CHAPTER I

INTRODUCTION

1.0. INTRODUCTION

“Education is an all round drawing out of the best in child and man body, mind and spirit” -Mahatma Gandhi

Education promotes all round development of the child, which unites the soul, body and mind of an individual and helps in transmission of entire values. Education is increasingly being perceived as capable of modifying the economic scenario and transforming the dreams of millions of human beings for a better and higher quality of life into a reality. It is an effective system resulting in the development of learner’s potentialities, competencies, interest, attitude and values. In the past this potential and educational rights were denied to the disabled children. Mean while the students with learning difficulties are ignored by the teachers and they become the drop out children.

Every individual is unique and hence Education should cater to the needs of all the individuals in compliance with the constitutional provision of equal opportunity. There are some individuals who, by virtue of their physical and mental abilities, require a more relevant or appropriate instruction than is usually available within formal and informal Education structures. A domain of education has been constructed to satisfy students learning requirements (Laura and Ashman, 1985). This domain is called “Education”.

The main aim of education is to develop harmonious personality of the learner. Education should make pupils fit to live with. In all modern human societies the young are prepared for their future roles through educational process which includes teaching
and testing. Schools are always transitional institutions. They prepare pupils for education or for occupation or for family life and so on.

1.1. EDUCATION SYSTEM IN INDIA

Education in India is provided by the public sector as well as private sector, with control and funding coming from three levels: Central Government, State Government, and Local Self Government. Education in India falls under the control of both the Union Government and the State Governments, with some responsibilities lying with the Union and the States having autonomy for others. The various Articles of the Indian Constitution provide for education as a fundamental right.

India has made progress in terms of increasing the Enrollment Ratio at the Primary Level and expanding literacy to approximately three quarters of the population. India's improved education system is often cited as one of the main contributors to the economic rise of India. Much of the progress, especially in higher education and scientific research, has been credited to various public institutions.

India's education system is divided into different levels such as Pre-Primary Level, Primary Level, Upper Primary Level, Secondary Level, Undergraduate Level and Postgraduate Level. The National Council of Educational Research and Training (NCERT) is the apex body for curriculum related matters for school education in India. The NCERT provides support and technical assistance to a number of schools in India and oversees many aspects of enforcement of education policies.
1.2. PRIMARY EDUCATION SYSTEM IN INDIA

The Constitution of India supports the right of universal education until age 14 and has had a long term goal of free and compulsory education for all children between the ages of 6 and 14. The Indian Government lays emphasis on primary education, referred to as Elementary Education, up to the age of fourteen years. 80% of all recognized schools at the elementary stage are Government run or supported, making it the largest provider of education in the country. The Indian Government has also banned child labour in order to ensure that the children do not enter unsafe working conditions. However, both free education and the ban on child labour are difficult to enforce due to economic disparity and social conditions.

Due to a shortage of resources and lack of political will, this system suffers from massive gaps including high pupil to teacher ratios, shortage of infrastructure and poor levels of teacher training. Figures released by the Indian government in 2011 show that there were 5,816,673 elementary school teachers in India. As of March 2012 there were 2,127,000 secondary school teachers in India. In India Education has also been made free for children of 6 to 14 years age or up to class VIII under the Right of Children to Free and Compulsory Education Act 2009.

The District Education Revitalization Programme (DERP) was launched in 1994 with an aim to universalize primary education in India by reforming and vitalizing the existing primary education system. 85% of the DERP was funded by the Central Government and the remaining 15 percent was funded by the States. The DERP, which had opened 160,000 new schools including 84,000 alternative education schools delivering alternative education to approximately 3.5 million children, was also supported by UNICEF and other international programmes.
The current scheme for universalization of Education for All in India is the Sarva Shiksha Abhiyan (SSA) which is one of the largest education initiatives in the world. There is a significant improvement in staffing and enrollment of students especially girls has also been made as a part of this scheme.

The Government of India began a program for improving the status of primary education in 2001, with the following areas of focus:

i. Increase in teacher appointments and training

ii. Improvement in elementary education content and techniques

iii. Provision of teaching materials

iv. Development of infrastructure

v. Education for disadvantaged groups: girls, disadvantaged castes, and the disabled.

The universalization of primary education in India is mainly focused on strengthening the 3 R’s namely Reading, Writing and Arithmetic among the primary school children.

1.3. DEFINITIONS OF MATHEMATICS

Aristotle defined mathematics as "the science of quantity", and this definition prevailed until the 18th century. Starting in the 19th century, when the study of mathematics increased in rigor and began to address abstract topics such as group theory and projective geometry, which have no clear-cut relation to quantity and measurement, mathematicians and philosophers began to propose a variety of new definitions.

Some of these definitions emphasize the deductive character of much of mathematics, some emphasize its abstractness, and some emphasize certain topics within mathematics. Today, no consensus on the definition of mathematics prevails, even among professionals. There is not even consensus on whether mathematics is an art or a science. A great many
professional mathematicians take no interest in a definition of mathematics, or consider it indefinable; some just say, "Mathematics is what mathematicians do."

An early definition of mathematics in terms of logic was Benjamin Peirce's "the science that draws necessary conclusions" (1870). In the Principia Mathematica, Bertrand Russell and Alfred North Whitehead advanced the philosophical program known as logicism, and attempted to prove that all mathematical concepts, statements, and principles can be defined and proven entirely in terms of symbolic logic. A logicist definition of mathematics is Russell's "All Mathematics is Symbolic Logic" (1903).

Formalist definitions identify mathematics with its symbols and the rules for operating on them. Haskell Curry defined mathematics simply as "the science of formal systems". A formal system is a set of symbols, or tokens, and some rules telling how the tokens may be combined into formulas. In formal systems, the word axiom has a special meaning, different from the ordinary meaning of "a self-evident truth". In formal systems, an axiom is a combination of tokens that is included in a given formal system without needing to be derived using the rules of the system.

1.4. MATHEMATICS EDUCATION

In contemporary education Mathematics Education is the practice of teaching and learning mathematics, along with the associated scholarly research.

Researchers in mathematics education are primarily concerned with the tools, methods and approaches that facilitate practice or the study of practice. However, mathematics education research, known in the continent of Europe as the didactics or pedagogy of mathematics, has developed into an extensive field of study, with its own concepts, theories, methods, national and international organisations, conferences and literature.
Elementary mathematics was part of the education system in most ancient civilisations, including Ancient Greece, the Roman empire, Vedic society and ancient Egypt. In most cases, a formal education was only available to male children with a sufficiently high status, wealth or caste.

In Plato's division of the liberal arts into the trivium and the quadrivium, the quadrivium included the mathematical fields of arithmetic and geometry. This structure was continued in the structure of classical education that was developed in medieval Europe. Teaching of geometry was almost universally based on Euclid's Elements. Apprentices to trades such as masons, merchants and money-lenders could expect to learn such practical mathematics as was relevant to their profession.

The first mathematics textbooks to be written in English and French were published by Robert Recorde, beginning with The Grounde of Artes in 1540. However, there are many different writings on mathematics and math methodology that date back to 1800 BCE. These were mostly located in Mesopotamia where the Sumerians were practicing multiplication and division. There are also artifacts demonstrating their own methodology for solving equations like the quadratic equation. After the Sumerians some of the most famous ancient works on mathematics come from Egypt in the form of the Rhind Mathematical Papyrus and the Moscow Mathematical Papyrus. The more famous Rhind Papyrus has been dated to approximately 1650 BCE but it is thought to be a copy of an even older scroll. This papyrus was essentially an early textbook for Egyptian students.
1.5. OBJECTIVES OF TEACHING MATHEMATICS

At different times and in different cultures and countries, mathematics education has attempted to achieve a variety of the following different objectives.

i. The teaching of basic numeracy skills to all pupils

ii. The teaching of practical mathematics (arithmetic, elementary algebra, plane and solid geometry, trigonometry) to most pupils, to equip them to follow a trade or craft

iii. The teaching of abstract mathematical concepts (such as set and function) at an early age

iv. The teaching of selected areas of mathematics (such as Euclidean geometry) as an example of an axiomatic system and a model of deductive reasoning

v. The teaching of selected areas of mathematics (such as calculus) as an example of the intellectual achievements of the modern world

vi. The teaching of advanced mathematics to those pupils who wish to follow a career in Science, Technology, Engineering, and Mathematics (STEM) fields.

vii. The teaching of heuristics and other problem-solving strategies to solve non-routine problems.

viii. Methods of teaching mathematics have varied in line with changing objectives.

1.5.1. METHODS OF TEACHING MATHEMATICS

The method or methods used in any particular context are largely determined by the objectives that the relevant educational system is trying to achieve. Methods of teaching mathematics include the following:
a. **Conventional approach**: the gradual and systematic guiding through the hierarchy of mathematical notions, ideas and techniques. It starts with arithmetic and is followed by Euclidean geometry and elementary algebra taught concurrently and requires the instructor to be well informed about elementary mathematics, since didactic and curriculum decisions are often dictated by the logic of the subject rather than pedagogical considerations. Other methods emerge by emphasizing some aspects of this approach.

b. **Classical education**: the teaching of mathematics within the quadrivium, part of the classical education curriculum of the Middle Ages, which was typically based on Euclid's Elements taught as a paradigm of deductive reasoning.

c. **Rote learning**: the teaching of mathematical results, definitions and concepts by repetition and memorization typically without meaning or supported by mathematical reasoning. A derisory term is drill and kills. In traditional education, rote learning is used to teach multiplication tables, definitions, formulas, and other aspects of mathematics.

d. **Exercises**: the reinforcement of mathematical skills by completing large numbers of exercises of a similar type, such as adding vulgar fractions or solving quadratic equations.

e. **Problem solving**: the cultivation of mathematical ingenuity, creativity and heuristic thinking by setting students open-ended, unusual, and sometimes unsolved problems. The problems can range from simple word problems to problems from international mathematics competitions such as the International Mathematical Olympiad. Problem solving is used as a means to build new mathematical knowledge, typically by building on students' prior understandings.
f. **New Math**: a method of teaching mathematics which focuses on abstract concepts such as set theory, functions and bases other than ten. Adopted in the US as a response to the challenge of early Soviet technical superiority in space, it began to be challenged in the late 1960s.

g. One of the most influential critiques of the New Math was Morris Kline's 1973 book *Why Johnny Can't Add*. The New Math method was the topic of one of Tom Lehrer's most popular parody songs, with his introductory remarks to the song: "...in the new approach, as you know, the important thing is to understand what you're doing, rather than to get the right answer."

h. **Historical method**: teaching the development of mathematics within an historical, social and cultural context. Provides more human interest than the conventional approach.

i. **Standards-based mathematics**: a vision for pre-college mathematics education in the United States and Canada, focused on deepening student understanding of mathematical ideas and procedures, and formalized by the National Council of Teachers of Mathematics which created the Principles and Standards for School Mathematics.

j. **Relational approach**: Uses class topics to solve everyday problems and relates the topic to current events. This approach focuses on the many uses of math and helps students understand why they need to know as well as helping them to apply math to real world situations outside of the classroom.

k. **Recreational mathematics**: Mathematical problems that are fun can motivate students to learn mathematics and can increase enjoyment of mathematics.

l. **Computer-based mathematics**: an approach based around use of mathematical software as the primary tool of computation.
1.6. LEARNING DIFFICULTIES

The phrase “learning difficulties” became prominent in the 1980s. It is broad in scope, covering general conditions such as Down’s syndrome as well as more specific cognitive or neurological conditions such as dyslexia and attention deficit disorder. In emphasizing the difficulty experienced rather than any perceived ‘deficiency’, it is considered less discriminatory and more positive than other terms such as mentally handicapped, and is now the standard accepted term in Britain in official contexts.

Children and adults with learning difficulties 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 difficulties involve problems with reading, writing, math, reasoning, listening, and speaking.

While learning disability, learning disorder and learning difficulty are often used interchangeably, they differ in many ways. Learning disability refers to significant learning problems in an academic area. These problems, however, are not enough to warrant an official diagnosis. Learning disorder, on the other hand, is an official clinical diagnosis, whereby the individual meets certain criteria, as determined by a professional (psychologist, pediatrician, etc.) The difference is in degree, frequency, and intensity of reported symptoms and problems, and thus the two should not be confused. When the term "learning disabilities" is used, it describes a group of disorders characterized by inadequate development of specific academic, language, and speech skills.

Learning difficulty is a disorder in one or more of the basic psychological process involved in understanding or using spoken or written language, which may appear as an impaired ability to listen, think, speak, read, write, spell, or do mathematical calculations. Learning disabilities, or learning disorders or Learning difficulties, are an umbrella term for a wide variety of learning problems. Kids with learning difficulties aren’t lazy or dumb. In
fact, most are just as smart as everyone else. Their brains are simply wired differently. This difference affects how they receive and process information.

Learning difficulties spread along a spectrum to include many intellectual, emotional, and verbal disorders. It is not only a term for the more common “Attention Deficit Disorder” and autism; instead learning difficulties also cover more basic disorders that directly deal with a child's ability to learn. That is not to say that all learning difficulties do not present some difficulty for a child to learn because they do. However, these learning difficulties have to do with how the children see reading, writing, mathematics, speech, etc. It encompasses subjects directly correlating to a developing child's school career; Hence being familiar with these disabilities, disorder or difficulty can be important to the teachers.

The Department of Health (USA) (2001) describes ‘learning disability’ as:

i. Significantly reduced ability to understand new or complex information, to learn new skills

ii. Reduced ability to cope independently which starts before adulthood with lasting effects on development.

iii. Learning disability or neurobehavioral disorder is a classification including several areas of functioning in which a person has difficulty in learning in a typical manner, usually caused by an unknown factor or factors. In other words, Learning give rise to difficulties in acquiring knowledge and skills to the normal level expected of those of the same age, especially because of mental disability or cognitive disorder

iii. Learning disabilities (LDs) are real. They affect the brain's ability. Children with learning difficulties are not able to receive, process, store, respond and to communicate information.
Learning disabilities are not the same as intellectual disabilities (formerly known as mental retardation), sensory impairments (vision or hearing) or autism spectrum disorders. People with Learning disabilities are of average or above-average intelligence but still struggle to acquire skills that impact their performance in school, at home, in the community and in the workplace. Learning disabilities are lifelong, and the sooner they are recognized and identified, the sooner steps can be taken to circumvent or overcome the challenges they present.

In the 1980s, the National Joint Committee on Learning Disabilities (NJCLD), United States defined the term “learning disability” as a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to Central Nervous System Dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g. sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g.cultural differences, insufficient/inappropriate instruction, psychogenic factors) it is not the direct result of those conditions or influences.

The National Joint Committee on Learning Disabilities used the term to indicate a discrepancy between a child’s apparent capacity to learn and his or her level of achievement.

Learning disabilities or difficulties fall into broad categories based on the four stages of information processing used in learning: input, integration, storage, and output.

**Input:** This is the information perceived through the senses, such as visual and auditory perception. Difficulties with visual perception can cause problems with recognizing the shape, position and size of items seen. There can be problems with sequencing, which can relate to deficits with processing time intervals or temporal perception. Difficulties with
auditory perception can make it difficult to screen out competing sounds in order to focus on one of them, such as the sound of the teacher's voice. Some children appear to be unable to process tactile input. For example, they may seem insensitive to pain or dislike being touched.

**Integration:** This is the stage during which perceived input is interpreted, categorized, placed in a sequence, or related to previous learning. Students with problems in these areas may be unable to tell a story in the correct sequence, unable to memorize sequences of information such as the days of the week, able to understand a new concept but be unable to generalize it to other areas of learning, or able to learn facts but be unable to put the facts together to see the "big picture." A poor vocabulary may contribute to problems with comprehension.

**Storage:** Problems with memory can occur with short-term or working memory, or with long-term memory. Most memory difficulties occur in the area of short-term memory, which can make it difficult to learn new material without many more repetitions than is usual. Difficulties with visual memory can impede learning to spell.

**Output:** Information comes out of the brain either through words, that is, language output, or through muscle activity, such as gesturing, writing or drawing. Difficulties with language output can create problems with spoken language, for example, answering a question on demand, in which one must retrieve information from storage, organize one’s thoughts, and put the thoughts into words before one speaks. It can also cause trouble with written language for the same reasons. Difficulties with motor abilities can cause problems with gross and fine motor skills. People with gross motor difficulties may be clumsy, that is, they may be prone to stumbling, falling, or bumping into things. They may also have trouble
running, climbing, or learning to ride a bicycle. People with fine motor difficulties may have trouble buttoning shirts, tying shoelaces, or with writing.

1.6.1. TYPES OF SPECIFIC LEARNING DIFFICULTIES

Diagnosing a learning difficulty is a process. It involves testing, history taking, and observation by a trained specialist. The experts have classified the children based their ability in memory, retention and recall. The following are the main types of children with learning difficulties.

1.6.1.1. Dyslexia

Dyslexia is a type of learning disability that impairs an individual's ability to read. It is a brain-based disability that causes a person to read at much lower levels than they are expected to. Dyslexia is a disability that is different from person to person, but some of the common characteristics include finding it difficult to spell, to process the way things are phonetically pronounced, and correctly processing quick visual/verbal reactions. As a way to treat dyslexia, teaching is usually modified to adapt to the way dyslexic pupils read and process words. Dyslexia is a life-long disability and it is best that the individual figure out early on what works for them because there is no cure.

1.6.1.2. Dyscalculia

Dyscalculia is a specific type of learning disability that affects an individual and their ability to comprehend and learn mathematical skills. In terms of learning disabilities, it shares a lot of similarities with dyslexia. However, it is not as widely known as dyslexia. Dyscalculia has the ability to affect any individual, no matter the intelligence level and generally refers to a person's difficulty with understanding time, spatial reasoning, and
measurement. But these particular problem areas are not always the case. It is estimated that dyscalculia affects about 5% of the population.

1.6.1.3. Aphasia

Aphasia, commonly referred to as receptive language disability, is affiliated with a child's ability to comprehend and follow verbal instructions. Children with aphasia may struggle with and appear to be helpless when trying to speak or pronounce words. Even repeating some phrases said to them may be an extremely arduous task for a child with an aphasia learning disability. Although the learning disability does have a proven effective treatment called melodic intonation therapy, this treatment is not true for all aphasia cases. Aphasia can be dealt with on a day to day basis by others using eye contact and speaking slowly with simple words to the child.

1.6.1.4. EXPRESSIVE LANGUAGE DISABILITY

Expressive language disability is a disorder affecting communication where an individual has difficulty with written and spoken communication. This creates issues with an individual's ability to produce complex sentences, their vocabulary, recalling words that they once learned, as well as potentially creating issues with their ability to articulate words. This disability not only affects an individual's ability to produce speech, but also to retain memories. An apparent memory problem occurs, but is only detrimental toward the verbal aspect of things, whereas the unspoken based memory remains unaffected. It is a disability that cannot go away on its own and can be treated by a specific type of speech therapy. It affects not only the individual's performance in school, but also his/her work later on.
1.6.1.5. NONVERBAL LEARNING DISABILITY

Nonverbal learning disability deals with a child learning more through sound than sight. The child suffers from poor visualization skills and therefore depends on hearing to learn rather than seeing. This is one of the lesser common learning difficulties because even with the adherence of seeing poorly, the child will still have average to above average grades. However, the child is always going to sort of lag behind her fellow pupils because as he or she grows and becomes familiar with his or her environment the strong hearing ability they once had begins to kind of cripple them. Social skills and coordination are two of the things that suffer because of this.

1.6.1.6. DYSPRAXIA OR DEVELOPMENT COORDINATION DISORDER

Dyspraxia is a difficulty with coordination and the organization of movement thought – processing can also be affected. There may be difficulties judging socially acceptable behaviour, anxiety in unfamiliar situations, orientation/place- findings problems and the experience of sensory over load. Articulation and pronunciation may also be affected. In common with dyslexia, there are memory and organizational weaknesses.

1.6.1.7. PERCEPTUAL DISABILITY (AUDITORY/VISUAL PROCESSING DISORDER)

A student that has a perceptual disability might have difficulty accurately processing and organizing information visually, Auditory and tactiley (touching) information-despite having normal vision and hearing.

1.7. LEARNING DIFFICULTIES IN MATHEMATICS

Mathematics learning is like acquiring a new language and it can be difficult for some children. It has a semiotic system different from that of the linguistic system that we called
language. Mathematics has its own set of vocabulary and symbols that convey meanings best understood within its own context. In learning to read, the key component underlying early reading development is phonological awareness. In the same way, in learning to count and compute, the concept of number sense plays a similar role – like that of phonemic sense in reading – in mathematics learning (Gersten & Chard, 2001).

As with phonological awareness, the early conceptual knowledge of numbers usually develops during the preschool years and most children have an initial understanding in place by the ages of 4 to 5 years (Griffin & Case, 1997). It has been found that children with reading problems tend to display problems incomprehension and discerning information essential for the identification and execution of accurate solution strategies in mathematical problem solving (Bryant, Kim, Hartman, & Bryant, 2006).

On the other hand, those who have learning difficulties in mathematics without reading problems typically do not have phonological deficits, but they frequently display visual-spatial mathematics has always been a challenging academic subject in school. It consists of numerous domains that continue to develop in a cumulative manner toward increasingly complex topics (Woodward, 2004). Hence, it is not surprising to note that many children perceive mathematics as a boring and tedious subject they have to learn in school and that it requires them to memorize rules and applying them. If they do get correct answers for the exercises they did, it is often assumed that they have understood the mathematical concepts. However, this is not a true picture of having attained mathematical knowledge and competence. In fact, it is often much later that learning problems, especially in the area of mathematical comprehension (essential for solving mathematical problem-solving), begin to crop up revealing a serious lack of real understanding of fundamental mathematical concepts. When children encounter difficulties in mathematics learning, the seemingly common
reaction to resolve the issue is to get them to practice more because most of us believe that practice makes perfect.

Chan (2009) has encouraged mathematics teachers to take time to reflect and ponder why there are children who continue to fail learning mathematics despite extra remedial lessons and provision of learning support for mathematics. In this way, Chan (2009) argues, we should be able to observe and/or examine “the errors these children have committed, misconceived or responded in certain ways when working out sums or mathematical problems”. From this observation or examination of error patterns, we can actually learn more and thus, become better equipped to manage the various learning difficulties children encounter in their mathematics learning.

1.7.1. LEARNING DIFFICULTIES AND DISABILITIES IN MATHEMATICS

According to Wendling and Mather (2009), it is estimated that between 5-8% of school-age children manifest significant problems in mathematics learning and it also includes those with dyscalculia (Garnett, 1998, and Geary, 2004) and more than 60% of them diagnosed with a learning disability in reading are also performing poorly in mathematics (McLeskey & Waldron, 1990). Learning problems in Mathematics depending on the varying degrees of severity, can range from being a learning disorder (level 6; most severe) to just having a learning disadvantage (level 1; least severe) on a rating scale of six (Chia & Wong, 2010). However, the focus of the present study is on learning disabilities (level 5) and learning difficulties (level 4) relating in mathematics learning.

According to the Australia’s National Health and Medical Research Council (NHMRC)(1990), learning difficulties and learning disabilities are different. Learning difficulties is a generic term referring to “the substantial proportion (16%-19%) of children and adolescents who exhibit problems in developmental and academic skills. These difficulties are considered to result from one or more of the following factors: intellectual
disability, physical and sensory defects, emotional difficulties, inadequate environmental experiences, lack of appropriate educational opportunities” On the other hand, difficulties (Geary, 2007).

Learning disabilities refer to “the much smaller proportion (2%-4%) of children and adolescents who exhibit problems in developmental and academic skills which are significantly below expectation for their age and general ability. The disabilities, which often include severe and prolonged directional confusion, sequencing and short-term retention difficulties, are presumed to be intrinsic to the individual, but they are not considered to be the direct result of intellectual disability, physical and sensory defects or emotional difficulties. Neither do they appear to derive directly from inadequate environmental experiences or lack of appropriate educational experiences” (NHMRC, 1990).

From the definitions of learning difficulties and learning disabilities as given by NHMRC (1990), both terms mean different learning problems in terms of the degree of severity as well as their respective prevalence. When the term dyscalculia is used, we are referring to learning disability or disorder in mathematics. Chia and Yang (2009) have defined dyscalculia as the disorder of an ability “to compute, where the level of mathematical ability falls below that expected for an individual’s age and intelligence. A generic term for a syndrome that covers a wide range of life-long learning difficulties of developmental, acquired, or psycho-socio genic origin with a varying degree of severity involving many aspects of mathematics in the process of learning”. “The complexity of numerical processing has made defining what it means to have a specific mathematical learning disability or difficult” (Butterworth, 2003).

The disorder results in poor ability to conceptualize, comprehend, and manipulate, i.e., to count, select, and/or “subitise”, to use Butterworth’s (1999) coined term, numbers, symbols and concepts, problems in understanding and remembering fundamental quantitative
concepts, rules, formulas and equations, and difficulties in performing mathematical operations in the correct sequence as well as solving story problems. Unlike dyscalculia or learning disabilities in mathematics, Chan (2009) has defined learning difficulties in mathematics as those challenging issues that concern children “who can learn but are misconceiving, developing error patterns, finding it hard to understand prescribed steps, having trouble visualizing or misunderstanding instructions”. In addition, Chan (2009) has identified the following areas of learning difficulties in mathematics that Singaporean children constantly encounter in the subject: numbers, measurement, geometry, fractions, ratio, percentage, and rate and speed.

1.7.2. FACTORS AFFECTING MATHEMATICS LEARNING

There are several factors that affect mathematics learning: short-term memory (for computation), long-term memory (for mathematical information), number sense, ability to follow directions (e.g., sequences, reverses, and left-to-right working), visual-spatial perceptual abilities (e.g., presentational aspect, and layout), speed of mathematical performance (e.g., expectation to finish), reading skills, organizational skills, and checking for answers (Chinn, 2004). Deficits in any of these factors will impair mathematics learning and Geary (1993) has identified three subtypes of learning difficulties in mathematics: procedural difficulties (e.g., using developmentally immature strategies to solve problems and making frequent errors in execution of procedures), semantic difficulties (e.g., difficulty learning and retrieving mathematical facts) and visuo-spatial difficulties (e.g., difficulty with the spatial representation of numbers in alignment or reversals, and making place value errors) in mathematics. In addition, problems in mathematics learning include lack of spatial awareness, poor problem solving strategies and motor perceptual difficulties (El-Nagger, 2001).
Misconceptions and error patterns are also manifested when children over-generalize (i.e., jumping into a quick conclusion) or over-specialize (i.e., being too restrictive) (Ashlock, 2002; Chia & Ng, 2010a). The most prevalent learning difficulty in mathematics concerns problems in storing and retrieving basic mathematical facts (Geary, 1993, 2007; Rourke & Conway, 1997). In an unpublished study of Chia and Ng (2010b), they found that this has to do with weak short-term memory needed for computation and solving story problems as well as poor long-term memory for mathematical information. These subjects were found to have performed poorly on the Arithmetic, Digit Span and Letter-Number Sequencing subtests of the Working Memory Index in the Wechsler Intelligence Scale for Children (4th Edition) or WISC-IV (Wechsler, 2003) for short. In other words, for an accurate representation of the mathematical fact to be stored and retrieved later, a learner must hold all elements of the fact in his/her working memory. Simultaneously (Geary, 2007). Bryant, Bryant, and Hammill (2000), in their respective studies, have highlighted another equally serious problem for children, who struggle with basic mathematical computation or counting, is their difficulty in completing arithmetic problems that involve multiple-steps. Other research studies (e.g., Bull & Johnston, 1997; Fuchs et al., 2008; Geary, 2007) have identified several cognitive correlates that are shown to affect basic mathematical performance that involves memory, attention-concentration span, processing speed, and language proficiency. Moreover, findings from additional studies (e.g., Chia & Ng, 2010b; Hecht, Torgesen, Wagner, & Rashotte, 2001) have found that measures of processing speed are good predictors of competence in mathematical computation.

Mathematical comprehension, according to Chia and Ng (2010), consists of the following three components (a) Numerical knowledge: First, children should understand the representation of numbers by symbols. For instance, $\frac{1}{2}$ is the same as 50% or half of a whole. $\frac{1}{4}$ is the same as 25% or one quarter of a whole. Second they also need to be able to identify a
number with a written symbol, e.g., 1 is one. A child with difficulty in this skill may count well but be unable to read numbers. Third, children must possess the ability to remember and write down numbers. Fourth, they must be able to read and understand arithmetical symbols such as = and %. Children with difficulty in this area may be low in working out what such a sign means when they see it written down. Lastly, they must be able to deal with constant mathematical proportions, e.g., $4+2=3+3$; $1:2=7:14$. (b) Numerical order: Besides, children must also possess the ability to establish numerical order. Any child with difficulty in this skill may encounter learning the multiplication tables. Mathematical comprehension also includes understanding words and phrases, besides symbols, used in mathematics learning that constitute mathematical vocabulary. For example, “a sum of” is the same as “altogether”, “total”, “how much/how many in all”, and is represented by the symbol +. Another example is the word product, which is also related to multiply, “how many” times, can also include words like “twice more than”, “thrice as much/many” and “six times as much/many”, and is represented by the symbol X. Studies (e.g., Bryant et al., 2008; Fuchs et al., 2008; Wiig & Semel, 1984) have shown that limited knowledge of mathematical knowledge can affect story problem solving skills due to poor mathematical comprehension.

In addition, mathematical comprehension includes background information and daily life experience as well as analytical skills needed for comprehending the story problem(s) as well as looking for key clues required to solve the problem(s). Using the two arithmetic operations + and X to illustrate what mathematical comprehension is: Sowmiya has 7 marbles. Deepak has two times as many as Sowmiya. Another friend of Sowmiya by name Shalini, has twice more than Sowmiya. How many marbles do the three of them have altogether? Poor word knowledge or for vocabulary in mathematics learning can affect performance in solving routine as well as non-routine problem stories, especially when a child does not know what the problem story is all about, the key clues the child is to look out
for, and what he/she is supposed to solve (Ng, 2005). In this problem, the key clues are two
times as many as twice more than and how many … altogether. These phrases have different
meanings: two times as many as is not the same as twice more than. Mathematical
comprehension involves more than mathematical vocabulary; it also precludes mathematical
sense (logic) as in the following illustration: A = C; B = C; A =B? Logically, A = B since
both share the same answer C. Mathematical comprehension is conceptually dense and
difficult and unlike reading, contextual clues are limited or even non-existent for many story
problems (Bryant et al., 2000; Wendling & Mather, 2009; Wiig & Semel, 1984). Returning to
the story problem given in the illustration above, the answer is 42.

In most cases, many students have failed to give the correct answer. Below is
one procedure how the answer is obtained: finally, it has been reported that the attitude
toward mathematics learning can also impact a child’s performance. According to Montague
(1996), “A history of academic failure can inhibit the student’s desire to perform in
mathematics as well as negatively impact his or her self-confidence regarding mathematics”.
Hence, such “early failures in mathematics learning can result in anxiety about performance
in mathematics learning and this can continue into high school, college and adulthood”
(Wendling & Mather, 2009).

While children with disorders in mathematics are specifically included under the
definition of Learning Disabilities, seldom do math learning difficulties cause children to be
referred for evaluation. In many school systems, special education services are provided
almost exclusively on the basis of children's reading disabilities. Even after being identified
as learning disabled (LD), few children are provided substantive assessment and remediation
of their arithmetic difficulties.
This relative neglect might lead parents and teachers to believe that arithmetic learning problems are not very common, or perhaps not very serious. However, approximately 6% of school-age children have significant math deficits and among students classified as learning disabled, arithmetic difficulties are as pervasive as reading problems. This does not mean that all reading disabilities are accompanied by arithmetic learning problems, but it does mean that math deficits are widespread and in need of equivalent attention and concern.

Evidence from learning disabled adults belies the social myth that it is okay to be rotten at math. The effects of math failure throughout years of schooling, coupled with math illiteracy in adult life, can seriously handicap both daily living and vocational prospects. In today's world, mathematical knowledge, reasoning, and skills are no less important than reading ability.

1.7.3. DIFFERENT TYPES OF MATHEMATICS LEARNING PROBLEMS

As with students' reading disabilities, when math difficulties are present, they range from mild to severe. There is also evidence that children manifest different types of disabilities in math. Unfortunately, research attempting to classify these has yet to be validated or widely accepted, so caution is required when considering descriptions of differing degrees of math disability. Still, it seems evident that students do experience not only differing intensities of math dilemmas, but also different types, which require diverse classroom emphases, adaptations and sometimes even divergent methods.
1.7.4. MASTERING BASIC NUMBER FACTS

Many learning disabled students have persistent trouble "memorizing" basic number facts in all four operations, despite adequate understanding and great effort expended trying to do so. Instead of readily knowing that \(5+7=12\), or that \(4\times6=24\), these children continue laboriously over years to count fingers, pencil marks or scribbled circles and seem unable to develop efficient memory strategies on their own. This represents their only notable math learning difficulty and, in such cases, it is crucial not to hold them back "until they know their facts." rather, they should be allowed to use a pocket-size facts chart in order to proceed to more complex computation, applications, and problem-solving. As the students demonstrate speed and reliability in knowing a number fact, it can be removed from a personal chart. Addition and multiplication charts also can be used for subtraction and division respectively. For specific use as a basic fact reference, a portable chart (back-pocket-size, for older students) is preferable to an electronic calculator. Having the full set of answers in view is valuable, as is finding the same answer in the same location each time since where something is can help in recalling what it is. Also, by blackening over each fact that has been mastered, over reliance on the chart is discouraged and motivation to learn another one is increased. For those students who have difficulty locating answers at the vertical/horizontal intersections, it helps to use cutout cardboard in a backward L-shape. Those curriculum materials offer specific methods to help teach mastering of basic arithmetic facts. The important assumption behind these materials is that the concepts of quantities and operations are already firmly established in the student's understanding. This means that the student can readily show and explain what a problem means using objects, pencil marks, etc. Suggestions from these teaching approaches include:

i. Interactive and intensive practice with games of motivational materials

ii. Distributed practice,
iii. Small numbers of facts per group to be mastered at one time then, frequent practice with mixed groups

iv. Emphasis is on "reverses," or "turnarounds" (e.g., $4 + 5/5 + 4$, $6x7/7x6$) vertical, horizontal, and oral formats

v. Student self-charting of progress...having students keep track of how many and which facts are mastered and how many more there are to be mastered.

vi. Instruction to ‘Teaching thinking strategies from one fact to another’ (e.g., doubles facts, $5 + 5, 6 + 6$, etc. and then double-plus-one facts, $5 + 6, 6 + 7$, etc.).

### 1.7.5. ARITHMETIC WEAKNESS/MATHEMATICS TALENT

There are students with learning difficulties. Some learning disabled students have an excellent grasp of math concepts, but are inconsistent in calculating. They are reliably unreliable at paying attention to the operational sign, at borrowing or carrying appropriately, and at sequencing the steps in complex operations. These same students also may experience difficulty mastering basic number facts.

Interestingly, some of the students with these difficulties may be remedial math students during the elementary years when computational accuracy is heavily stressed, but can go on to join honors classes in higher math where their conceptual prowess is called for. Clearly, these students should not be tracked into low level secondary math classes where they will only continue to demonstrate these careless errors and inconsistent computational skills while being denied access to higher-level math of which they are capable. Because there is much more to mathematics than right-answer reliable calculating, it is important to access the broad scope of math abilities and not judge intelligence or understanding by observing only weak lower level skills. Often a delicate balance must be struck in working with learning disabled math students which include:
a. Acknowledging their computational weaknesses

b. Maintaining persistent effort at strengthening inconsistent skills;

c. Sharing a partnership with the student to develop self-monitoring systems and ingenious compensations; and at the same time, providing the full, enriched scope of math teaching.

1.7.6. THE WRITTEN SYMBOL SYSTEM AND CONCRETE MATERIALS

Many younger children who have difficulty with elementary math actually bring to school a strong foundation of informal math understanding. They encounter trouble in connecting this knowledge base to the more formal procedures, language, and symbolic notation system of school math. The collision of their informal skills with school math is like a tuneful, rhythmic child experiencing written music as something different from what he/she already can do. In fact, it is quite a complex feat to map the new world of written-math symbols onto the known world of quantities, actions and, at the same time to learn the peculiar language we use to talk about arithmetic. Students need many repeated experiences and many varieties of concrete materials to make these connections strong and stable.

Teachers often compound difficulties at this stage of learning by asking students to match pictured groups with number sentences before they have had sufficient experience relating varieties of physical representations with the various ways we string together math symbols, and the different ways we refer to these things in words. The fact that concrete materials can be moved, held, and physically grouped and separated makes them much more vivid teaching tools than pictorial representations. Because pictures are semiabstract symbols, if introduced too early, they easily confuse the delicate connections being formed between existing concepts, the new language of math, and the formal world of written number problems.
In this same regard, it is important to remember that structured concrete materials are beneficial at the concept development stage for math topics at all grade levels. There is research evidence that students who use concrete materials actually develop more precise and more comprehensive mental representations, often show more motivation and on-task behavior, may better understand mathematical ideas, and may better apply these to life situations. Structured, concrete materials have been profitably used to develop concepts and to clarify early number relations, place value, computation, fractions, decimals, measurement, geometry, money, percentage, number bases story problems, probability and statistics), and even algebra.

Of course, different kinds of concrete materials are suited to different teaching purposes (see appendix for selected listing of materials and distributors). Materials do not teach by themselves; they work together with teacher guidance and student interactions, as well as with repeated demonstrations and explanations by both teachers and students.

Often students' confusion about the conventions of written math notation are sustained by the practice of using workbooks and ditto pages filled with problems to be solved. In these formats, students learn to act as problem answerers rather than demonstrators of math ideas. Students who show particular difficulty ordering math symbols in the conventional vertical, horizontal, and multi-step algorithms need much experience translating from one form to another. For example, teachers can provide answered addition problems with a double box next to each for translating these into the two related subtraction problems. Teachers can also dictate problems (with or without answers) for students to translate into pictorial form, then vertical notation, then horizontal notation. It can be helpful to structure pages with boxes for each of these different forms.
Students also can work in pairs translating answered problems into two or more different ways to read them (e.g., 20 x 56 = 1120 can be read twenty times fifty-six equals one thousand, one hundred and twenty or twenty multiplied by fifty-six is one thousand, one hundred, twenty). Or, again in pairs, students can be provided with answered problems each on an individual card; they alternate in their demonstration, or proof, of each example using materials (e.g., bundled sticks for carrying problems). To add zest, some of the problems can be answered incorrectly and a goal can be to find the "bad eggs."

Each of these suggestions is intended to move youngsters out of the rut of thinking of math as getting right answers or giving up. They help create a frame of mind that connects understanding with symbolic representation, while attaching the appropriate language variations.

1.7.7. THE LANGUAGE OF MATHEMATICS

Some Learning Difficulty students are particularly hampered by the language aspects of math, resulting in confusion about terminology, difficulty following verbal explanations, and/or weak verbal skills for monitoring the steps of complex calculations. Teachers can help by slowing down the pace of their delivery, maintaining normal timing of phrases, and giving information in discrete segments. Such slowed down "chunking" of verbal information is important when asking questions, giving directions, presenting concepts, and offering explanations.

Equally important is frequently asking students to verbalize what they are doing. Too often, math time is filled either with teacher explanation or with silent written practice. Students with language confusions need to demonstrate with concrete materials and explain what they are doing at all ages and all levels of math work, not just in the earliest grades. Having students regularly "play teacher" can be not only enjoyable but also necessary for
learning the complexities of the language of math. Also, understanding for all children tends to be more complete when they are required to explain, elaborate, or defend their position to others; the burden of having to explain often acts as the extra push needed to connect and integrate their knowledge in crucial ways.

Typically, children with language deficits react to math problems on the page as signals to do something, rather than as meaningful sentences that need to be read for understanding. It is almost as though they specifically avoid verbalizing. Both younger and older students need to develop the habit of reading or saying problems before and/or after computing them. By attending to the simple steps of self-verbalizing, they can monitor more of their attention slips and careless errors. Therefore, teachers should encourage these students to:

i. Stop after each answer,

ii. Read aloud the problem and the answer, and

iii. Make students listen to themselves and ask, "Does that make sense?"

For youngsters with language weakness may take repeated teacher modeling, patient reminding and much practice using a cue card as a visual reminder.

1.7.8. VISUAL-SPATIAL ASPECTS OF MATHEMATICS

A small number of Learning Disability students have disturbances in visual-spatial-motor organization, which may result in weak or lacking understanding of concepts, very poor "number sense," specific difficulty with pictorial representations and/or poorly controlled handwriting and confused arrangements of numerals and signs on the page. Students with profoundly impaired conceptual understanding often have substantial perceptual-motor deficits and are presumed to have right hemisphere dysfunction.
This small subgroup may well require a very heavy emphasis on precise and clear verbal descriptions. They seem to benefit from substituting verbal constructions for the intuitive/spatial/relational understanding they lack. Pictorial examples or diagrammatic explanations can thoroughly confuse them, so these should not be used when trying to teach or clarify concepts. In fact, this subgroup is specifically in need of remediation in the area of picture interpretation, diagram and graph reading, and nonverbal social cues.

To develop an understanding of math concepts, it may be useful to make repeated use of concrete teaching materials (e.g., Stern blocks, Cuisenaire rods), with conscientious attention to developing stable verbal renditions of each quantity (e.g., 5), relationship (e.g., 5 is less than 7), and action (e.g., 5+2=7). Since understanding visual relationships and organization is difficult for these students, it is important to anchor verbal constructions in repeated experiences with structured materials that can be felt, seen, and moved around as they are talked about. For example, they may be better able to learn to identify triangles by holding a triangular block and saying to themselves, "A triangle has three sides. When we draw it, it has three connected lines." For example, a college freshman who had this deficit could not "see" what a triangle was without saying this to her when she looked at different figures or attempted to draw a triangle.

The goal for these students is to construct a strong verbal model for quantities and their relationships in place of the visual-spatial mental representation that most people develop. Consistent descriptive verbalizations also need to become firmly established in regard to when to apply math procedures and how to carry out the steps of written computation. Great patience and verbal repetition are required to make small incremental steps.
It is important to recognize that average, bright, and even very bright youngsters can have the severe visual-spatial organization deficits that make developing simple math concepts extremely difficult. When such deficits are accompanied by strong verbal skills, there is a tendency to disbelieve the impaired area of functioning. Thus, parents and teachers can spend years growling, "Students just not trying, they do not pay attention, they must have a math phobia. It's probably an emotional problem." Because other accompanying weaknesses usually include a poor sense of body in space, difficulty reading the nonverbal social signals of gesture and face, and often nightmarish disorganization in the world of "things," it can be easy to mistake the problem for a constellation of emotional symptoms. Misreading the problems in this way delays the appropriate work that is needed both in mathematics and the other areas.

1.7.9. READINESS FOR NUMBER INSTRUCTION

Piaget (1965) describes several concepts basic to understanding numbers; classification, ordering and serration, one-to-one correspondence, and conservation. Mastering these concepts is necessary for learning higher –order math skills.

Classification is one of the most basic intellectual activities and must precede work with numbers (Piaget, 1965). It involves a study of relationships, such as likenesses and differences. Activities include categorizing objects according to a specific property. For example, children may group buttons according to color, then size, then shape, and so on. Most children 5 to 7 years old can judge objects as being similar or dissimilar on the basis of properties such as color, shape, size, texture, and function (Copeland, 1979).

Ordering is important for sequencing numbers. Many children do not understand order until they are 6 or 7 years of age (Copeland, 1979). They first must understand the topological relation of order. When counting objects, students must order them so that each object is counted only once. The teacher can display objects in a certain order and ask the
students to arrange identical objects in the same order. Ordering activities include sequencing blocks in a certain pattern, lining up for lunch in a specific order, and completing pattern games – for example, students are given a series such as and then must determine what goes in the blank.

Topological ordering involves arranging a set of items without considering a quantity relationship between each successive item. The combination of serration and ordering, however, involves ordering items on the basis of change in a property, such as length, size, or color. An example of a serration task would be arranging items of various lengths in an order from shortest to longest with each successive item children 6 to 7 years old usually master ordering and serration (Copeland, 1979).

One – to – one correspondence is the basis for counting to determine how many and is essential for mastering computation skills. It involves understanding that one object in a set is the same number as one object in a different set, whether or not characteristics are similar. If a teacher places small buttons in a glass one at a time and the students place the same number of large buttons one at a time in a glass, the glass containing the large buttons soon displays a higher stack. If students respond “yes” to the question “Does each glass have the same number of buttons, “they understand one – to – one correspondence. If they respond “No, because the buttons are higher in one glass, “they are not applying one – to – one correspondence and instead are judging on the basis of sensory cues. Most children 5 to 7 years old master the one – to – one correspondence concept. Initial activities consist of matching identical object whereas later activities should involve different objects. Sample activities are giving one pencil to each head with a hat, and matching a penny to each marble.
1.7.10. READINESS FOR MORE ADVANCED MATHEMATICS

Once formal math instruction begins, students must master operations and basic axioms to acquire skills in computation and problem solving operations are well known: addition, subtraction, multiplication, and division. Basic axioms are less familiar. Some axioms that are especially important for teaching math skills to students with learning disabilities are the commutative property of addition and multiplication over addition, and inverse operations for addition and multiplication.

a. **Commutative Property of Addition.**

No matter what order the same numbers are combined, in the sum remains constant:

\[ a + b = b + a \]
\[ 3 + 4 = 4 + 3 \]

b. **Commutative Property of Multiplication.**

Regardless of the order of the numbers being multiplied, the product remains constant:

\[ a \times b = b \times a \]
\[ 9 \times 6 = 6 \times 9 \]

Associative property of Addition and Multiplication: Regardless of grouping arrangements, the sum or product is unchanged:

Addition

\[ (a + b) + c = a + (b + c) \]
\[ (4 + 3) + 2 = 4 + (3 + 2) \]

Multiplication

\[ (a \times b) \times c = a \times (b \times c) \]
\[(5 \times 4) \times 3 = 5 \times (4 \times 3)\]

Distribute Property of Multiplication over Addition.

This rules relate the two operations

\[a(b + c) = (a \times b) + (a \times c)\]

\[5(4 + 3) = (5 \times 4) + (5 \times 3)\]

Inverse Operations: These axioms relate operations that are opposite in their effects. The following equations demonstrate inverse operations:

Addition and Subtraction

- \[a + b = c\]
- \[c - a = b\]
- \[c - b = a\]

\[a + b = c\]
\[5 + 4 = 9\]
\[9 - 5 = 4\]
\[9 - 4 = 5\]

Multiplication and Division

- \[a \times b = c\]
- \[c \div a = b\]
- \[c \div b = a\]

\[a \times b = c\]
\[9 \times 3 = 27\]
\[27 \div 9 = 3\]
\[27 \div 3 = 9\]

1.7.11. SPECIFIC LEARNING DISABILITIES IN MATHEMATICS

Many educators believe that too many students are failing to acquire essential mathematical concepts skills, and problems – solving strategies unfortunately; students with learning disabilities represent a sizeable number of students who are failing to make acceptable progress in mathematics (Cawley & Millier, 1989; Schied, 1990). The individual with disabilities education Act (IDEA), India lists mathematics calculations and mathematics reasoning as two areas in which a student can have learning disabilities. Since the passage of public Law 94 – 142 in 1975 (MHRD, India), knowledge about the characteristics of students with learning disabilities that relate to mathematics learning has
expanded rapidly. An examination of these characteristics provides an improved understanding of math disabilities and insights into how to plan better mathematics instruction.

Peterson, Carpenter, and Fennema’s (1986) finding that the teacher’s knowledge of an individual student’s problem – solving skills predicated math achievement better than the teacher’s knowledge of problem solving or number fact strategies underscores the need for teachers to be aware of the learning characteristics of their students. This learner-specific knowledge was positively correlated with the teacher presenting problems for students, questioning students about methods they used to solve problems, and listening to students. Thus, knowledge of a student enables the teacher to interact more prescriptively with a student to enhance achievement and motivation (e.g., asking appropriate questions, modeling cognitive processes, monitoring processes, and providing feedback and encouragement).

1.7.12. GENERAL CHARACTERISTICS

Although each student is unique, an examination of the characteristics of students with learning disabilities alerts the teacher or researcher to learning factors that deserve inspection when planning and teaching. Some students with learning disabilities have achievement problems (e.g., reading disabilities, written expression disabilities, or math disabilities). Many of these individuals have histories of academic failure and have developed a learned helplessness about math (Parmar & Cawley 1991). It is postulated that learned helplessness in math results from youngest trying to solve problems when they have little or no understanding of mathematical concepts (e.g., when students practice computing multiplication means).

This lack of understanding fosters the student’s dependency on the teacher and thus promotes the notion that external help is needed to compute problems correctly. Repetition of this scenario promotes and strengthens learned helplessness. Likewise, it helps create passive
learners, a term that frequently is used to describe students with learning disabilities and refers to students who are cognitively passive because they typically do not participate actively or self-regulate their own learning (Parmar & Cawley 1991) given their experiences; it is not surprising that many of these students are characterized as having motivational deficits. Attention deficits (Zentall & Ferkis, 1993), memory deficits (Garnet, Mellard, & Deshler, 1993), and information – processing deficits (Torgesen, 1990) traditional have been cited as learning processes that contribute to poor math achievement. These and other factors combine in intricate ways to produce students with learning disabilities who fail to develop automatically with basic math facts or operation, to use efficient strategies for computing answer or salving word problems, and to transfer their knowledge across settings or math problems (Garnett, 1992; Kulak, 1993; woodward, 1991)

The characteristics of students with learning difficulties and their implied relationship to mathematics performance traditionally, perceptual, attention, memory, mother and language problems have received the most attention in examinations of the math deficiencies of students with learning difficulties.

Given that many students with learning difficulties use qualitatively different strategies in math from students who are high achievers, it is important for teachers to ascertain the strategies that students are using. This information is critical to designing instruction because evidence indicates that different students need different types of strategy instruction (Swanson, 1990). Learning strategy instruction can help students become successful self-regulated and potential outcomes will encourage educators to examine students thought processes and design strategies that are most parsimonious for individual student success.
1.7.13. SOCIAL AND EMOTIONAL FACTORS

The affective domain also is recognized as an important variable in the math performances of students with learning disabilities. For example it is believed that repeated academic failures frequently result in low self-esteem and passivity in mathematical learning (Cherkes-Julkowski, 1985). The emotional reaction of some individuals to math is so negative that they develop math anxiety) This condition is believed to stem from a fear of school failure and low self-esteem and causes students to become so tense that their ability to solve, learn, or apply math is impaired (Slavin, 1991).

Arousal Deficit Theory provides a tentative explanation for math anxiety. This theory maintains the existence of a biological arousal system that regulates alertness across situations. A low level arousal is associated with relaxing among friends. Whereas perceiving a threat to ones safely engender a high level of arousal. The arousal deficit theory suggests that the arousal system of certain individuals with learning disabilities, especially those with attention deficit disorder, fails to function properly. Specifically, it is postulated that their arousal system generates too much arousal during pressure situation. If this happens during a math test of lesson, the excessive arousal leads to anxiety and results in confused thinking disorganization avoidance behavior, and math phobia (Conte, 1991 Zentall & Zantall 1983)

1.7.14. PERSPECTIVES ON MATHEMATICS DISABILITIES

An examination of the literature suggests that many individuals with learning disabilities have learning social or emotional characteristics that predispose them for mathematical disabilities. Although some students with learning disabilities have a learning disability only in mathematics, many others have a combination of academic disabilities. (e.g reading disability and math disability). Lovitt (1989) notes that other disabilities represent correlates of failure handwriting disabilities can have a strong negative influence on math performance.
Cowley et al. (1987) examined the responses of students with learning disabilities on problem-solving tasks (word problems) and recorded 97 different responses to a single item.

In a study of responses to multiplication problems the incorrect responses were classified into 35 different error categories. The heterogeneity becomes more of an issue when students without disabilities, at-risk students, and students with learning disabilities and mild retardation participate continuously in the same math lessons. Recently, Parmer, Cawley, and Miler (1994) found that students with learning disabilities and mild retardation perform differently and require differentiated instruction. Moreover, Kavale, Fuchs, and Scruggs (1994) report that students with learning disabilities and low achievers have differential learning characteristics. The complexity of math disabilities and learning characteristics is enormous, but several perspectives make it less intimidating to the educator.

The increased interest and research in mathematics are resulting in a better understanding of math disabilities and, perhaps, will lead to some meaningful subtyping among student performance of students with learning disabilities has occurred within instructional programs that do not represent best practices in math instruction. Many authorities (Carnine, 1991; Cawley et al. 1987; Kelly, Gersten, & Carmine, 1990; Scheid, 1990) believe that poor or traditional instruction is a primary cause of the math difficulties of many students with learning disabilities. Numerous studies with math disabilities can be taught to improve their mathematical performance (Kirby & Becker, 1988; Mastropieri et al. 1991; Mercer & Miller, 1992b Rivera & Smith, 1988; Scheid, 1990).

It is encouraging that these successful interventions do not require instructional adaptations for each type of math disability or error pattern. In many cases, successful interventions represent procedures that teachers readily can implement. It is plausible that the widespread use of best practices in math instruction would greatly reduce the number of students who have math disabilities. This in turn, would decrease the heterogeneity resulting
from error patterns, inefficient or ineffective strategies, and faulty algorithms that originate from limited or no understanding of math concepts.

Math learning difficulties are common, significant, and worthy of serious instructional attention in both regular and special education classes. Students may respond to repeated failure with withdrawal of effort, lowered self-esteem, and avoidance behaviors. In addition, significant math deficits can have serious consequences on the management of everyday life as well as on job prospects and promotion.

Mathematics learning problems range from mild to severe and manifest themselves in a variety of ways. Most common are difficulties with efficient recall of basic arithmetic facts and reliability in written computation. When these problems are accompanied by a strong conceptual grasp of mathematical and spatial relations, it is important not to bog the student down by focusing only on remediating computation. While important to work on, such efforts should not deny a full math education to otherwise capable students.

Language difficulties, even subtle ones, can interfere with math learning. In particular, many Learning Difficulties students have a tendency to avoid verbalizing in math activities, a tendency often exacerbated by the way math is typically taught in America. Developing their habits of verbalizing math examples and procedures can greatly help in removing obstacles to success in mainstream math settings.

Many children experience difficulty bridging informal math knowledge to formal school math. To build these connections takes time, experiences, and carefully guided instruction. The use of structured, concrete materials is important to securing these links, not only in the early elementary grades, but also during concept development stages of higher-level math. Some students need particular emphasis on the translating between different written forms, different ways of reading these and various representations (with objects or drawings) of what they mean.
The formation of foundation mathematics concepts is impaired in this small subgroup of students. Methods to compensate include avoiding the use of pictures or graphics for conveying concepts, constructing verbal versions of mathematics ideas, and using concrete materials as anchors. The organizational and social problems that accompany this mathematics disability are also in need of long-term appropriate remedial attention in order to support successful life adjustment in adulthood.

1.8. AWARENESS OF PRIMARY SCHOOL TEACHERS TOWARDS THEIR ROLE AND RESPONSIBILITIES

The teachers are the essence of the work of the school. Each teacher is responsible for the education of the students in his/her class(es). In addition, it is the role of each teacher to be sure that all students are safe, secure and properly supervised at all times. The role of the Primary school teacher is to work with children between the ages of 4 and 11 years. They are responsible for teaching either a number of, or every area of the National Curriculum.

i. Ensuring the optimal development of children, both socially and academically.

ii. Preparation and delivery of lessons that cater to the wide ranging abilities of the class.

iii. To understand and identify the level of learning, of each student.

iv. To up-to-date his/her knowledge in enhancing the modern methods of teaching, strategies and approaches.

v. To enrich his/her content in the syllabus to be taught.

vi. To be aware that the appraisal documents encompass what is expected of teachers in relation to their teaching practices.

vii. Instill interest to learn, through enthusiastic and motivating presentation of lessons.

viii. Recording and monitoring student progression.

ix. Meeting with carers/parents giving feedback regarding child’s performance.
x. Organizing activities, classroom displays and class trips.

xi. Ensuring the curriculum is covered and up to date.

xii. Prepare pupils for secondary education and examinations.

xiii. Whilst potentially specializing in a particular subject, are able to teach all areas of the primary curriculum.

xiv. Passionate attitude towards imaginative teaching.

xv. Patient and well mannered.

xvi. Strong communication and organization skills.

xvii. Ability to maintain discipline and deal with difficult behaviour.

xviii. Remains up to date with latest schemes, curriculum and learning methods.

xix. Work well in a team, specifically for in smaller schools where compromise may be necessary.

xx. To assist in ensuring the safety of all children in the school and intervene if conflict should arise between any students.

xxi. To under the level of learning difficulties of the students in all the subjects.

The primary school teachers must aware of their roles and responsibilities in handling the students.

**1.9 AWARENESS OF PRIMARY SCHOOL TEACHERS TOWARDS LEARNING DIFFICULTIES**

The primary school teachers must aware on sign and symptom of learning difficulties in the different stages of growth and development, understand the problem of the children in listening, speaking, spelling, reading, writing, arithmetic and also the types of common learning difficulties of the children.
1.9.1. SIGN AND SYMPTOMS OF LEARNING DIFFICULTIES

Learning difficulties look very different from one child to another. One child may struggle with reading and spelling, while another loves books but can’t understand math. Still another child may have difficulty understanding what others are saying or communicating out loud. The problems are very different, but they are all learning disorders.

It is not always easy to identify learning difficulties because of the wide variations; there is no single symptom or profile that one can look to as proof of a problem. However, some warning signs are more common than others at different ages.

The following checklist lists some common red flags for learning disorders. Remember that children who do not have learning difficulties may still experience some of these difficulties at various times. The time for concern is when there is a consistent unevenness in child’s ability to master certain skills.

1.9.2. PRESCHOOL SIGNS AND SYMPTOMS OF LEARNING DIFFICULTIES

The following are the signs and symptom of Learning Difficulties for children at Preschool level.

i. Problems in pronouncing words

ii. Trouble finding the right word

iii. Difficulty rhyming

iv. Trouble learning the alphabet, numbers, colors, shapes, days of the week

v. Difficulty following directions or learning routines

vi. Difficulty controlling crayons, pencils, and scissors or coloring within the lines.

vii. Trouble with buttons, zippers, snaps, learning to tie shoes
1.9.3. Ages 5-9 Signs and Symptoms of Learning Difficulties

The following are the signs and symptom of Learning Difficulties of the children during the age of 5 to 9 years.

i. Trouble learning the connection between letters and sounds

ii. Unable to blend sounds to make words

iii. Confuses basic words when reading

iv. Consistently misspells words and makes frequent reading errors

v. Trouble learning basic math concepts

vi. Difficulty telling time and remembering sequences

vii. Slow to learn new skills.

1.9.4. Ages 10-13 Signs and Symptoms of Learning Difficulties

The following are the signs and symptom of Learning Difficulties of the children during the ages of 10 to 13 years.

i. Difficulty with reading comprehension or math skills

ii. Trouble with open-ended test questions and word problems

iii. Dislikes reading and writing; avoids reading aloud

iv. Spells the same word differently in a single document

v. Poor organizational skills (bedroom, homework, desk is messy and disorganized)

vi. Trouble following classroom discussions and expressing thoughts aloud

vii. Poor handwriting
Paying attention to normal developmental milestones for toddlers and preschoolers is very important. Early detection of developmental differences may be an early signal of a learning disability and problems that are spotted early can be easier to correct.

1.9.5. PROBLEM WITH READING, WRITING AND MATHEMATICS

Learning difficulties are often grouped by school-area skill set. If the child is in school, the types of learning difficulties that are most conspicuous usually revolve around reading, writing, or mathematics.

1.9.6. LEARNING DIFFICULTIES IN READING (DYSLEXIA)

There are two types of learning difficulties in reading. Basic reading problems occur when there is difficulty understanding the relationship between sounds, letters and words. Reading comprehension problems occur when there is an inability to grasp the meaning of words, phrases, and paragraphs.

Signs of reading difficulty include problems with:

i. letter and word recognition

ii. understanding words and ideas

iii. reading speed and fluency

iv. general vocabulary skills

1.9.7. LEARNING DIFFICULTIES IN MATHEMATICS (DYSCALCULIA)

Learning difficulties in math vary greatly depending on the child’s other strengths and weaknesses. A child’s ability to do math 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 signs, and number “facts” (like $5+5=10$ or $5\times5=25$). Children with math learning disorders might also have trouble with counting principles (such as counting by 2s or counting by 5s) or have difficulty telling time.

1.9.8. LEARNING DIFFICULTIES IN WRITING (DYSGRAPHIA)

Learning difficulties in writing can involve the physical act of writing or the mental activity of comprehending and synthesizing information. Basic writing disorder refers to physical difficulty forming words and letters. Expressive writing disability indicates a struggle to organize thoughts on paper.

Symptoms of a written language learning disability revolve around the act of writing. They include problems with:

i. neatness and consistency of writing

ii. accurately copying letters and words

iii. spelling consistency

iv. writing organization and coherence

v. other types of learning difficulties and disorders

Reading, writing, and math aren’t the only skills impacted by learning disorders. Other types of learning difficulties involve difficulties with motor skills (movement and coordination), understanding spoken language, distinguishing between sounds, and interpreting visual information.

1.9.9. LEARNING DIFFICULTIES IN MOTOR SKILLS (DYSPRAXIA)

Motor difficulty refers to problems with movement and coordination whether it is with fine motor skills (cutting, writing) or gross motor skills (running, jumping). A motor disability is sometimes referred to as an “output” activity meaning that it relates to the output
of information from the brain. In order to run, jump, write or cut something, the brain must be able to communicate with the necessary limbs to complete the action.

1.9.10. LEARNING DIFFICULTIES IN LANGUAGE (APHASIA/DYSPHASIA)

Language and communication learning difficulties involve the ability to understand or produce spoken language. Language is also considered an output activity because it requires organizing thoughts in the brain and calling upon the right words to verbally explain something or communicate with someone else.

Signs of a language-based learning disorder involve problems with verbal language skills, such as the ability to retell a story and the fluency of speech, as well as the ability to understand the meaning of words, parts of speech, directions, etc.

1.9.11. AUDITORY AND VISUAL PROCESSING PROBLEMS

The eyes and the ears are the primary means of delivering information to the brain, a process sometimes called “input.” If either the eyes or the ears aren’t working properly, learning can suffer.

i. Auditory processing disorder – Professionals may refer to the ability to hear well as “auditory processing skills” or “receptive language.” The ability to hear things correctly greatly impacts the ability to read, write and spell. An inability to distinguish subtle differences in sound, or hearing sounds at the wrong speed make it difficult to sound out words and understand the basic concepts of reading and writing.

ii. Visual processing disorder – Problems in visual perception include missing subtle differences in shapes, reversing letters or numbers, skipping words, skipping lines, misperceiving depth or distance, or having problems with eye–hand coordination. Professionals may refer to the work of the eyes as “visual processing.” Visual perception can affect gross and fine motor skills, reading comprehension, and math.
# Table 1.1

Types of Common Learning difficulties

<table>
<thead>
<tr>
<th>COMMON TYPES OF LEARNING DIFFICULTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dyslexia</strong></td>
</tr>
<tr>
<td>Difficult in reading</td>
</tr>
<tr>
<td>Problems in reading, writing, spelling and speaking</td>
</tr>
<tr>
<td><strong>Dysgraphia</strong></td>
</tr>
<tr>
<td>Difficulty with writing</td>
</tr>
<tr>
<td>Problems with handwriting, spelling, organizing ideas</td>
</tr>
<tr>
<td><strong>Dyscalculia</strong></td>
</tr>
<tr>
<td>Difficulty with math</td>
</tr>
<tr>
<td>Problems in doing math sum. Problem in even understanding time.</td>
</tr>
<tr>
<td><strong>Dyspraxia</strong></td>
</tr>
<tr>
<td>(Sensory Integration Disorder)</td>
</tr>
<tr>
<td>Difficulty with fine motor skills</td>
</tr>
<tr>
<td>Problems with hand–eye coordination, balance, manual dexterity</td>
</tr>
<tr>
<td><strong>Dysphasia/Aphasia</strong></td>
</tr>
<tr>
<td>Difficulty with language</td>
</tr>
<tr>
<td>Problems understanding spoken language, poor reading comprehension</td>
</tr>
<tr>
<td><strong>Auditory Processing Disorder</strong></td>
</tr>
<tr>
<td>Difficulty hearing differences between sounds</td>
</tr>
<tr>
<td>Problems with reading, comprehension, language</td>
</tr>
<tr>
<td><strong>Visual Processing Disorder</strong></td>
</tr>
<tr>
<td>Difficulty interpreting visual information</td>
</tr>
<tr>
<td>Problems with reading, math, maps, charts, symbols, pictures</td>
</tr>
</tbody>
</table>
1.9.12.OTHER DISORDERS MAKE LEARNING DIFFICULTIES

Difficulty in school doesn’t always stem from a learning disability. Anxiety, depression, stressful events, emotional trauma, and other conditions affecting concentration make learning more of a challenge. In addition, ADHD and autism sometimes co-occur or are confused with learning difficulties.

i. **ADHD** – Attention deficit hyperactivity disorder (ADHD), while not considered a learning disability, can certainly disrupt learning. Children with ADHD often have problems sitting still, staying focused, following instructions, staying organized, and completing homework.

ii. **Autism** – Difficulty mastering certain academic skills can stem from pervasive developmental disorders such as autism and Asperger’s syndrome. Children with autism spectrum disorders may have trouble communicating, reading body language, learning basic skills, making friends, and making eye contact.

1.10.ROLE OF TEACHERS IN HELPING THE CHILDREN WITH LEARNING DIFFICULTIES IN MATHEMATICS

All children can be both exhilarating and exhausting, but it may seem that the child with a learning disability is especially so. Teachers may experience some frustration trying to work with their child, and it can seem like an uphill battle when they don’t have the information they need. When the teacher learns what their specific learning disability is and how it is affecting their behavior, the teacher will be able to start addressing the challenges in school and at home. If teachers can, be sure to reach out to other parents who are addressing similar challenges as they can be great sources of knowledge and emotional support.
Table 1.2

Difficulties in learning mathematics at different stages of growth and development

<table>
<thead>
<tr>
<th>Young Children</th>
<th>School-Aged Children</th>
<th>Teenagers and Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trouble With</td>
<td>Trouble With</td>
<td>Trouble With</td>
</tr>
<tr>
<td>Difficulty learning to count</td>
<td>Trouble learning math facts (addition, subtraction, multiplication, division)</td>
<td>Difficulty estimating costs like groceries bills</td>
</tr>
<tr>
<td>Trouble recognizing printed numbers</td>
<td>Difficulty developing math problem-solving skills</td>
<td>Difficulty learning math concepts beyond the basic math facts</td>
</tr>
<tr>
<td>Difficulty tying together the idea of a number (4) and how it exists in the world (4 horses, 4 cars, 4 children)</td>
<td>Poor long term memory for math functions</td>
<td>Poor ability to budget or balance a checkbook</td>
</tr>
<tr>
<td>Poor memory for numbers</td>
<td>Not familiar with math vocabulary</td>
<td>Trouble with concepts of time, such as sticking to a schedule or approximating time</td>
</tr>
<tr>
<td>Trouble organizing things in a logical way - putting round objects in one place and square ones in another</td>
<td>Difficulty measuring things</td>
<td>Trouble with mental math</td>
</tr>
<tr>
<td></td>
<td>Avoiding games that require strategy</td>
<td>Difficulty finding different approaches to one problem</td>
</tr>
</tbody>
</table>

When a teacher or trained professional evaluates a student for learning difficulties in math, the student is interviewed about a full range of math-related skills and behaviors. Pencil and paper math tests are often used, but an evaluation needs to accomplish more. It is meant to reveal how a person understands and uses numbers and math concepts to solve advanced-
level, as well as every day, problems. The evaluation compares a person's expected and actual levels of skill and understanding while noting down the person's specific strengths and weaknesses. Below are some of the areas that may be addressed:

i. Ability with basic math skills like counting, adding, subtracting, multiplying and dividing

ii. Ability to predict appropriate procedures based on understanding patterns— knowing when to add, subtract, multiply, divide or do more advanced computations

iii. Ability to organize objects in a logical way

iv. Ability to measure—telling time, using money

v. Ability to estimate number quantities

vi. Ability to self-check work and find alternate ways to solve problems.

Helping a student identify his/her strengths and weaknesses is the first step to getting help. Following identification, parents, teachers and other educators can work together to establish strategies that will help the student learn math more effectively. Help outside the classroom lets a student and tutor focus specifically on the difficulties that student is having, taking pressure off moving to new topics too quickly. Repeated reinforcement and specific practice of straightforward ideas can make understanding easier.

Other strategies for inside and outside the classroom include:

Use graph paper for students who have difficulty organizing ideas on paper.

i. Work on finding different ways to approach math facts; i.e., instead of just memorizing the multiplication tables, explain that $8 \times 2 = 16$, so if 16 is `doubled, $8 \times 4$ must = 32.

ii. Practice estimating as a way to begin solving math problems.

iii. Introduce new skills beginning with concrete examples and later moving to more abstract applications.
iv. For language difficulties, explain ideas and problems clearly and encourage students to ask questions as they work.

v. Provide a place to work with few distractions and have pencils, erasers and other tools on hand as needed.

Teachers help students must to be aware of their strengths and weaknesses, and understand how a person learns best is a big step in achieving academic success and confidence.

1.11. DEFINITION OF ATTITUDE

Definition of attitude as psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavor (Eagly & Chaiken, 1993) this definition encompasses the key features of attitudes – namely, tendency, entity (or attitude object), and evaluation. This conception of attitude distinguishes between the inner tendency that is attitude and the evaluative responses that express attitudes.

Attitude is a broad concept in social psychology. Triandis (1971) considers attitudes to be one’s thoughts or ideas regarding one’s feelings that influence behaviours related to a particular issue.

Gall, Borg and Gall (1996) define attitude as “an individual’s viewpoint or disposition towards a particular, object (a person, a thing, or an idea)”. They consider attitude to be an individual’s way of seeing and reacting to a social phenomenon, and assert that it varies from person to person. An individual’s ways of viewing the world and reacting to it are influenced by many different factors including the individual’s beliefs, knowledge, emotions and their participation in social activities (Eagly & Chaiken, 1993; Triandis, 1971).

There are three major components of attitudes: cognitive, affective and behavioural (Eagly & Chaiken, 1993; Triandis, 1971). The cognitive component consists of one’s knowledge and views about a particular issue, the affective component reflects one’s feelings.
about something; and the behavioural component is one’s tendency to act towards something in a particular way (Boer, Pijl, & Minnaert, 2011).

1.11.1. ATTITUDE TOWARD LEARNING DIFFICULTIES IN MATHEMATICS OF THE TEACHERS

In this study of teachers attitudes towards learning difficulties in mathematics is the ‘cognitive component as their participants’ “knowledge and thoughts about the causes of the behaviour of children with disabilities in learning mathematics” “affective component as teachers’ motivations or feelings that caused them to make decisions regarding teaching children with special needs. Finally, the behavioural component was defined as the way in which teachers behave or respond to these children.

The definition of ‘positive’ or ‘negative’ attitude toward learning difficulties in mathematics of the teachers are clearly depends on the definition of attitude itself. In a ‘simple’ definition, it is clear what a ‘positive’ or a ‘negative’ attitude is: A ‘positive’ attitude is a positive emotional disposition toward the best teaching could make the students who are poor learners in learning mathematics and their achievement will be enhanced; a ‘negative’ attitude is a negative emotional disposition toward the best teaching cannot make the students who are poor learners in learning mathematics and their achievement will not be enhanced.

The conceptions, attitudes, and expectations of the teachers regarding teaching in mathematics has been considered to be very significant factor underlying their school experience and achievement.

The characterization of an individual’s attitude as positive / negative is in most cases simply the result of a process of measurement, performed through instruments such as the Thurstone or Likert attitude-scales or the semantic differential technique. This process ends up in a score - attached to an individual’s attitude - obtained by summing points relating to the single items.
The choice of scores to be assigned to the items naturally leads to a positive/negative evaluation of each one. Since in most questionnaires used to assess attitude the items range from those related to emotions (“it is difficult to teach mathematics to the slow learners”) to those related to beliefs (“the slow learners will understand my teaching”), to those related to behaviour (the slow learners will do the homework in mathematics”), an answer can be characterized as ‘positive’ by referring to different meanings of the word ‘positive’ itself. More precisely, this meaning varies depending on whether ‘positive’ refers to emotions, beliefs, or behaviour.

That understanding the nature of mathematics learning requires exploration of affective as well as cognitive factors is now widely recognized. Large scale surveys of student performance in mathematics, such as the (American) National Assessment of Educational Progress (NAEP) and the Third International Mathematics Studies (TIMS) include items designed to measure student attitudes to mathematics.

The published and influential Handbook of Research on Mathematics Teaching and Learning (Grouws, 1992), devoted considerable space to the impact on mathematics learning of affective factors, for example, student and teacher beliefs and attitudes. It is interesting to recall that the generally comprehensive Handbook of Research on Teaching (Wittrock, 1986), published less than a decade earlier, did not explore in any depth the interaction between student or teacher attitudes and school learning. Closer to home, documents such as the National Statement on Mathematics for Australian Schools (Australian Education Council, 1991) also recognise the importance of student attitudes towards learning.

An important aim of mathematics education is to develop in students positive attitudes towards mathematics. The notion of having a positive attitude towards mathematics encompasses both liking mathematics and feeling good about one's own capacity to deal with
situations in which mathematics is involved. (Australian Education Council, 1991, p. 31). In this setting, attitudes are perceived as being closely linked to beliefs, emotions, and motivation to engage in the subject.

The teachers have the positive attitude to handle the children with learning difficulties; understand their types of learning difficulties apply their knowledge in overcoming those problems. In this regard the teacher has to

i. Learn the specifics about their child’s learning disability

ii. Understand the Research treatments, services, and new theories.

iii. Even if the school doesn’t have the resources to treat the child’s learning disability optimally, teacher can pursue these options on their own at home or with a therapist or tutor.

iv. Nurture child’s strengths. Even though children with learning difficulties struggle in one area of learning, they may excel in another. Pay attention to their child’s interests and passions. Helping children with learning disorders develop their passions and strengths will probably help them with the areas of difficulty as well.

1.12. STATEMENT OF THE PROBLEM

The statement of the problem in the present study is entitled as “AWARENESS AND ATTITUDE OF PRIMARY SCHOOL TEACHERS TOWARDS LEARNING DIFFICULTIES IN MATHEMATICS AT PRIMARY LEVEL”
1.12.1. OPERATIONAL DEFINITIONS OF KEY TERMS

AWARENESS

Concise oxford Dictionary (1990) explains that aware is conscious not ignorant, having knowledge, well informed. Awareness is noun of aware.

In the present study, awareness is defined as having knowledge or being fully aware of or well informed about the concept of learning difficulties in mathematics by the primary school teachers.

ATTITUDE

Chambers concise Dictionary (1992) defines attitude as position expressing some thoughts or feelings. Oxford Advanced Learners Dictionary (1996) defines attitude as a way of thinking about or behaving towards. In the present study, attitude refers to the primary school teachers’ beliefs, feelings and behaviours with learning difficulties in mathematics.

PRIMARY SCHOOL TEACHERS

Primary school teachers are the persons who provide education for pupils (children) from Standard I to Standard V in Tamilnadu.

LEARNING DIFFICULTIES

Learning involves acquiring knowledge and skill. So while imbibing some concepts proper perceptual shifts should be headed over to assimilate it so this is called as the difficulties in learning. In the present study, learning difficulties refers to bottleneck, obstruction and difficult to understand the basic mathematical concept among the primary school students by the teachers.
MATHEMATICS

Mathematics is the study of the measurement, properties and relationships of quantities and sets using numbers and symbols.

1.13. NEED AND IMPORTANCE OF THE STUDY

Teacher is an artist who moulds and shapes physical, mental and normal powers of the mind. To accomplish their task effectively a teachers should be highly competent. To become a competent teachers whether he\she is working in normal or special school or integrated school one, should possess through understanding about the various aspects of difficulties in various subjects. Teachers are responsible for the Identification of children with learning difficulties among the children. Mathematics is the queen of all science and king of all arts. Those who are good in mathematics will sustain in the modern world. For that a teacher should exhibit better awareness about the concept of learning difficulties particularly in mathematics.

The primary school teachers must understand the causes and characteristics of children with learning difficulties in mathematics, identification and assessment of children with learning difficulties, teaching and training methods and guidance and counselling to the children with learning difficulties as well as parents and community. As the children with learning difficulties need more care than the clever children, a teacher should have positive attitude towards children with learning difficulties.

Further, the influence of certain variables of the teachers on their awareness with regard to the different aspects of learning disabilities in children in mathematics may help to generate specific type of need based orientation programmes to specific teaching population. Research studies which address the above mentioned aspects go a long way to arrest dropout, wastage and stagnation thereby promoting quality and quantity education at primary level.
Hence, the present study is an attempt to find the level of awareness and attitude of primary school teachers in understanding the learning difficulties in mathematics.

To prevent dropout, wastage and stagnation at primary level, a fresh look is needed on the difficulties faced by the primary school children in learning the subjects specifically on mathematics and English. At primary level, mathematics is one of the subjects invariably learned by the entire student. Most of the students find difficult in mathematics and secure poor marks due to difficulties in understanding basic mathematical concepts. Identification of learning difficulties among the children in mathematics is need of the hour. If not found the level of difficulties faced by the students and the same level of difficulties will be prolonged to their higher classes leads to drop out and behavioral disorder. Hence, there is a necessity of the teachers should have awareness of learning difficulties and positive attitude in teaching mathematics to the children with learning difficulties.

1.14.OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

i. To study the level of awareness of primary school teachers towards learning difficulties of children in mathematics at primary level is more,

ii. To study the attitude of primary school teachers towards learning difficulties of children in mathematics at primary level is more.

iii. To find out the level of awareness of primary school teachers towards learning difficulties of children in mathematics at primary level with their demographic variables viz. Gender, educational qualification, experience of the teachers, type of school, locality of the school and medium of instruction.
iv. To find out the level of attitude of primary school teachers towards learning difficulties of children in mathematics at primary level with their demographic variables viz. Gender, educational qualification, experience of the teachers, type of school, locality of the school and medium of instruction.

v. To find out the relationship between awareness and attitude of primary school teachers towards learning difficulties in mathematics.

1.15. HYPOTHESES OF THE STUDY

The following are the hypotheses formulated to find the significant difference among the primary school teachers towards the awareness and attitude in learning difficulties of the primary school children.

1) There is no significant difference between male and female Teachers towards the awareness of learning difficulties in mathematics.

2) There is no significant difference among the primary school teachers towards the awareness of learning difficulties with respect to their educational qualification.

3) There is no significant difference among the primary school teachers towards the awareness of learning difficulties with respect to their experience.

4) There is no significant difference among the primary school teachers towards the awareness of learning difficulties with respect to their locality of school.

5) There is no significant difference among the primary school teachers towards the awareness of learning difficulties with respect to type of school.

6) There is no significant difference between Tamil medium and English medium primary school teachers towards the awareness of learning difficulties in mathematics.

7) There is no significant difference in the awareness of primary school teachers towards the dimension of learning difficulties in mathematics with respect to gender.
8) There is no significant difference in the awareness of primary school teachers towards the dimension of learning difficulties in mathematics with respect to their educational qualification.

9) There is no significant difference in the awareness of primary school teachers towards the dimension of learning difficulties in mathematics with respect to their experience.

10) There is no significant difference in the awareness of primary school teachers towards the dimension of learning difficulties in mathematics with respect to locality of the school.

11) There is no significant difference in the awareness of primary school teachers towards the dimension of learning difficulties in mathematics with respect to type of school.

12) There is no significant difference between in the awareness of Tamil medium and English medium school teachers towards the dimension of learning difficulties in mathematics.

13) There is no significant difference between male and female Teachers towards the attitude of learning difficulties in mathematics.

14) There is no significant difference among the primary school teachers towards the attitude of learning difficulties with respect to their educational qualification.

15) There is no significant difference among the primary school teachers towards the attitude of learning difficulties with respect to their experience.

16) There is no significant difference among the primary school teachers towards the attitude of learning difficulties with respect to their locality of school.

17) There is no significant difference among the primary school teachers towards the attitude of learning difficulties with respect to type of school.

18) There is no significant difference between Tamil medium and English medium primary school teachers towards the attitude of learning difficulties in mathematics.
19) There is no significant difference in the attitude of primary school teachers towards the dimension of learning difficulties in mathematics with respect to gender.

20) There is no significant difference in the attitude of primary school teachers towards the dimension of learning difficulties in mathematics with respect to their educational qualification.

21) There is no significant difference in the attitude of primary school teachers towards the dimension of learning difficulties in mathematics with respect to their experience.

22) There is no significant difference in the attitude of primary school teachers towards the dimension of learning difficulties in mathematics with respect to locality of the school.

23) There is no significant difference in the attitude of primary school teachers towards the dimension of learning difficulties in mathematics with respect to type of school.

24) There is no significant difference between in the attitude of Tamil medium and English medium school teachers towards the dimension of learning difficulties in mathematics.

25) There is a relationship between the level of attitude and awareness of primary school teachers towards learning difficulties in mathematics.

1.16. LIMITATIONS OF THE STUDY

i. The study is confined to the teachers serving in Mecheri Union of Salem District in Tamilnadu consists of 354 teachers only.

ii. The awareness of the primary school teachers toward learning difficulties in mathematics is assessed with YES or NO type questions.

iii. The attitude of primary school teachers towards learning difficulties in mathematics is measured with 4 points scale.
1.17. CONCLUSION

The present dissertation is organized under 5 chapters as follows. The first chapter deals about, Introduction, education system in India, definition of mathematics, history of mathematics, objective of teaching mathematics. Meaning, types of learning difficulties, awareness and attitude of primary school teachers towards learning difficulties in mathematics objectives, hypotheses, need and importance of the study, delimitation of the study and arrangement of chapter. The second chapter gives an account of some previous research studies conducted in India and abroad, which are related to the present investigation. These studies are abstracted. The third chapter describes about research method adopted for the study, construction of tools, sample, and administration of statistical techniques. The fourth chapter deals about the analysis of data, results and their interpretations. The fifth chapter presents summary of findings, discussion and recommendations for further research study.