CHAPTER II
THEORETICAL OVERVIEW

2.1 Concept of Learning Disability
2.2 Theoretical Foundations of Learning Disability
2.3 Multi Sensory Strategy
2.4 Theoretical Foundations of Multi Sensory Strategy
2.5 Models on Multi Sensory Strategy
THEORETICAL OVERVIEW

Theoretical overview provides a theoretical background to the study. Borg and Gall (1974) says the more powerful a theory is, the more events can be explained by it. Theoretical research usually consists of testing a hypothesis that is derived from a theory. Thus the theoretical overview makes a strong basis for the study conducted by the investigator. The theory provides a rational explanation of the results. It gives a clear idea about the study.

In this chapter, psychological theories that provide the underpinnings for the field of Learning Disability are examined. Such a survey is expected to provide procedural guidelines for designing the new study and give theoretical orientation that will give strong indications of the nature of the hypothesis of the present study.

The collected information has been organized and summarised under four subtitles:

1) Concept of Learning Disability

2) Theoretical foundations of Learning Disability

3) Multi Sensory Strategy

4) Theoretical foundations of Multi Sensory Strategy.

5) Models on Multi Sensory Strategy
2.1 Concept of Learning Disability

Learning Disability is an umbrella term for a wide variety of learning problems. Learning Disability is not a problem with intelligence or motivation. Usually children with Learning Disability have average or above average intelligence. In fact, most of them are just as smart as everyone else. Their brains are simply wired differently. This difference affects how they receive and process information. Simply put, children and adults with Learning Disability see, hear, and understand things differently. This can lead to trouble with learning new information and skills, and putting them to use. The most common types of Learning Disabilities involve problems with reading, writing, arithmetic, reasoning, listening, and speaking ("Learning Disabilities in Children: Types of learning disorders and their signs", n.d.).

The field of Learning Disability is the challenging sub area of the broader field of special education. The term Learning Disability was first introduced in 1962 in a small meeting of concerned parents and educators in Chicago to consider linking of isolated parent groups active in few communities into a single organization. This term was proposed by Samuel Kirk (1962) as a compromise because of the confusing variety of labels that were being used then to describe the child with relatively normal intelligence who was having learning problems. It was immediately approved. The organization is today known as the Association of Children and Adults with Learning Disabilities (ACLD).
It is only at a later date that Learning Disability was officially recognized as something different from handicapping conditions and so there is still a great deal of debate as to what is meant by the term Learning Disability (Friedrich, Fuller & Davis, 1984). Though Learning Disability was not officially named until 1962, the historical roots of the field go back at least to the early 1800s. Starting in 1802 with Gall’s work, there is documented concern with dysfunction of the brain and the relationship of such dysfunction to observed disorders of spoken language. In 1926, Head concluded that language disorder do not necessarily mean a loss of other abilities like mechanical aptitude, instead disorders in language are based on integrated functions higher on the neural hierarchy than motor or sensory abilities and thus cannot necessarily be classified as motor, visual or auditory disorders.

The origin of the field of Learning Disability has passed through three distinct phases each of which stretches over a period of time. The three phases are the foundation phase, the transitional phase and recognition phase. The foundation phase ranges right from the year 1802 to 1946. In the foundation phase researches relating to disorders of spoken language, written language and perceptual and motor processes were carried out. Transitional phase ranges from 1946 to 1964. In this phase interest had been expanded to include concerns about any student who has apparently normal learning ability but could not learn in the normal manner as others did, making use of standard
educational methods. This interest paved the way for classes for brain –
injured students, dyslexic students, aphasic students and others. In the
recognition phase, which ranges from 1965, the field of Learning Disability
has grown in a very rapid, though sometimes – disorderly manner, and today
it is the largest of the recognized sub areas of special education.

The three distinct factors that have influenced the development of the
field of Learning Disability in a definite chronological order are scientific
interest in abnormal and unusual behaviour, interest in teaching methods and
parents’, legislators’, and educators’ interest in providing programmes for
backward or problem students.

Although the term Learning Disability had immediate appeal and
acceptance, the task of developing a definition of Learning Disability proved
to be a challenge. A number of definitions have been generated and used over
the years, but each has been judged by some to have certain shortcomings.
Kirk (1962) defined Learning Disability as follows:

“A Learning Disability refers to a retardation, disorder, or delayed
development in one or more of the processes of speech, language, reading,
writing, arithmetic, or other school subjects resulting from a psychological
handicap caused by a possible cerebral dysfunction and/or emotional or
behavioural disturbances. It is not the result of mental retardation, sensory
deprivation, or cultural and instructional factors” (Kirk, 1962, p. 263).
Exact definitions of Learning Disability vary from place to place. Probably the most widely used is the federal definition (1977) by the U.S. Government, which reads

‘Specific Learning Disability’ means a disorder in one or more of the basic psychological processes involved in understanding or in using language spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage (as cited in Reynolds & Janzen, 2002).

Because of the continued problems in definition of Learning Disability a group of specialists from several organizations was convened. This council, National Joint Committee on Learning Disabilities (NJCLD, 1981) defined Learning Disability as a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities (as cited in Hammill, Leigh, McNutt, & Larsen, 1981). Learning disabled children exhibit disorders in listening, thinking, talking, reading, writing,
spelling and arithmetic, but does not include learning problems, which are primarily due to visual, hearing or motor handicaps, emotional disturbance, mental retardation, or the environmental disadvantage.

2.1.1 Learning Disability at the Elementary Level

In many children, Learning Disability first becomes apparent when they enter school and fail to acquire academic skills. The failure often occurs in reading, but it also happens in mathematics, writing, or other school subjects. Frequently seen behaviours in the early elementary years like inability to attend and concentrate poor motor skills are evidenced in the awkward handling of a pencil and in poor writing, and difficulty in learning to read.

As the curriculum becomes more difficult in the later elementary years, problems may emerge in other areas, such as social studies or science. After several years of repeated failure, emotional problems may also become more of an impediment, and students become more conscious of their poor achievement in comparison with peers. For some students, social problems and the ability to make and keep friends increase in importance at this age level.

2.1.2 Prevalence of Learning Disability

Prevalence figures can provide valuable information for policy makers, schools and local authorities while planning teaching and resource allocation. However, prevalence figures vary from country to country and even within a
country. Rutter and Yule (1975), for example, reported a figure of 3.9 per cent with specific learning difficulties in the Isle of Wight, but using the same methods and psychological characteristics found 9.9 per cent in London. More recently, Chan, Ho, Tsang, Lee and Chung (2008) described two studies in China, where one suggested that Learning Disability was found in less than one per cent of the population whereas the other suggested about 10 per cent. However, different criteria were employed in the two studies (as cited in Kelly & Philips, 2011). That is, as the definitions and criteria vary the statistics about the prevalence also vary.

In India a latest report on prevalence of Learning Disability claimed that at least 10% of children in the country have a Learning Disability. This was revealed by experts at ‘Learn 2012’, an International Conference on Inclusive Education and Vocational options held at Chennai. The organizers pointed out that one in 200 people in India have autism, while an estimated 30 million children are known to be dyslexic. The only way to handle the situation is early detection and intervention by which the symptoms of unacceptable language and behaviour can be minimized (The Times of India, 2012).

2.1.3 Characteristics of Students with Learning Disability

All underachieving students are not learning disabled. In addition, there is so much of individual variation within the learning disabled group that it is not always possible to specify clear-cut characteristics. The main part
of all definitions of Learning Disability is that there is a severe discrepancy between achievement and intellectual ability in some areas such as oral expression, written expression, listening comprehension, reading comprehension, reading or mathematics. Besides these basic characteristic, there are other characteristics, which are common to students with Learning Disability than to the general population of students of their age.

These characteristics include delayed spoken language(s) development, poor spatial orientation, inadequate time concepts, difficulty in judging relationships, direction related confusion, poor general motor co-ordination, poor manual dexterity, inattention, hyperactivity, perceptual disorders and memory disorders.

2.1.4 Causes of Learning Disability

Unfortunately it is not possible to point out any single factor or group of factors as directly causing a Learning Disability. Rather than a cause and effect relationship, it can only be related to associate factors. The many different causes related to Learning Disability are

- Organic factors
- Genetic factors
- Environmental factors
2.1.4.1 Organic factors

Normal development of a child can be interrupted in two ways: 1) by any kind of neurological damage and 2) by maturational delay.

**Neurological Damage:** Children with Learning Disability share several characteristics found in persons with brain damage caused by injury or infection. Some of these behaviours are impulsivity, distractibility, figure-ground disturbances, visual-motor disorders, and thinking and conceptual disorders.

**Maturational Delay:** Another theory to Learning Disability suggests that it occurs because there is a maturational delay- rather than a permanent dysfunction- within the neurological system. Bender (1973) observed that if differential stages in the development of the brain are delayed, a maturational lag occurs, some typical symptoms mentioned were slow maturation of language skills, specially reading, delayed development of motor skills, uneven performance pattern on measures of intellectual development, visual – motor problems, incomplete or mixed dominance, right- left confusion, immaturity (more often seen in males), and tendency for members within a family to show similar symptoms (as cited in Nakra, 2008).

2.1.4.2 Genetic Factors

The exact nature of the relationship between the genetics and Learning Disability remains obscure but the evidence does suggest that members within a family have a tendency toward Learning Disability. Hallgren (1950) found
that 88 percent of the families of dyslexic children showed similar learning problems. Hermann (1959) examined dyslexia in twins and reported that of the twelve sets of identical (monozygotic) twins, all members were dyslexic. But when the study was conducted with thirty three pairs of fraternal (dizygotic) twins, only one-third showed both members as being dyslexic and two-thirds had only one dyslexic member (as cited in Nakra, 2008).

2.1.4.3 Environmental factors

There are several factors in the child’s environment which may result in Learning Disability. In economically deprived homes, children may not be exposed to adequate sensory, linguistic and cognitive activities. An emotionally unstable home life may deprive the child of any motivation to learn. Some researchers (Bruner, 1971) believe that the poor quality of teaching in schools can also cause a Learning Disability (as cited in Nakra, 2008).

2.1.5 Common Types of Learning Disability.

A person with Learning Disability may have discrepancies in one or all of these categories. The effects of Learning Disability are manifested differently for different individuals and ranges from mild to severe. Learning Disability may also be present along with other disabilities, such as mobility or sensory impairments. Often people with Attention-Deficit Disorder (ADD) or Attention-Deficit/Hyperactivity Disorder (ADHD) also have Learning
Disability ("Developmental reading disorder", n.d.). Specific types of Learning Disability are listed in the table 2.1.

Table 2.1

*Common Types of Learning Disability*

<table>
<thead>
<tr>
<th>Type</th>
<th>Area of difficulty</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslexia</td>
<td>Difficulty in processing language</td>
<td>Problems in reading, writing, spelling, speaking</td>
</tr>
<tr>
<td>Dyscalculia</td>
<td>Difficulty with mathematics</td>
<td>Problems in doing math problems, understanding time, using money.</td>
</tr>
<tr>
<td>Dysgraphia</td>
<td>Difficulty with writing</td>
<td>Problems with hand writing, spelling, organizing ideas</td>
</tr>
<tr>
<td>Dyspraxia</td>
<td>Difficulty with fine motor skills(Sensory Integration Disorders)</td>
<td>Problems with hand eye co-ordination, balance, and manual dexterity</td>
</tr>
<tr>
<td>Auditory Processing Disorder</td>
<td>Difficulty in learning differences between sounds</td>
<td>Problems with reading comprehension, language</td>
</tr>
<tr>
<td>Visual Processing Disorder</td>
<td>Difficulty in interpreting visual information</td>
<td>Problems with reading, math, maps, charts, symbols, pictures</td>
</tr>
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</table>


There are rigorous criteria used to determine if a student has a Learning Disability as it is defined by special education criteria. Learning Disability is often grouped by school-area skill set. For children it is linked with the three R’s of education- reading, writing and arithmetic. Hence the study focuses on the crucial areas of Dyslexia, Dysgraphia and Dyscalculia. The relevant theories related to these areas are given below.
2.1.5.1 Dyslexia

Dyslexia has been used for a long time and has been defined in different ways. In 1968, the World Federation of Neurologists defined dyslexia as "a disorder in children who, despite conventional classroom experience, fail to attain the language skills of reading, writing, and spelling commensurate with their intellectual abilities" (as cited in Gaddes & Edgell, 1994, p. 336). According to the U.S. National Institutes of Health (NIH), dyslexia is a Learning Disability that can hinder a person's ability to read, write, spell, and sometimes speak. Dyslexia is the most common Learning Disability in children and persists throughout life. The severity of dyslexia can vary from mild to severe. The sooner dyslexia is treated, the more favourable the outcome; however, it is never too late for people with dyslexia to learn to improve their language skills. Children with dyslexia have difficulty in learning to read despite traditional instruction, at least average intelligence, and an adequate opportunity to learn. It is caused by impairment in the brain's ability to translate images received from the eyes or ears into understandable language. It does not result from vision or hearing problems. It is not due to mental retardation, brain damage, or a lack of intelligence.

Dyslexia can go undetected in the early grades of schooling. The child can become frustrated by the difficulty in learning to read, and other problems can arise that disguise dyslexia. The child may show signs of depression and low self-esteem. Behaviour problems at home as well as at school are
frequently seen. The child may become unmotivated and develop a dislike for school. The child's success in school may be jeopardized if the problem remains untreated (Perlstein, 2013).

2.1.5.1.1 Signs and Symptoms of dyslexia

Dyslexia occurs when there is a problem in areas of the brain that help interpret language. It is not caused by vision problems. The disorder is a specific information processing problem that does not interfere with one's ability to think or to understand complex ideas. Most people with dyslexia have normal intelligence, and many have above-average intelligence.

Classroom teachers may not be able to determine if a child is dyslexic. They may detect early signs that suggest further assessment by a psychologist or other health professional in order to actually diagnose the disorder. Letter and number reversals are the most common warning signs. Such reversals are fairly common up to the age of 7 or 8 and usually diminish by that time. If they do not, it may be appropriate to test for dyslexia or other learning problems. Difficulty copying from the board or a book can also suggest problems. There may be a general disorganization in the written work. A child may not be able to remember content, even if it involves a favourite video or storybook. Problems with spatial relationships can extend beyond the classroom and be observed on the playground. The child may appear to be uncoordinated and have difficulty with organized sports or games. Difficulty with left and right is common, and often dominance for either hand has not
been established. In the early grades, music and dance are often used to enhance academic learning. Children with dyslexia can have difficulty moving to the rhythm of the music.

Auditory problems in dyslexia encompass a variety of functions. Commonly, a child may have difficulty remembering or understanding what s/he hears. Recalling sequences of things or more than one command at a time can be difficult. Parts of words or parts of whole sentences may be missed, and words can come out sounding funny. The wrong word or a similar word may be used instead. Children struggling with this problem may know what they want to say but have trouble finding the actual words to express their thoughts (Perlstein, 2013).

Many delicate signs can be observed in children with dyslexia. Children may become withdrawn and appear to be depressed. They may pretend to act out, drawing attention away from their learning difficulty. Problems with self-esteem can arise, and sibling and peer interactions can become strained. These children may lose their interest in school-related activities and appear to be demotivated or lazy. The emotional symptoms and signs are just as important as the academic and require equal attention.

Some characteristics of the dyslexic readers are:

- Dyslexic readers have average or above average intelligence. However the verbal IQ tends to be significantly below the performance IQ.
Severely disabled readers often have comprehension difficulties and cannot understand the meaning of a given passage.

Dyslexic readers tend to be spatially disoriented, with pronounced left-right confusion. This affects the way they perceive words:

- There is frequent kinetic reversal of letters (b-d, flim-film); words (was-saw); and sometimes entire sentences.
- Sounds are confused (empty-entry).
- Concepts are reversed (floor for ceiling, cake for bread, east for west).

There may be poor figure-ground discrimination and visual-motor patterning. Fine motor movements tend to be clumsy. The child may write very untidily with jerky irregular strokes. The letters tend to be poorly formed, irregular and uneven in formation.

Speech difficulties are also a typical characteristic of a dyslexic reader. Stuttering, lisping, cluttering is quite common. Delay in learning to talk is often indicative of later problems in reading.

There is a tendency to be hyperactive, impulsive and distracted. Most dyslexic readers have a short attention span. They tend to perseverate (get fixated on words) and lack the ability to scan lines, an ability required for successful reading. They are unable to discriminate between letters and cannot attend to critical features of a word.
Dyslexic readers tend to have an inefficient visual memory system, which prevents their reading from becoming automatic. They lack reading fluency (Rief & Stern, 2010).

In general, symptoms of dyslexia may include:

- Difficulty in understanding the meaning (idea content) of a simple sentence.
- Difficulty in recognizing written words.
- Difficulty in rhyming.

Dyslexia may occur in combination with writing or math learning problems.

**2.1.5.1.2 Instructional Method for Dyslexic Reader**

The reading journey can be painful and laborious for dyslexic readers. Most schools in India focus largely on content and teachers know what to teach. But it is equally important to know how to teach, and the right teaching methods can make all the difference to the child’s success or failure. Teaching a dyslexic child is a hard work and teachers need to be constantly learning themselves, reading up new research and experimenting with different programmes. Instruction has to suit each child’s individual needs. By the time a child is firmly diagnosed as dyslexic, he/she is usually in the grade 6 or 7 and is expected to deal with vast quantities of information. Lack of motivation is yet another hurdle because most students have a history of prior failure and hate to read. The teacher must be sensitive to the students learning style, age,
Theoretical Overview

and interests, and choose materials that are suitable to the particular child. There is no fixed formula that works best or any magic ingredient that will instantly help the student to read. But with drill, practice and appropriate materials, a great amount of progress can be achieved (Kelly & Philips, 2014).

2.1.5.2 Dysgraphia

Learning Disability in writing can involve the physical act of writing or the mental activity of comprehending and synthesizing information. Disorders of written language are referred to as dysgraphia and this include difficulties in three areas: 1) handwriting, 2) spelling and 3) written expression. Basic writing disorder refers to physical difficulty forming words and letters. Expressive writing disability indicates a struggle to organize thoughts on paper.

Dysgraphia is a specific Learning Disability that affects written expression. Dysgraphia can appear as difficulties with poor handwriting, spelling and trouble putting thoughts on paper. Dysgraphia can be a language based, and/or a non-language based disorder.

Many people may have poor handwriting, but dysgraphia is more serious. Dysgraphia is a neurological disorder that generally appears when children first learn to write. Eventhough the exact reason is unknown, experts believe that early treatment can help prevent or reduce problems.
Writing requires a complex set of motor and information processing skills. Not only does it require the ability to organize and express ideas in the mind, but also requires the ability to get the muscles in the hands and fingers to form those ideas, letter by letter, on paper.

Dysgraphia that is caused by a language disorder may be characterised by the person having difficulty converting the sounds of language into written form (phonemes into graphemes), or knowing which alternate spelling to use for each sound. A person with dysgraphia may write their letters in reverse, have trouble recalling how letters are formed, or when to use lower or upper case letters (Jordan, 1989). A person with dysgraphia may struggle to form written sentences with correct grammar and punctuation, with common problems including omitting words, incorrect verb and pronoun usage, words ordered incorrectly and word ending errors. People with dysgraphia may speak more easily and fluently than they write.

Non-language based dysgraphia are those caused by difficulties performing the controlled fine motor skills required to write. The generic term apraxia refers to a wide variety of motor skill deficits in which the voluntary execution of a skilled motor movement is impaired. Apraxia can involve a single controlled movement, or a sequence of movements, such as writing a single letter or entire words (“What is dysgraphia”, n.d.).
2.1.5.2.1 Signs of dysgraphia

- Generally illegible writing.

- Inconsistencies in writing, e.g. mixtures of print and cursive writing, upper and lower case, or irregular sizes, shapes, or slant of letters.

- Unfinished words or letters, omitted words.

- Inconsistent position of letters on the page with respect to lines and margins.

- Inconsistent spaces between words and letters.

- Cramped or unusual grip of the writing instrument, especially holding the writing instrument very close to the paper, or holding thumb over two fingers and writing from the wrist.

- Strange wrist, body, or paper position.

- Talking to self whilst writing, or carefully watching the hand that is writing.

- Slow or laboured copying or writing.

- Large gap between written ideas and understanding demonstrated through speech.

- Difficulty organising thoughts on paper (Joseph, 2010).
2.1.5.2.2 Instructional Method for Correcting Dysgraphia

Many different approaches can be used for the remedy of handwriting disorders like; improving the underlying visual-motor processes, focusing directly on producing correctly formed letters and words, using prompts and cues, multi-sensory stimulation etc.

A spelling disorder never goes away by itself. One definite conclusion from the research (McIntyre, 1995) is that students with spelling disorders need explicit instruction in spelling. Students with a Learning Disability tend to need more individualised, intensive training in these skills than other students for gains to be noticed (as cited in O’Connor, Syverson & Vadaszy, 1996).

To improve the written expression, following strategies can be used.

- Learning disabled students tend to have difficulty with working memory, and would benefit from the use of tape recorders to store information or, provide a planning sheet and have them refer to that as they write.

- Teach students that different kinds of genres (mysteries, horror stories, action adventures etc) require a different choice of words.

- Provide students with strategies for monitoring their own writing. Have them graph their own progress and of skills they still need to work on.
Do not expect computers alone to transform learning disabled students who are poor writers into good writers.

Be patient and do not expect instant mastery of writing skills. Becoming a good writer takes time and evolves over a long period (Wolf, 2011).

Types of Reading and Writing Problems

Children with Learning Disability exhibit a variety of deficits in the area of reading and writing. After discussing with school teachers and experts the investigator found that in certain areas of language and mathematics the children with Learning Disability struggle the most. These areas were included in the content to be taught in the present study. The main deficit areas dealt in this study are:

a) Reading Comprehension

A Learning Disability in reading comprehension affects the learner's ability to understand the meaning of words and passages. Gough, Hoover and Peterson (1996) suggest that the relationship between listening comprehension and reading comprehension grow stronger with age where as word recognition becomes less significant (as cited in Kelly and Philips, 2014). This affects particularly the children with Learning Disability. Students with Learning Disability in reading comprehension may also struggle with basic reading skills such as decoding words, but comprehension is of greater weakness. Some students with a Learning Disability in reading
comprehension can read aloud with little or no difficulty in pronouncing words, but they do not understand or remember what they have read. They often read aloud the words and phrases with no feeling, no change in tone, no logical phrasing, and no rhythm or pace.

b) Vocabulary

Vocabulary is one of the core components of reading instruction that are essential to successfully teach children how to read. Vocabulary knowledge is important because it encompasses all the words we must know to access our background knowledge, express our ideas and communicate effectively, and learn about new concepts. Vocabulary development focuses on helping students learn the meaning of new words and concepts. Helping students to develop vocabulary means providing explicit instruction on important words from the reading passage and strategies to help them learn word meanings independently.

c) Grammar

Grammar is a system that gives certain rules governing the use of language. Grammar is the underlying structure of language that any native speaker of that language knows intuitively. Many children with Learning Disability have particular problems with grammar and grammatical structure of language in spoken as well as written language.
Dyslexia and Dysgraphia in the First Language

Accounts of dyslexia in more than one language (polyglot dyslexia) are quite sparse. Salter and Smythe (1997) produced an international book of dyslexia in which 39 accounts of dyslexia world-wide are given, yet none of the authors discussed the incidence of polyglot dyslexia. Studies in this area have tended to concentrate on individual cases rather than large samples and found that where the first language is regular (transparent) reading difficulties have not always been evident despite there being literacy difficulties in English. But Snowling (2008) pointed out that recent studies have examined reading fluency in transparent languages and found subtle differences in children at-risk of dyslexia, suggesting that a phonological deficit exists in the first language (as cited in Kelly and Philips, 2014). If the first language is more regular than English a multi-lingual learner will need particular emphasis on the instruction on their first language. Hence the investigator has included the first language, Malayalam, in the content area to be taught in the present study. Thus, for Malayalam similar areas of English were included in the study viz. ‘grahanam’ for reading comprehension, ‘padaprayogam’ for vocabulary and ‘vyakaranam’ for grammar.

2.1.5.3 Dyscalculia

Learning Disability in Mathematics vary greatly depending on the child’s other strengths and weaknesses. A child’s ability to do mathematics will be affected differently by a language Learning Disability, or a visual
disorder or a difficulty with sequencing, memory or organization. A child with a math–based learning disorder may struggle with memorization and organization of numbers, operation of signs, and number “facts” (like $5+5=10$ or $5\times5=25$). Children with dyscalculia might also have trouble with counting principles (such as counting by 2s or counting by 5s) or have difficulty telling time (Kemp, Smith & Segal, 2012).

The term Dyscalculia has been used in the sense of a specific learning difficulty in Mathematics, indicated by extremely low performance in arithmetic in relation to other indicators of normal intelligence.

The first neuropsychological definition of developmental dyscalculia was put forward by the researcher Kosc (1974), who defined it as difficulty in mathematical performance resulting from impairment to those parts of the brain that are involved in mathematical processing, without a concurrent impairment in general mental function. Kosc introduced the term developmental dyscalculia which he defined as a structural disorder of mathematics which has its origin as a genetic or constitutional disorder without simultaneous disorder of general mental functions. An individual could be low functioning on mathematics and yet have above average intelligence (as cited in Nakra, 2008).
2.1.5.3.1 Signs of Dyscalculia

- Delay in counting.

- Difficulties in memorizing arithmetic facts. Dyscalculic children have great difficulty in memorizing simple addition, subtraction and multiplication facts (eg. \(5 + 4 = 9\)).

- Lack of “number sense”. Dyscalculic children may have a fundamental difficulty in understanding quantity. They are slower at even very simple quantity tasks such as comparing two numbers (which is bigger, 7 or 9?).

- Difficulty imagining a mental number line.

- Difficulty using finger counting (slow, inaccurate, unable to immediately recognise finger configurations).

- Difficulty decomposing numbers (e.g. recognizing that 10 is made up of 4 and 6).

- Shows difficulty understanding concepts of place value, quantity, number lines, positive and negative value, carrying and borrowing.

- Has difficulty understanding and doing word problems.

- Has difficulty sequencing information or events.

- Exhibits difficulty using steps involved in math operations.

- Shows difficulty understanding fractions.
- Displays difficulty recognizing patterns when adding, subtracting, multiplying, or dividing.

- Has difficulty putting language to math processes.

- Has difficulty understanding concepts related to time such as days, weeks, months, seasons, quarters, etc.

- Exhibits difficulty organizing problems on the page, keeping numbers lined up, following through on long division problems (Joseph, 2010).

2.1.5.3.2 Instructional Methods for Teaching Mathematics

It is better to choose a variety of approaches rather than look for one single method that works best. Young children benefit from direct instruction in the use of strategies. It is also important to increase opportunities for generalization as it takes time for younger children to learn how to generalize. Jordan et al. (2003) and Robinson et al. (2002) have argued that children must learn to use calculation principles or “shortcuts”, for example, 2+2=4 so 2+3=5. Or 6+4=10, so 10-6=4 (as cited in Gresten, Jordan & Flojo, 2005). This kind of instruction is much more productive than rote drill which places a heavy demand on memory, an area of weakness for many students with Learning Disability. Short cuts in mental calculation help children develop fluency as well as number sense (Gresten, Jordan & Flojo, 2005).
Students need to learn the very abstract language of mathematics before they can express their ideas; thus learning the vocabulary of mathematics seems another critical piece of early intervention.

2.1.5.3.3 Types of Mathematical Problems

Children with Learning Disability exhibit a variety of deficits in the area of mathematics. During the course of the study the investigator found that in certain areas of mathematics frequent errors occur for the children with Learning Disability. After discussing with school teachers and experts these areas were included in the content to be taught in the present study. The main deficits areas dealt in this study are:

a) Multiples and Factors

A set is a family of objects and anything within a set is called an element or a member of that set. For example, tables, chairs, cupboard are all members of the set called furniture. Mathematically, sets have been used to help children to count. Unfortunately, most children with Learning Disability do not understand the concept of a set, and find it difficult to categorize objects according to a particular common quality.

Any number has a set of multiples. These multiples are that number multiplied by various integers. For example, the multiples of 3 are 3x0=0, 3x1=3, 3x2=6, 3x3=9, etc. The concept of factor is the opposite to that of a multiple. If some number A is a factor of a number B, that means that B is a multiple of A. For example, 2 is a factor of 6 because 6 is a multiple of 2 (6 is
2 multiplied by 3). That is, if one number is a factor of a second number or divides the second (as 3 is a factor of 12), then the second number is a multiple of the first (as 12 is a multiple of 3). For a dyscalculic child this is too complicated to follow.

b) Place Value

The concept of place value – ones and tens – appears difficult to many children, and more so to learning disabled children, who may be having problems with left – right orientation. These children may read the digit 63 as 6 and 3 or reverse it as 36 or they may find it difficult to understand that the same digit may indicate different values according to how it is placed. Place value will naturally affect how the child solves addition and subtraction problems specially those involving borrowing and carry over.

c) Word problem

Children with Learning Disability may find it very difficult to solve word problems both owing to reading deficit and a lack of analysis and reasoning skills. Most word problems involve a fair degree of abstract thinking and inferential reasoning. In the absence of concrete manipulative objects the child is unable to tackle these problems. Another area of difficulty arises from not knowing which operation or process to use. “Does the problem require addition or division”? The child must be given repeated practice to avoid this using a trial and error method and to develop a systematic approach to problem solving.
Dyscalculia is not a very common form of disability. There are several symptoms that confirm the presence of dyscalculia which are discussed earlier. Besides this dyscalculia – afflicted people are predominantly absent minded people. As a result of which they are unable to keep a track of any work or activity that involves sequences or use of active memory. Such a person will find it difficult to remember the steps of a dance set-up. They are also unable to recall the events that have happened in the past because of short memory. They are also poor in remembering the rules of any game.

Children with Dyscalculia are usually described as having one or several of a range of difficulties. The UK Department for Education and Skills (2001) described Dyscalculia as a condition that affects the ability to acquire arithmetical skills. Dyscalculic learners may have difficulty understanding simple number concepts, lack an intuitive grasp of numbers and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence (as cited in Babtie & Emerson, 2015). This implies a range of characteristics, including good performance but lack of understanding and confidence.

### 2.2 Theoretical foundations of Learning Disability

An understanding of the theories that form the foundation of the field of Learning Disability is a basic requirement for understanding and participating fully in the field. Theory provides perspectives for examining
and interpreting the various branches of the field. It is also helpful in sorting and evaluating the bewildering deluge of new materials, techniques, machines, gadgets, methods and mediums confronting the educator.

Theories in this context are meant to be working statements. As Dewey (1946) wrote, theories are not meant to be ideas frozen into absolute standards masquerading as eternal truths or programs rigidly adhered to. Rather, theory is to serve as a guide in systematizing knowledge and as a working concept to be modified in the light of new knowledge. The psychological theories that provide the underpinnings for the field of Learning Disability as explained by Janet Lerner are given below.

2.2.1 Developmental Psychology and Maturational Theories of Learning Disability

Maturational views of Learning Disability are built on the concepts of developmental psychology of children’s learning through the sequential maturation of cognitive abilities. This approach suggests that progression ability normally occurs under appropriate conditions. Knowledge of maturation and the normal cognitive development of children serve as a basis of comparison of children with learning problems, since a child’s maturational status affects the ability to learn.

The maturational concept suggests that a major cause of school difficulty is immaturity. An implication of this theory is that the younger and less mature children in a grade would experience more learning problems than
the older students in that grade. In fact, several research studies have found this to be the case. Younger children in the early grades do have more learning problems. When the month of birth was compared with the percentage of children referred for Learning Disability services, the researchers found that the younger children (those born near the cut off date for school entrance) were much more likely to be referred for Learning Disability services. The researchers called this phenomenon the “birth date effect”. Piaget’s (1974) concept of the maturational stages of logical thinking suggests that cognitive growth occurs in a series of invariant and interdependent stages. At each stage, the child is capable of learning only certain cognitive tasks.

The maturational point of view is based on the presumption that all individuals have a natural development and time for maturation of various skills. What is sometimes thought to be a learning problem in a child may be merely a lag in the maturation of certain processes. It is important to those who have the responsibility of providing the educational environment for the child to be aware of the child’s stage of maturation and of any lags in maturation that may be present.

Theories of maturational development have significant implications for understanding and teaching learning disabled children and youth. The theory suggests that the cognitive abilities of the child are qualitatively different from those of the adult. Cognitive abilities develop in a sequential fashion that
cannot be altered. Further, as children mature, their ways of thinking continually change (Lerner, 2000).

2.2.2 Behavioural Psychology and Direct Instruction

Behavioural psychology contributes important theories for teaching students with Learning Disability. The focus of these theories is on the curriculum or tasks to be taught and the analysis of behaviours needed to learn those tasks. Instruction stemming from this theory is sometimes called direct instruction. A recommendation based on behavioural theory is that the educators concentrate on the academic skills that students need to learn rather than on the underlying deficiencies in students that impede their learning.

Behavioural theories require that teachers analyze academic tasks in terms of the underlying skills needed to accomplish those tasks. These skills are then placed in an ordered and logical sequence, and students are tested to determine which they possess and which they do not. Teaching involves helping students acquire the sub skills that are not yet mastered.

In direct instruction, a complex terminal behaviour is analyzed into its component parts (called enabling behaviours), then those enabling behaviours that a pupil does not yet demonstrate are taught, and finally those behaviours are integrated into the terminal objectives. The theory holds that assessment should be restricted to the strengths and weaknesses of specific skills and that instruction should be restricted to the teaching of those skills. The direct instruction approach does not focus on any special learning problems or
ability deficits within the pupil other than lack of experience and practice with the task. The underlying assumption is that academic success or failure is due to the connections between the sub skills that are characteristic of a particular academic task. The theory emphasizes the analysis of the tasks and the behaviours needed to learn that task (Lerner, 2000).

2.2.3 Theories from Cognitive Psychology

Cognitive psychology deals with the human processes of learning, thinking, and knowing. Cognitive abilities are clusters of mental skills that are essential to human functions. They enable one to know, to be aware, to think, to conceptualize, to use abstractions, to reason, to criticize, and to be creative. An analysis of the nature of these cognitive abilities is critical to understand Learning Disability. A number of theories focus on the unique ways that learning disabled children learn and the intrinsic cognitive characteristics that impede or deter their processes of learning.

In the field of Learning Disability, different aspects of cognitive abilities have been emphasised at different times. Several theories stemming from a concern with deficits in cognitive abilities are: 1) disorders of psychological processing, a theory of mental abilities and disabilities that was especially important in the formative years of the field; 2) disorders of cognitive processing, a theory that expands and elaborates the earlier concepts of psychological processing; and 3) information processing theories, a model
that emphasizes the flow of information and combines the various cognitive abilities into an integrated system.

2.2.3.1 **Disorders of Psychological Processing**

Psychological processes are cognitive abilities in perception, language, memory, attention, concept formation, problem solving, and the like. The implication is that deficits in these cognitive processes are intrinsic limitations or deficiencies that interfere with the child’s learning. Many of these processes are considered preacademic or developmental areas of learning.

Fundamental to the concept of psychological processing in Learning Disability is the contention that students differ in their underlying mental abilities to process and use information and these differences affect a student’s learning. A basic premise is that certain students fail to learn effectively because of deficits in psychological processing functions. Thus students with auditory processing dysfunctions, for example, may encounter difficulty with instructional approaches that are primarily auditory, such as phonics. Similarly students with visual processing dysfunctions may experience obstacle in learning to read by methods that are primarily visual, such a sight-word method.

2.2.3.2 **Disorders of Cognitive Processing**

Cognitive processing theories emphasise difficulties in many cognitive functions, in addition to perceptual disorders, including problems in memory, automaticity, and the development of cognitive structures. Many children
with Learning Disability do poorly on tests of memory and in academic skills that require memory such as recognizing words, numbers, or facts. The problem is not one of limited memory capacity but rather a difficulty in the management of intact memory capacities. In a study of children with reading disabilities, Torgesen (1979) found that teaching can help students develop memory strategies. Thus, while teaching cannot change student's brain biologically, it can help students to develop efficient learning strategies that will enhance their ability to remember academic tasks (as cited in Lerner, 2000).

For learning disabled children, the flow of information is hampered because they have difficulty acquiring the automatization needed for successful learning. Through automatization, certain knowledge becomes almost subconscious, requiring little processing effort. These children need more practice and repetition to develop the automatization of critical abilities. The implication of cognitive structure theories for Learning Disability is that what students learn depends on their existing cognitive structures, or the experiences and knowledge that they bring to learning situation. Therefore, one of the most important factors in learning is what the students already know. They must learn to use the experiences, knowledge, and skills they already possess.
2.2.3.3 Information Processing Theories

Information processing is a theory that expands and incorporates the concepts of psychological and cognitive processing. According to Swanson (1989), first the sensory information comes to the individual (input stimuli), who then clusters it with previous knowledge within the brain (memory and experience) and programmes or manipulates the information (executive function) which leads to a response or performance activity (output performance). The theory explores how the learning disabled child takes in sensory data, interprets and elaborates this information, and then uses it to perform a task. It emphasises that the learner must coordinate several kinds of cognitive abilities rather than using a single appropriate cognitive strategy. Learners must not only integrate abilities and types of knowledge but also select from a repertoire of possible strategies, a plan of action relevant for solving a problem or completing a task. The process also requires learners to possess the necessary information and knowledge of their own cognitive resources to be able to transfer and refine their learning process efficiently. In short, they must integrate a multitude of cognitive abilities into one complex act for successful task performance.

Applying the theory of information processing to the problems that learning disabled children face in mathematics Pellegrino and Goldman (1987) found that these students have difficulty in both processing the knowledge of the number facts and formulating the rules of mathematics.
Gerber and Hall (1987) applied the information processing model to learning disabled children’s performance in spelling. They found that these students could not hold words in short-term memory, could not identify the phonemic representations of words and had difficulty with spelling rules (as cited in Lerner, 1988).

The cognitive theories of Learning Disability imply that these children have defects in cognitive processing abilities that impede their ability to learn (Bender, 2001). The learning disabled child’s poor performance is thus related to 1) deficiencies in several areas of cognitive function, 2) difficulties in coordinating and integrating cognitive functions, and 3) the integration of various control strategies to make maximum use of the system.

2.3 Multi Sensory Strategy

The ‘multi-sensory approach’, as the name suggests, makes maximum use of the different senses, in particular integrating hearing, seeing and feeling. Multi-Sensory approaches are used to teach reading and writing (including spelling) through using auditory (hearing), visual (sight) and kinesthetic (movement/touch) pathways. This gives multiple pathways for the information to reach the brain. As it involves constant testing and reflection on the knowledge of the student, it is diagnostic. It is systematic and seeks to unite the components of written language. Thus it treats sound-symbol knowledge, oral language (grammar and pronunciation), written language conventions and handwriting in an organised and integrated fashion.
Teaching and learning in this way is an exciting journey of discovery. It is a fast paced and creative process where learning is fun since each small step is mastered and the learner is aware of what they have gained. Confidence is built through growing mastery of written language. The students can see themselves as successful learners and this helps each individual learner to gain independence and a great “can do” attitude (“Multi-sensory approaches to teaching”, n.d.).

2.4 Theoretical Foundations of Multi Sensory Strategy

The idea that learning experienced through all senses is helpful in reinforcing memory has a long history in pedagogy. Educational psychologists of the late 19th century promoted the theory that all senses, including kinesthetic, are involved in learning. Hinshelwood (1917) was the first physician to advocate a specific instructional approach for written language disorders in children defined as ‘word blind’. On the supposition that reading failure was due to underdevelopment or injury of brain, Hinshelwood recommended instruction using an alphabetic method in a manner that would appeal to as many ‘cerebral centres’ as possible. Orton (1925) was the first to advocate using all sensory pathways to reinforce weak memory pattern especially for word blindness. He called for educational methods based on simultaneous association of visual, auditory and kinesthetic fields.
Prominent early educational approaches strongly associated with multisensory instructions were those developed by educators such as Montessori (1912), Fernald and Keller (1921) and Strauss and Lehtinen (1947) (as cited in Farrel & Sherman, 2011). Major theories that guide this multisensory strategy are Cognitive Learning Theory, Constructivist Theory, Sensory Integration Theory and Multiple Intelligence Theory.

2.4.1 The Cognitive Learning Theory

The Cognitive Learning Theory, through studies in both psychology and neuroscience, analyzes how the various parts of the brain work to synthesize and assimilate learning for memory and usage. Cognitive psychology involves the study of how human beings gain access to information in one’s environment: how the brain stores it, reflects on it, retrieves it, utilizes it, transfers it to other information, solves problems, and develops and uses language (Solso, M. Maclin & O.Maclin, 2005).

2.4.2 The Constructivist Theory

The Constructivist Theory of child development believes that learning is hierarchical. When teaching the child, new learning needs to connect to prior learning. Learning is sequential in nature. Human beings need to link new information to knowledge that is already established in memory (as cited by Feinstein, 2006).

Piaget (1974), a constructivist, believed that learning starts as early as babyhood, beginning with things that are innate, such as reflexes and
information taken in through the senses. Children are not blank pages when they come to the classroom (Donovan, Bransford & Pellegrino, 1999). They have years of listening, observing and doing which gives them a foundation for learning more complex concepts. What the child already knows becomes the foundation for new learning (Jacobs, 2010).

A constructivist model of learning reflects scientists’ best understanding of the brain’s natural way of making sense of the world. Constructivism holds that learning is essentially active (Jacobs, 2010). Teachers are to teach through concrete and simple concepts first, helping the child to achieve mastery, and then move on to more abstract, difficult concepts as the child is ready, laying the foundation for future learning (Piaget, 1974).

Davis (1967) found that dendrites grow and connect as new learning connects to both new and prior learning. It is a “use it or lose it” process. If fostered in interesting and novel ways, stimulated brains grow dendrites which create neural synaptic connections which enhance memory and utilization (as cited by Feldstein, 2006).

As children learn in the classroom, the teacher layers the instruction, adding new information to prior learning, inviting the child to participate in the learning process with all his or her senses, making his or her own discoveries at the same time (Jacobs, 2010).
2.4.3 The Sensory Integration Theory

Sensory integration theory was originated by A. Jean Ayres. Sensory processing is a generic term used to describe the way in which sensation is detected, transduced, and transmitted through the nervous system. The Sensory Integration Theory, designed by Ayres (1972) defined sensory integration as the neurological processes that organizes sensation from one’s own body and from the environment and makes it possible to use the body effectively within the environment relationships (as cited in Bundy, Lane & Murray, 2002). Drawing on motor control theories, Ayres (1960) proposed that motor learning follows inherent maturational sequences and is influenced by, if not dependent on, incoming sensation. In 1961, Ayres proposed that the development of the body scheme in children created a postural model to understand visual-motor development, and she proposed that the ability to sit up and sit still required perceptual support from the vestibular and proprioceptive systems in addition to the neuromotor systems, thus highlighting postural control as an essential foundation for more skilled academic and motor performance. She further proposed that the tactile, vestibular, proprioceptive, and visual systems provided key data in the development of reading and writing and may be impaired in children with Learning Disability. Ayres’s early references to what is now commonly called sensory modulation began in 1964. She emphasized the importance of tactile functions, and she proposed that the ability to focus and maintain attention
and to keep a steady level of activity were related to the way in which the nervous system responds to tactile and other sensations.

In 1972, Ayres wrote about one of the most important features of her theory: the aspect of sensory integration itself. She proposed that sensory systems do not develop independently of one another; rather, visual and auditory processing depends on the foundational body-centered senses. According to Ayres, sensory information is not processed in isolation and, given this essential feature of the central nervous system, therapeutic intervention that incorporates sensation to affect multisensory perception will influence learning and behaviour (as cited in Roley, Mailloux, Kuhaneck, and Glennon, 2007).

Sensory integration theory has three major postulates:

1. Learning is dependent on the ability to take in and process sensation from movement and the environment, and use it to plan and organize behaviour.

2. Individuals who have a decreased ability to process sensation also may have difficulty producing appropriate actions, which, in turn, may interfere with learning and behaviour.

3. Enhanced sensation, as a part of meaningful activity that yields an adaptive interaction, improves the ability to process sensation, thereby enhancing learning and behaviour (Bundy et al., 2002).
Ayres believed the brain to be plastic and malleable; that it functions as an integrated whole; and that lower ordered (sub-cortical) integrative functions develop first, through the senses, which inform higher ordered structures (cortical), as the child takes in information from instruction, self-discovery, and interaction with the environment. Ayres, like Piaget and Montessori, incorporated hierarchical concepts into her theory.

“Sensory Integration Theory was designed to describe the difficulties of a particular group of individuals and to explain mild to moderate problems in learning and behaviour” (Bundy et al., 2002). Sensory integration activities are designed to strengthen weak modalities (visual, auditory, aural, motor, touch) in order to stimulate the brain to learn (Wrighton, 2010).

2.4.4 Multiple Intelligence Theory by Howard Gardner (1983)

Multiple Intelligence theory proposes that people use at least seven relatively autonomous intellectual capacities- each with its own distinctive mode of thinking- to approach problems and create products. Every normal individual possesses varying degrees of each of these intelligences, but the ways in which these intelligences combine and blend are as varied as the faces and personalities of individuals (as cited in Rief & Heimburge, 1996). According to this theory, individuals are all able to know the world through language, logical-mathematical analysis, spatial representation, musical thinking, use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves. Where
individuals differ is in the strength of these intelligences - the so-called profile of intelligences - and in the ways in which such intelligences are invoked and combined to carry out different tasks, solve diverse problems, and progress in various domains. Gardner says that these differences challenge an educational system that assumes that everyone can learn the same materials in the same way and that a uniform, universal measure suffices to test student learning. Indeed, as currently constituted, our educational system is heavily biased toward linguistic modes of instruction and assessment and, to a somewhat lesser degree, toward logical-quantitative modes as well. Gardner argues that a contrasting set of assumptions is more likely to be educationally effective. Students learn in ways that are identifiably distinctive. The broad spectrum of students - and perhaps the society as a whole - would be better served if disciplines could be presented in a numbers of ways and learning could be accessed through a variety of means (as cited in Lane, n.d.).

2.5 Models on Multi Sensory Strategy

The design and delivery of effective vocabulary instruction requires more than formulating a lesson plan; it also requires a comprehensive understanding of goals, word learning characteristics, stages of word acquisition, and instructional approaches. The following session discusses some popular models on Multi Sensory Strategy (MSS).
2.5.1 The Orton-Gillingham (OG) Approach (1930)

The history of lesson planning in Multisensory strategy and how it evolved from the original Orton-Gillingham Approach provides a solid background for planning the MSS. The Orton-Gillingham Approach to remedial instruction began in 1930s when Anna Gillingham and Bessie Stillman collaborated to develop remedial techniques based on Dr. Samuel T. Orton’s neurological explanation for language Learning Disability (as cited in Birsh & Schedler, 2011). The OG approach was primarily designed to help with reading, writing and spelling, though the method can also be used for mathematics. It involves the explicit and systematic teaching of language sounds (phonemes) / phonemic awareness. As early as the 1920s, Orton helped pioneer the concept of "multisensory" teaching which integrates kinesthetic (movement), tactile (touch), visual and auditory learning into the reading process.

2.5.1.1 Main Features of OG Approach

- Personalized - It recognizes the individual needs of learners.

- Multisensory - It uses all the learning strands: seeing, hearing, feeling (tactile), and awareness of motion (kinesthetic).

- Diagnostic and Prescriptive- It is diagnostic in the sense that the instructor continuously monitors the verbal, non-verbal, and written responses of the student in order to understand both the student’s challenges and progress. This information is used to plan the next
The lesson is prescriptive in the sense that it is designed to help resolve the student’s difficulties and build upon the student’s progress noted in the previous lesson.

- **Direct Instruction** - Lesson content includes explaining to students what is to be learned, why it is to be learned, and how it is to be learned.

- **Systematic and Structured** - Information is presented in an ordered way that indicates the relationship between the material currently being taught and material previously taught.

- **Sequential, Incremental, and Cumulative** - Learners move from the simple, well-learned material to the more complex, only after mastering each step along the way.

- **Continuous Feedback and Positive Reinforcement** - A close teacher-student relationship that builds self-confidence based on success and mastery.

- **Cognitive** - Students understand the what, why and how of the learning process. Confidence is gained as they improve their ability to apply new knowledge about the learning process itself.

- **Emotionally Sound** - Teaching is directed toward providing the success. With mastery comes increased self-confidence and motivation (“Orton-Gillingham approach”, n.d.).
Figure 2.1 Schematic diagram illustrating main features of OG Approach

2.5.2 Repeated Reading Model (1979)

Fluent reading, often defined as speed and accuracy, is an important skill for all readers to develop. Students with Learning Disability often struggle to read fluently, leading to difficulties in reading comprehension. The development of reading fluency has been linked to successful reading, since the early research on the psychology of reading. In his classic review of 19th-century reading research, Huey (1908) likened the development of fluent reading to the development of other psychomotor skills such as playing tennis, remarking that both skills benefited from practice. Repetition progressively frees the mind from attention to details, and makes facile the total act, shortens the time, and reduces the extent to which consciousness must concern itself with the process (as cited in Chard, Vaugh & Tyler, 2002). Despite this attention afforded to fluency in the early 1900s, it was not until 1974, when LaBerge and Samuels offered their theory of automatic
processing, that reading fluency took a more prominent role in our understanding of reading development.

LaBerge and Samuels (1974) proposed that learning to read involves increasing automaticity in processing word units (e.g., letter-sound correspondences), processing these units into recognizable words, and connecting the words while reading a passage. In effect, improvement in the processing of units, words, and connected text cognitively releases the reader to think about the meaning of the text. This theory of automatic information processing resulted on repeated reading as a simple but powerful set of fluency-building procedures first developed by Samuels (1979).

Chard et al. (2002) highlighted research findings from studies of repeated reading that they considered particularly useful for students with reading/Learning Disability:

- Work on phrasing as part of repeated reading to promote automaticity.
- Include a skilled model since that enhances the comprehension effects of repeated reading (e.g., live modelling as well as recordings and computer).
- Alert students to stay connected to comprehension, to notice when it breaks down, and to activate repair strategies.
Figure 2.2. Schematic diagram showing the main interrelated ingredients that are common to many effective fluency-building methods with continuous text


2.5.3 **Collaborative Strategic Reading (1998)**

Klingner and Vaughn (1998) designed Collaborative Strategic Reading (CSR) commonly known as ‘From clunk to click’ program for middle school students (as cited in Marzola, 2005). CSR teaches students to use comprehension strategies while working cooperatively. Student strategies include previewing the text; giving ongoing feedback by deciding "click" (I get it) or "clunk" (I don't get it) at the end of each paragraph; "getting the gist" of the most important parts of the text; and "wrapping up" key ideas. The goals of CSR are to improve reading comprehension and increase conceptual learning in ways that maximize students' involvement. Developed to enhance
reading comprehension skills for students with Learning Disability and students at risk for reading difficulties, CSR has also yielded positive outcomes for average and high average achieving students. In CSR, students work together to reach the goal. The program works through four strategies.

**Strategy 1: Preview**

Students preview the entire passage before they read each section. The goals of previewing are to enable students to learn as much about the passage as they can in a brief period of time (2-3 minutes), to activate their background knowledge about the topic, and to help them make predictions about what they will learn. Previewing serves to motivate students' interest in the topic and to engage them in active reading from the onset.

**Strategy 2: Click and clunk**

Students choose click and clunk while reading each section of the passage. The goal of clicking and clunking is to teach students to monitor their reading comprehension and to identify when they have breakdowns in understanding. Clicks refer to portions of the text that make sense to the reader. "Clunk" refers to parts of text that were hard to understand, including challenging vocabulary.

**Strategy 3: Get the gist**

Students learn to "get the gist" by identifying the most important idea in a section of text (usually a paragraph). The goal of getting the gist is to teach students to re-state in their own words. The most important point is
making sure they have understood what they have read. This strategy can improve students' understanding and memory of what they have learned.

**Strategy 4: Wrap up**

Students learn to wrap up by formulating questions and answers about what they have learned and by reviewing key ideas. The goals are to improve students' knowledge, understanding, and memory of what was read (Klingner and Vaughn, 1998).

*Figure 2.3* Schematic representation of Collaborative Strategic Reading (CSR)

**2.5.4 Multi sensory Approach by Kelly and Philips (2011)**

The multisensory approach designed to teach literacy to learners with dyslexia by Kathleen Kelly and Sylvia Philips is based on the principles that any successful multisensory programme should be: structured, multisensory, cumulative and containing opportunities for over learning in order to develop automaticity and improve recall.
Theoretical Overview

Structure

Conquering literacy provides a structured programme, introducing both phonograms and literacy concepts in a particular order. The amount of new learning is strictly controlled so that learners do not encounter too many unfamiliar points in any one lesson. Practice in reading, writing and arithmetic within a lesson is restricted to using only those concepts which have already been taught. This is referred to as ‘working in structure’.

Multisensory

Multisensory teaching builds on a learner’s strong channels while also developing the weaker ones and will help to develop neutral pathways. It involves making clear links between the visual, auditory, kinesthetic, and tactile senses (VAKT).

Cumulative

Teaching points are introduced in a logical sequence of graded steps so that any new point builds on what has previously been taught. There is a progression to the structure in that simpler concepts are taught and learned before more complex concepts are introduced.

Over learning

Over learning is included in each teaching point to secure what is learnt before moving on to the next one. One way of achieving this is to repeat a particular routine or drill until optimal learning is acquired in terms
of accuracy and speed. Over learning is embedded within the cumulative structure of the programme.

Kelly and Philips identified some elements based on these principles to design multisensory approach. The design depicting major elements is represented in the flowchart given below:

![Flowchart depicting the multisensory approach by Kelly and Philip](image)

*Figure 2.4 Flowchart depicting the multisensory approach by Kelly and Philip*

Alphabetic/ dictionary work help the learner to recall and name the letters rapidly and have a secure knowledge of the sequence of alphabetic order. A revision exercise is used to check on a learner’s understanding and
consolidate their previous learning. The aim of memory training is to increase the capacity for storing information in working memory long enough to act on it or store it in the long-term memory. Reading in structure enables the learner to apply their knowledge and skills successfully when reading because they are only required to read words that have been taught already. Written exercise gives an opportunity to reinforce learner’s new learning by undertaking a writing activity. The purpose of quick review is to find out whether the learner has understood the new teaching points introduced in the lesson. Games are included at the end of a lesson so that there is an enjoyable final activity (Kelly & Philips, 2014).

**Conclusion**

The relevant theories so far revealed the significance of early intervention and the need to formulate Individual Education Programme for each child to minimise the problem of learning. The good news is that Learning Disability can be minimised to a great extent by a teacher. For that, when choosing the most appropriate programmes, the teacher should question whether the program is well sequenced and addresses stage-appropriate skills, the overall appearance of the materials should be uncluttered; directions should be simple and clearly understood; and, it should link real-life situations to the concepts taught.