention? Speech therapists, for example, are happy to intervene in early language delay.

Research has shown for example that if children are unaware that the letters represent sounds in spoken language they are more than likely to develop a reading disorder. Even if children do not develop a reading disorder and may just be behind their peers with regards to phonemic awareness, surely correcting this disorder or delay when it appears is more productive than waiting to see if it develops into a more serious problem? A small problem is dealt with and a possibly bigger problem is eliminated or reduced.

In Chapter Three it was ascertained that underlying genetic and neurological abnormalities cause learning disabilities; these abnormalities cannot be cured or fixed. The brain of learning disabled children perceives information incorrectly. This in turn could compromise children's learning processes and cognitive abilities, affecting children's overall ability to learn. Perception is the interpretation of incoming stimuli from the senses and it is the faulty interpretation of these stimuli which should be remediated.

From the evidence and research presented in Chapter Four it was deduced that a multisensory approach was the most appropriate to deal with learning disabilities because it supports the senses such as the visual and auditory sense with the other senses, in acquiring and interpreting the information they receive correctly. This method was also found to enhance children's memory abilities, since so much of what is learned depends on what came before and the ability to recall this information.

I observed that these multisensory methods were generally only used on school-going children who exhibited disabilities in reading and writing. The implementation of this current multisensory approach required remediation to go back and correct the sub-disabilities discussed in the second chapter. I question if this is the most effective way.

Is it not then possible to use multisensory intervention when sub-disabilities become evident in preschool to circumvent the impending learning disability? I conclude that an educational system is required that will be able to deal with these issues when they arise. This system should be able to recognise and identify the sub-disabilities when they arise and be able to provide a multisensory approach to the intervention of these sub-disorders.

In Chapter Five it is clear that the Montessori Method has something to offer special education. In the development of the theory it was evident that this system was created in response to the needs of learning disabled children. Montessori's view of children is sympathetic to the needs of children with the underlying idea that in order for children to learn effectively they need to be supported.

The concept of the *absorbent mind* offered an explanation as to how children learn and what is required to enhance this learning. The *sensitive periods* help to direct teaching by asserting that children are primed to acquire certain aptitudes at different ages.

The *prepared environment* and the learning materials were developed to aid learning in such a way that it is supportive of children. The sensory-motor approach is aimed directly at the education of children's senses and body. This approach is very helpful to learning disabled children since it deals with perception of incoming stimuli. This method is multisensory as it employs most of the senses to bring about learning and aids in the correct interpretation of the stimuli received by children. The senses are used to support each other and therefore make learning more effective.

In Chapter Six it was found that the Montessori Method could remediate all the sub-disabilities discussed previously through her muscular educational programme, the sensory educational programme and the language programme. This multisensory system is graded, the sub-disorders are remediated and then the successive levels of education reinforce this remediation.

It could be discerned that the muscular education programme in the Montessori Method aids in the development and remediation of gross and fine motor problems, vestibular problems, coordination and balance. It was found that Montessori uses exercises that isolate specific problems and therefore create ample opportunity for their remediation. Such exercises used with regard to muscular development are

the scooter board (like a skateboard) which assists with vestibular problems, walking the line which assists with balance problems and the dressing frames which assist with fine motor development as well as hand-eye coordination.

It was found that the practical life exercises further reinforced remediation in fine and gross motor development, hand-eye coordination, visual-motor problems, visual-spatial problems and left/right discrimination problems. These exercises also improved children's independence skills.

Perceptual development in the Montessori Method was found to be aimed at creating specific opportunities for children to discriminate and process incoming sensory information, which ultimately is the point from which all learning stems. The development of discrimination of each sense occurs in isolation: that is, visual discrimination is specifically developed as its own skill, with its own exercises and materials and not in combination with the other senses. This applies to all the senses.

To illustrate this, visual discrimination is developed using the solid cylinders, the pink tower, the brown stairs, red rods, binomial and trinomial cubes, the geometric solids, geometric cabinet, knobless cylinders and constructive triangles. To develop the tactile sense, rough and smooth touch boards and tablets are used. To further the development of the tactile sense, the mystery bag and progressive exercises isolating the sense of touch are used. The auditory sense is developed through the use of sound boxes (Orem & Coburn, 1978; Plekhanov, 1992; The Montessori Foundation, 1996b).

These exercises and materials were therefore found to create ample opportunity for the diagnosis and remediation of visual perception problems, visual discrimination problems, figure-ground problems, problems with form constancy, visual-motor problems, visual-spatial problems, left/right discrimination problems, auditory perception problems, auditory discrimination problems, auditory and visual memory problems.

It was found that problems with sound-symbol association, phonological awareness, spelling and writing could all be remediated with the use of Montessori's reading and writing preparation. The classified pictures give children further practice in discrimination and categorisation. The 'I Spy' game introduces and develops children's phonological awareness. The object boxes and geometrical insets introduce children to symbolism by teaching them that objects can be represented by symbols, which is later reinforced with the sandpaper letters which show that sounds are represented by letters.

The sandpaper letters and the movable alphabet specifically teach sound-symbol association and reinforce phonological awareness. Children are then able to spell phonetically; the reading folders and

puzzle words explicitly teach words that cannot be spelt phonetically. This process then also aids in the remediation of spelling problems.

Writing is developed through first preparing the hand to write through plenty of fine motor development. The sandpaper letters develop the tactile and kinesthetic senses which enable the hand to form the letters. Placement and positioning of the letters is taught using the movable alphabet. Children are able to concentrate on developing this skill without having to think about writing the letters.

Although speech problems cannot specifically be remediated using the Montessori Method, it also requires the intervention of speech therapists, the Montessori Method supports children's speech therapy by providing opportunities to develop verbal expression through the conversational exercises and in the development of vocabulary.

It can therefore be said that the strength of the Montessori Method in remediating sub-disorders, that may be the precursors to impending learning disabilities, is that the specific skills required to address each sub-disability is taught explicitly using multisensory reinforcement.

From this it could be concluded that theoretically the Montessori Method can contribute to multisensory approaches, which have been proven to be the most effective in remediating learning disabilities especially in early childhood education.

This thesis suggests the following questions for further research:

1. In a practical sense, is the Montessori Method useful in remediation?

An empirical study would need to be conducted with preschool children identified as having sub-disabilities indicative of impending learning problems who are allowed to follow the Montessori curriculum. A control group of children with the same identified problems could be remediated using contemporary methods. These children would have a typical early childhood development experience. Their problem would be remediated at a later stage, as is conventionally done. The two groups could then be compared perhaps at the ages of five, six and seven.

2. Does the Montessori Method increase the effectiveness of multisensory remediation?

This would require a study of children identified as having learning problems or the sub-disabilities of such a problem who then receive contemporary remediation while simultaneously following the

Montessori curriculum. The success of these children in mastering their sub-disabilities could then be compared to children receiving only multisensory remediation.

3. Does the Montessori Method need to be paired with contemporary remediation to be effective?

A study could be conducted of children identified as having learning problems who receive contemporary remediation while simultaneously following the Montessori curriculum. The success of these children could then be compared to children who received only contemporary remediation or only Montessori education. There would be three groups in such a study.

4. Does the Montessori Method make a significant contribution to early literacy achievement?

This question could be asked statistically of questions 1, 2 and 3.This study could compare quantitatively the reading and writing success rate of children aged five, six and seven after remediation has taken place.

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