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CHAPTER I
INTRODUCTION

1.1 INTRODUCTION

Science and technology have occupied all fields of activity, such as agriculture, industry, business, defence, medicine, communication etc. The educational field is no exception – the science and technology have occupied the teaching – learning educational process also. The teacher has a big role in teaching – learning process and he / she has to take along with him the pupils for reaching the required objectives.

Each and every class consists of students with a variety of abilities, personalities and learning skills. A teacher must take utmost effort to accommodate all students in his classroom with different needs. If the teacher fails to perceive the individual difference among the students, he/ she would not be able to help the students to achieve the goal.

Almost always efficacy of the teaching is measured in terms of the student’s academic achievement. There are few low achievers in every educational setting and it is a challenge to the teachers to help them overcome the shortenings. The low achiever group includes slow – learners, low intellects and learning disabled / difficulties etc.

But, the students with learning difficulties are endowed with skills that are not brought out. Infrastructure and human resources
development are inadequate in dealing with such students in India. A greater need for research in this area was felt by National policy on Education (1986), which emphasized appropriate education to cater to the educational needs of exceptional students. Their potential can be enhanced by means of special education and Instructional technology.

1.2 CONCEPT AND MEANING OF LEARNING DIFFICULTIES

A Learning disability refers to a retardation, disorder or delayed development in one or more of the processes of speech, language, reading, spelling, writing or arithmetic resulting from a possible cerebral dysfunction and / or emotional or behavioural disturbance and not from mental retardation, sensory deprivation or cultural or instructional factors (Kirk 1963).

Unlike other disabilities, such as paralysis or blindness, a learning disability (LD) is a hidden handicap. A learning disability doesn’t disfigure or leave visible signs that would invite others to be understanding or offer support.

LD is a disorder that affects people’s ability to either interpret what they see and hear or to link information from different parts of the brain. These limitations can show up in many ways - as specific difficulties with spoken and written language, coordination, self – control, or attention. Such difficulties extend to schoolwork and can impede learning to read or write, or to do math.
Learning disabilities can be lifelong conditions that, in some cases, affect many parts of a person's life: school or work, daily routines, family life and sometimes even friendship and play. In some people, many overlapping learning disabilities may be apparent. Other people may have a single, isolated learning problem that has little impact on other areas of their lives.

Types of Learning Disabilities

LD is a broad term that covers a pool of possible causes, symptoms, treatments and outcomes, partly because learning disabilities can show up in so many forms, it is difficult to diagnose or to pinpoint the causes. And no one knows of a pill or remedy that will cure them.

Not all learning problems are necessarily learning disabilities. Many students are simply slower in developing certain skills. Because students show natural differences in their rate of development, sometimes what seems to be a learning disability may simply be a delay in maturation, to be diagnosed as a learning disability, specific criteria must be met.

Learning disabilities can be divided into three broad categories:

A. Developmental speech and language disorders
B. Academic skills disorders
C. “Others,” a catch-all that includes certain coordination disorders and learning handicaps not covered by the other terms
A. Developmental Speech and Language Disorders

Speech and language problems are often the earliest indicators of a learning disability. People with developmental speech and language disorders have difficulty producing speech sounds, using spoken language to communication or understanding what other people say. Depending on the problem, the specific diagnosis may be:

- Developmental articulation disorder
- Developmental expressive language disorder
- Developmental receptive language disorder

Developmental Articulation Disorder

Students with this disorder may have trouble controlling their rate of speech. Or they may lag behind playmates in learning to make speech sounds.

Developmental Expressive Language Disorder

Some students with language impairments have problems expressing themselves in speech. Their disorder is called, therefore, a developmental expressive language disorder.

Developmental Receptive Language Disorder

Some people have trouble understanding certain aspects of speech. It's as if their brains are set to a different frequency and the reception is poor.
B. Academic Skills Disorders

Students with academic skills disorders are often years behind their classmates in developing reading, writing or arithmetic skills. The diagnoses in this category include:

- Developmental reading disorder
- Developmental writing disorder
- Developmental arithmetic disorder

Developmental Reading Disorder

This type of disorder, also known as dyslexia, is quite widespread. In fact, reading disabilities affect 2 to 8 percent of elementary school students.

A person can have problems in any of the tasks involved in reading. However, scientists found that a significant number of people with dyslexia share an inability to distinguish or separate the sounds in spoken words.

However, there is more to reading than recognizing words. If the brain is unable to form images or relate new ideas to those stored in memory, the reader can’t understand or remember the new concepts. So other types of reading disabilities can appear in the upper grades when the focus of reading shifts from word identification to comprehension.
Developmental Writing Disorder

Writing, too involves several brain areas and functions. The brain networks for vocabulary, grammar, hand movement and memory must all be in good working order. So a developmental writing disorder may result from problems in any of these areas. A child with a writing disability, particularly an expressive language disorder might be unable to compose complete, grammatical sentences. Because developmental skills build on each other, a person may have more than one learning disability.

Developmental Arithmetic Disorder

Arithmetic involves recognizing numbers and symbols, memorizing facts such as the multiplication table, aligning numbers and understanding abstract concepts like place value and fractions. Any of these may be difficult for students with developmental arithmetic disorders. Problems with numbers or basic concepts are likely to show up early. Disabilities that appear in the later grades are more often ties to problems in reasoning.

Many aspects of speaking, listening, reading, writing and arithmetic overlap and build on the same brain capabilities. So it’s not surprising that people can be diagnosed as having more than one area of learning disability. For example, the ability to understand language underlies learning to speak. Therefore, any disorder that hinders the ability to understand language will also interfere with the development of speech, which in turn hinders learning to read and write. A single gap in the brain’s operation can disrupt many types of activity.
C. Other Learning Disabilities

The additional categories of other learning disabilities such as "motor skills disorders" and "Specific developmental disorders not otherwise specified." These diagnoses include delays in acquiring language, academic and motor skills that can affect the ability to learn, but do not meet the criteria for a specific learning disability. Also included are coordination disorders that can lead to poor penmanship, as well as certain spelling and memory disorders.

Attention Disorders

Nearly 4 million school-age students have learning disabilities. Of these, at least 20 percent have a type of disorder that leaves them unable to focus their attention. Some students and adults who have attention disorders appear to daydream excessively. And once you get their attention, they're often easily distracted. In a large proportion of affected students – mostly boys – the attention deficit is accompanied by hyperactivity. Because of their constant motion and explosive energy, hyperactive students often get into trouble with parents, teachers and peers.

By adolescence, physical hyperactivity usually subsides into fidgeting and restlessness. But the problems with attention and concentration often continue into adulthood. At work, adults with ADHD often have trouble organizing tasks or completing their work. They don’t seem to listen to or follow directions. Their work may be messy and appear careless. Attention disorders, with or without hyperactivity, are not considered learning disabilities in themselves.
However, because attention problems can seriously interfere with school performance, they often accompany academic skills disorders.

**Students with Learning Difficulties (SLD)**

A child can be considered to have learning difficulty if he has considered difficulty in understanding or using spoken language, reading, writing, spelling and/or arithmetic during developmental period (before 16 years of age) provided.

a. he is free from Visual, Hearing or motor activity Mental retardation, and severe emotional problems and

b. he has adequate facilities, interest and motivation to learn.

Such students experience difficulty in one or many areas - i.e. reading, writing, spelling, arithmetic and organization.

Early diagnosis of learning difficulty is important to avoid the frustration of a child. The students themselves do not understand why they are having such trouble and they may avoid certain subject to learn and develop bad learning habits in the process out of fear.

**Description of Technical Terms of Learning Difficulties**

The students with learning difficulties can be broadly classified into various categories depending upon the major problem experienced by them. The different types of learning difficulties are
oral language difficulties, reading difficulties, writing difficulties and Arithmetic difficulties.

1. **Oral language difficulties**
   
   There are two types of oral language difficulties namely

   **Dysphasia** – It refers to the partial inability to comprehend the spoken word and to speak.

   **Aphasia** – It refers to the loss of ability to comprehend, manipulate or express words in speech, writing or gestures.

2. **Reading difficulties**
   
   There are two types of Reading Difficulties namely

   **Alexia** – It refers to the loss of ability to read written or printed language.

   **Dyslexia** – It refers to the partial inability to read or understand.

3. **Writing Difficulties**
   
   Writing Difficulties are divided into two types namely

   **Dysgraphia** – It refers to the partial inability to write.

   **Agraphia** – It refers to the total inability to write.
Revisualization problem refers to inability to revisualise the image of letters or words. Formulation and syntax disorder is the inability to organize the ideas into a clear, concise pattern of words, spelling problem is the trouble in reading or writing.

4. Arithmetic Difficulties

Arithmetic difficulty is the trouble in isolated numerals or series of numerals. This is further divided into two types as

Dyscalculia – It refers to the partial inability to perform calculations.

Acalculia – It refers to the total inability to perform calculations.

1.3 CHARACTERISTICS OF LEARNING DIFFICULTIES

The following ten characteristics have been identified as widely prevalent in individual with learning disability based on the frequency of occurrence (Clements 1966)

1. Hyperactivity
2. Perceptual impairment
3. Emotional instability
4. General co-ordination deficits
5. Disorder of attention
6. Impulsivity
7. Disorders of memory and thinking
8. Specific learning difficulties in the areas of reading, arithmetic, writing and spelling
9. Disorder of speech and language
10. Equivocal neurological signs and electro encephalographic irregularities.

The varieties of learning and behavioural traits are exhibited by SLD. Attention and processing disorders are problems of them but not for all. At certain age levels, some kinds of characteristics are exhibited and deficits are manifested, young students are more likely to be hyperactive than adolescence. Research by Bryant and Pflaum (1978) reveals that learning disabled fail to read social cues and may misinterpret the reactions of other people.

Pearl.L. Seidenberg (1997) list out nine characteristics of students with learning difficulties. They are

1. **Hyperactivity**: Inappropriate excessive motor activity such as tapping of finger or foot, jumping out of seat, or skipping from task to task.

2. **Attention Deficits**: Distracted by irrelevant stimuli or preservation, or attention becomes fixed upon a single task or behaviour that is repeated over and over.

3. **Motor deficits**: General co-ordination problems resulting in awkward or clumsy movements.
4. **Perceptual – motor deficits:** Difficulty in integrating a Visual or Auditory stimulus with a motor response.

5. **Language deficits:** Delays in speech and difficulty in understanding and/or formulating spoken language.

6. **Impulsivity:** Lack of reflective behaviour.

7. **Cognitive deficits:** Deficits in memory and concept formation.

8. **Orientation deficits:** Poorly developed spatial or temporal concepts.

9. **Specific learning deficits:** Problems in acquiring reading, writing, or arithmetic skills.

The USOE 1977 Federal Register provides framework for examining characteristics. The list of disability areas (Oral expression, listening comprehension, written expression, basic reading skills, reading comprehension, mathematical calculation and mathematics reasoning) shows that academic and language difficulties are primary characteristics. Apart from primary characteristics there are some specific characteristics (*Cecil. D. Mercer, 1997*)

a. Discrepancy factor
b. Academic learning difficulty
c. Language disorders
d. Perceptual disorders
e. Meta cognitive deficits
f. Social – emotional problems
g. Memory problems
h. Motor disorders
i. Attention problems and hyperactivity

(a) **Discrepancy Factor**

The discrepancy factor was originally popularized by Bateman (1964). It is an identification criteria and is present in most definitions (Hammill, 1990). Many authorities consider it to be the common denominator of learning disabilities. A discrepancy exists when the difference between the estimated ability and the academic performance of a student differ greatly.

(b) **Academic Learning Difficulty**

Academic problems are the most widely accepted characteristics of individuals with learning disabilities.

(c) **Language Disabilities (Read, Write and Spell)**

Gibbs and Cooper (1989) found mild – to – moderate language deficits in 90% of 242 students with learning disabilities. Moreover, Mann (1991) notes the indication of research that many students who do not read well suffer from underlying language problems. As the language skills and academic functioning are closely related, sometimes it is difficult to determine the primary disability (i.e., reading or language)
(d) **Perceptual Disorder**

Perceptual problems such as — inability to recognize, discriminate and interpret sensation especially visual and auditory disabilities, traditionally have received much attention from several authorities on learning disabilities. **Garnett (1992)** notes that spatial deficits are a factor in learning mathematics for students with learning disabilities.

(e) **Meta – Cognitive Deficits**

**Hresko and Reid (1981)** report that the study of meta-cognitive variables (e.g. predicting, planning, checking and monitoring) in students with learning difficulties may lead to a better understanding of how these variables function, and this may result in more productive educational interventions. Several researchers (**Kulak, 1993; Montague & Applegate, 1993 and Swanson, 1990**) claim that viewing students with learning disabilities as having meta-cognitive or cognitive deficits is only partially accurate. They note that many of these students are not deficient in using cognitive strategies, instead they apply different strategies.

(f) **Social and Emotional Problems**

The students with learning difficulties act disruptively and acquire negative feelings of self-work because of their learning difficulties. They have poor self-concept and self-esteem. **Montgomery (1994)** found that some students with learning difficulties have a low self-concept regarding academics but do not
differ from their high achieving peers and peers without disabilities on self concepts related to other areas (e.g., family, physical and social).

Researchers (Gresham & Elliott, 1989., Mc Kinney, 1989) note that the youngsters with learning disabilities frequently experience problems in interacting with parents, teachers, peers or strangers. The definition of learning disabilities by Interagency Committee on Learning Disabilities (ICLD, 1987, p. 22) include social skill deficits as a primary disability that has generated much discussion regarding whether social skill deficits are a primary or secondary disability in learning disabilities (Hammill, 1990)

(g) Memory Problems

Hallahan and Kaufman (1988) note that students with learning disabilities usually have problems of remembering auditory and visual stimuli. Swanson, Cochran and Ewers (1990) and Gettinger (1991) found that measures of memory differentiate students with learning disabilities from other students in general classes. Students with learning disabilities exhibit distinct learning deficiencies in working memory. Torgesen and Kail (1980) provide the following conclusion:

1. Students with learning disabilities fail to use strategies that students without disabilities readily use. For example, in learning a list of words, students without disabilities rehearse the names to themselves or group the words in categories for
studying. Generally, students with learning disabilities do not spontaneously use these strategies.

2. Students with learning disabilities may have difficulty in remembering because of their poor language skills. Thus, verbal material may be particularly difficulty to remember.

(h) **Motor Disorders**

Some students with learning difficulties exhibit motor disorders like walk with a clumsy gait or have difficulty in throwing or catching a ball, skipping or hopping. Others exhibit fine motor difficulties when cutting with scissors, putting buttons or zip.

(I) **Attention Problems and Hyperactivity (Low Attention Span Unable to Shift Attention to New Stimuli, Easily Attracted to Irrelevant Stimuli)**

To excel in a classroom set up a student should possess good attention span. They must also be able to shift attention to new tasks, students with attention problems are unable to screen out extraneous stimuli and are attracted by irrelevant stimuli. Hyperactivity is often accompanied by attention problem. *Silver (1990)* notes that the relationship between learning disabilities and Attention Deficit Hyperactivity Disorder (ADHD) is becoming increasingly clear.

**Memory Disorder of SLD**

SLD generally characterized by inefficient memory system. They are unable to spontaneously use rehearsal strategies, recode
information in a meaningful way or recognize information. The following characteristics are clearly observed in most of SLD.

1. SLD find it difficult to recall visual material specially the written word.
2. SLD are unable to use strategies for verbal rehearsal.
3. SLD are poor on tasks requiring auditory discrimination.
4. SLD have difficulties with gross motor abilities and fine motor co-ordination and they exhibit general awkwardness and clumsiness and have spatial problems.
5. SLD often have problems in processing Auditory or Visual information. Perception is the cognitive ability to receive and make sense of incoming stimuli. For a long time, students with learning difficulties were considered deficient in perceptual skills and were treated specifically for improving this deficiency. Learning difficulties continue to be associated with perceptual ability.
6. SLD does not know how to go about learning and studying. They lack organization skills have not developed an active learning style and do not direct their own learning.
7. SLD involves social skills. These individuals have not learned how to act and fall in social situations and their social skills deficits make it hard to establish satisfying social relationships and make and keep friends. They lack role taking skills and find it difficult to adopt another’s point of view. Teachers too tend to rate them negatively even without being told that the child is a learning disabled.
1.4 CAUSES OF LEARNING DIFFICULTIES


a. Acquired Trauma

Injury to the central nervous system that originates outside the individual and results in learning disorders is called acquired trauma in the medical literature. Acquired central nervous system damage can occur during gestation (Prenatal), at birth (Perinatal) or after birth (Postnatal).

i) Prenatal Causes

Complications during pregnancy have been linked empirically with a variety of learning problems. Maternal drug consumption is the most common cause associated with these complications and subsequent learning difficulties.

Gold and Sherry (1984) reviewed available literature and found a correlation between alcohol consumption during pregnancy and later learning difficulties in the child.

For example, Shaywitz, et al. (1980) assessed 15 students of normal intelligence with foetal alcohol syndrome and found that all had been referred for special education services by the third grade.
Among the characteristics observed in these youngsters were academic difficulties, hyperactivity and attention problems.

It is also suggested that exposure to cocaine affects the development of neuro receptors and transmitters and results in a malfunctioning of central nervous system (Van Dyke and Fox, 1990). Maternal use of tobacco products also has been linked with various aspects of learning disabilities, especially academic problems and hyperactivity (Lovitt, 1989).

ii) Perinatal causes

Colletti (1979) reports that students with learning disabilities had more problems at birth such as prolonged labour, induced birth and forceps delivery than the natural form (i.e. 96% of the subjects with learning disabilities versus 10% of the normal subjects). Sell, et al. (1985) found that 32 out of 74 students who received neonatal intensive care needed special education services in the elementary grades.

iii) Postnatal causes

Accidents and diseases occurring after birth that lead to brain damage and concomitant learning problems include stroke, high fever, encephalitis, meningitis and head trauma.

b) Genetic/Hereditary influences

Investigators examined the relationship between genetics and learning disabilities. Hallgren(1950) studied 276 individuals with
dyslexia and their families. The prevalence of reading and language problems among the relatives led him to conclude that learning problems are inherited. Decker and Defries (1980, 1981) compared families of 125 students without disabilities and found greater rates of reading disabilities within the families of the group with disabilities.

Pennington (1995) notes that, in studies of familial recurrence of reading problems, sibling recurrence is high and consistent across studies (i.e., ranging from 38.5% to 43%) and parent recurrence is likewise high and generally consistent (i.e., ranging from 27% to 49%).

Results of a twin study conducted in London at the Institute of Psychiatry indicate significant hereditability for deficits in spelling. Two chromosomal abnormalities are linked with learning problems in females. When one X chromosome is missing (Turner Syndrome), characteristics such as-spatial deficits, problem in mathematics, attention deficits or hyperactivity, and poor handwriting often exhibited. Males with the condition Klinefelter Syndrome, typically exhibit reading and language problems as well as poor motor coordination and a tendency to be withdrawn. Genetic/Hereditary factors thus influence the individual while learning.

c) Environmental Influences

Learning process is distracted by various factors in the environment. Allergic reactions to certain foods and food additives also have been linked to learning disabilities. Natural or synthetic compound called salicylate which is a chemical found in artificial
colours and flavours as well as in certain foods (e.g., apples, tomatoes and berries) also cause hyperactivity and learning problems in some students. (Feingold, 1976).

Allergic reactions to other foods that do not contain salicylate, such as milk, wheat, sugar and chocolate, also have been linked to learning disabilities (Crook, 1975, Rapp, 1978, 1986).

Learning environment also contribute to learning difficulties in students. Conducive learning environment enhances teaching - learning - process. As a facilitator, the teacher has to provide suitable teaching - learning environment in the classroom. This is one of the important tasks to be carried over by the teacher. If environment is not conducive it will certainly result in learning difficulties.

Brophy and Good (1986) as well as Alderman (1990) reported that a positive learning environment and student learning are enhanced when teachers believe that all students can learn and that teachers can make a difference.

d) Biochemical Abnormalities

Some students with learning disabilities have not been diagnosed as having apparent neurological damage or a family history of learning problems. It has been hypothesized that the cause may be biochemical abnormalities at the cellular level. Imbalances in the production of neurotransmitters (e.g., serotonin, dopamine, acetylcholine and other chemicals) are assumed to cause difficulties in
neural impulse transmission and consequent learning and behavioural problems.

**Cecil D. Mercer (1997)** states that one area of research indirectly supports the existence of chemical imbalance in some individuals with learning disabilities involves the use of psychoactive drugs (e.g., stimulant mediation) to improve attention and learning and to decrease hyperactivity. It means that there exists chemical imbalance and it can be corrected through administration of drugs.

### 1.5 MEANING AND CONCEPT OF LEARNING STYLES

Educators have for many years, noticed that some students prefer certain methods of learning to others. These dispositions referred to as Learning Styles, form a student unique learning preference and aid teachers in the planning of small group and individualized instruction.

‘Learning Style’ should be interpreted to mean an individual mixture of styles. Everyone has a mixture of strengths and preferences. No one has exclusively one single style or preference.

The Visual – Auditory – Kinesthetic learning styles model or ‘inventory’ usually abbreviated to VAK, provides a simple way to explain and understand our own learning styles (and learning styles of others)
The original VAK concepts were first developed by psychologists and specialists such as Fernald, Keller, Orton, Gillingham, Stillman and Montessori, starting in the 1920’s. VAK theory is now a favourite of the accelerated learning community because its principles and benefits extend to all types of learning and development, far beyond its early applications. According to the VAK model, most people possess a dominant or preferred learning style, however some people have a mixed and evenly balanced blend of the three styles.

**Types of Learning styles**

The Learning styles of the students can be broadly classified into various categories depending upon their preferences. The different types of Learning styles are Visual, Auditory and Kinesthetic learning styles.

- **‘Visual learning style’** involves the use of seen or observed things, including pictures, diagrams, demonstrations, displays, handouts, films, flip – chart etc.

- **‘Auditory learning style’** involves the transfer of information through listening to the spoken word, of self or others, of sounds and noises.

- **‘Kinesthetic learning style’** involves physical experience – touching, feeling, holding, and doing practical hands on
experiences. The word 'Kinesthetic' describes the sense of using muscular movement.

1.6 TEACHING SCIENCE TO STUDENTS WITH LEARNING DIFFICULTIES

One of the four guiding principles of the National Science Education (USA) Standards is simply "Science for all students" (NRC 1996). This principle underscores the belief that all students, regardless of race, gender, or disability, should have the opportunity to learn and understand the essential science content described in the standards. Because of increasing wide spread inclusion practices and more thorough identification procedures, students with documented learning difficulties (LD) are becoming a large percentage of the classroom.

Because many practicing science teachers have little training or experience in identifying and meeting the needs of students with disabilities (Norman, Caseau and Stefanich 1998). We have obtained basic educational principles that support the unique learning needs of these students. Each principle is accompanied by examples of how a science instructor might put that principle into practice.

The Success of LD students

Between 5% and 10% of all K-12 students are identified as having a specific learning disability (Department of Education 2002) and it is anticipated that this number will grow. The LD students with
academic challenges in both their general high school curriculum and in science classes.

Between 36% and 56% of LD students leave high school without a diploma or certificate of completion (Collett-Klingeberg 1998), and LD students score almost one standard deviation lower on science achievement tests than those students without disabilities (Anderman 1998).

**Learning Difficulties in Science**

The learning difficulties in science are mainly focused on the content that is most important for students to learn. The content standards define the science all students will come to understand, they portray the outcomes of science education as rich and varied encompassing. The students have the following learning difficulties in science.

- The ability to inquire.
- Knowing and understanding scientific facts, concepts, principles, laws and theories.
- The ability to reason scientifically.
- The ability to use science to make personal decisions and to take positions on societal issues.
- The ability to communicate effectively about science.
1.7 NEED OF THE DIFFERENT INSTRUCTIONAL STRATEGIES FOR STUDENTS WITH DIFFERENT LEARNING STYLES

The students with learning difficulties with different learning styles needed different instructional strategies. According to their preferences instructional strategies can be applied for better academic achievement.

In this study, for the students with learning difficulties with different learning styles in learning environmental science concepts, different instructional strategies were applied such as Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL). Instructional strategies refer to the skillful planning, execution and implementation of the comprehensive strategy incorporating the appropriate technology to overcome learning difficulties of students with different learning styles in learning environmental science concepts.

1. Computer Assisted Teaching Learning Instructional Strategy (CATL)

Individualized instruction aims at meeting the individual needs and requirements for learning. There are various methods of individualized instruction such as personalized system of instruction, Audio tutorial system, modular system, and computer assisted teaching learning (CATL), learning contracts and programmed learning.
These methods aim at improving learning materials, strategies for learning and teaching environments for learning, procedure for involving students in their own goal planning and organizational arrangements to facilitate shared planning and decision making. In this context, the investigator analyse how computers can be used as an effective instructional aid in teaching learning process.

Computers are used for very many purposes in all walks of life. In individualized instruction computers have found their way. In many cases computers are used as components of their methods of individualized instruction. Computers are used as a learning medium and they are capable of meeting the individual needs effectively and even efficiently. Computers can adopt and respond to the learner’s needs, difficulties and progress.

Computers are used to assist learning it is termed as Computer Assisted Teaching Learning (CATL) and also to manage learning it is termed as Computer Managed Learning (CML). In CATL, computers are used to mediate the flow of information in the process of learning. There may be flows between the learner and the factual information being learnt, the feed from and to the learner on his progress, the information about a model with which he is working or between the learner and his teacher or tutor.

The simplest form of CATL is providing the learner with exercise for drill and practice. The computer will process the responses of the learner and give the feedback about the correctness or
otherwise of the responses. It may congratulate on the correct response and give corrective comments when the answers are wrong. CATL offers endless drill and practice without repetition at a pace that can be controlled by the learner.

Tutorial is another mode of CATL. The tutorial dialogue may be somewhat similar to the programmed learning sequences. But it is not simply flashing the information on the screen instead of presenting it in a printed form in a book or over a teaching machine, CATL tutorials can decide in the needs of the students and their preferences and tutor the students according to their individual needs and preferences.

Computers can be used to emulate or simulate real life system by following a set of rules (a Programme) which approximate the behaviour of a real system, CATL simulation can be more flexible and more easily controllable than the simulations created using other equipments and media. Learning experiences that are time consuming, extensive, difficult and even dangerous can be learnt through simulations. Computers can simulate different systems using different programmes, computers as they run the simulation, can also mediate between the learner and the simulation of the real life system guiding her towards experiences which are likely to be helpful and providing some tutorial assistance where necessary.

Modeling mode is similar to the simulation mode. Both the modes help students learn by working with and analogue of a real life
system or phenomenon expressed as a set of rules within the computer. But in simulation the tutor specifies the analogue whereas in modeling the learner constructs the analogue. They teach the computer the rules to emulate the real life system in the given circumstances and predict the behaviour of the real life system in new circumstances. The learner learns through this process and the final model that develops testifies to his mastery of the learning.

Interactive knowledge based system (IKBS) provides tutorial guidance and explanations for the learner and helps him to understand and assimilate knowledge. The system may also ask a series of questions answers to which will help the learner to gain mastery over the content. Alternatively the learner may use the interactive knowledge based systems to model his own knowledge of the topic building and testing his own knowledge base.

Here the learner teaches the computer the subject and we know the best way to learn a subject is to teach it and IKBS provides an opportunity for the learner to do it. Computers help the learner in storing, retrieving, searching for and collecting relevant information, summarizing statistical data and suggesting possible lines of investigation.

2. **Experiential Learning Instructional Strategy (EL)**

**Experiential Learning Theory**

Experiential Learning Theory (ELT) provides a wholistic model of the learning process and a multilinear model of adult development,
both of which are consistent with what we know about how people learn, grow and develop.

The theory is called “Experiential Learning” to emphasize the central role that experience plays in the learning process, an emphasis that distinguishes ELT from other learning theories. The term “experiential” is used therefore to differentiate ELT both from cognitive learning theories, which tend to emphasize cognition over affect, and behavioural learning theories that deny any role for subjective experience in the learning process.

Another reason the theory is called “Experiential” is its intellectual origins in the experiential works of Dewey, Lewin and Piaget. Taken together, Dewey’s philosophical pragmatism, Lewin’s social psychology and Piaget’s cognitive – developmental genetic epistemology form a unique perspective on learning and development. (Kolb, 1984)

The Experiential Learning Model

Experiential learning theory defines learning as “the process whereby knowledge is created through the transformation of experience, Knowledge results from the combination of grasping and transforming experience” (Kolb 1984). The ELT model portrays two dialectically related modes of grasping experience Concrete Experience (CE) and Abstract conceptualization (AC) and two dialectically related modes of transforming experience – reflective observation (RO) and Active Experimentation (AE).
According to the four stages learning cycle, immediately or concrete experiences are the basis for observations and reflections. These reflections are assimilated and distilled into abstract concepts from which new implications for action can be drawn. These implications can be actively tested and serve as guides in creating new experiences.

A closer examination of the ELT learning model suggests that learning requires abilities that are polar opposites and that the learner must continually choose which set of learning abilities he or she will use in a specific learning situation. In grasping experience some of us perceive information through experiencing the concrete, tangible, felt qualities of the world, relying on our senses and immersing ourselves in concrete reality.

Others tend to perceive, grasp, or take hold of new information through symbolic representation of abstract conceptualization - thinking about, analyzing or systematically planning, rather than using sensation as a guide, similarly, in transforming or processing experience some of us tend to carefully watch others who are involved in the experience and reflect on what happens, while others choose to jump right in and start doing things. The watchers favour reflective observation, while the doers favour active experimentation.

Each dimension of the learning process presents us with a choice. Since it is virtually impossible, for example, to simultaneously drive a car (Concrete experience) and analyze a driver’s manual about
the car’s functioning (Abstract conceptualization), we resolve the conflict by choosing. Because of our hereditary equipment, our particular past life experiences, and the demands of our present environment, we develop a preferred way of choosing. We resolve the conflict between concrete or abstract and between active or reflective in some patterned, characteristic easy. We call these patterned ways “Learning Styles”.

1.8 DEFINITION OF THE TERMS USED IN THE STUDY

Learning Difficulties

A definition was formulated by the National Advisory Committee on handicapped students in their annual report to congress in 1968 states that “Students with specific learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading and writing. However, they usually contain three essential elements: a discrepancy clause, an exclusion clause and an etiology clause.

1. The discrepancy clause states there is significant disparity between aspects of specific functioning and general ability.
2. The exclusion clause states that the disparity is not primarily due to intellectual, physical, emotional or environmental problems.
3. The etiology clause speaks to causation involving genetic, biological or neurological factors.
But most frequent clause used in determining whether a child has learning difficulty (LD) is the difference between areas of functioning.

**Kirk (1963)** coined the term 'Learning Disability' who used it to describe a group of students with specific learning deficits. He stated that a learning disability refers to retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, spelling, writing or arithmetic. Kirk explains that learning disability results from a possible cerebral dysfunction and or emotional or behavioural disturbances, not from mental retardation, sensory deprivation, or cultural or instructional factors. The term learning difficulties was formally accepted and an organization called the Association for Students with Learning Disabilities (ACLD) was started to provide services for individuals of all ages.

**Ramaa (1992)** explains that term ‘Learning Disability’ indicates limited ability in learning. When a person is having inadequacy or limited ability in learning a wide variety of tasks involving different levels of intellectual functioning he can be considered to have a general mental retardation, on the other hand, if the limitation is restricted to certain areas of learning especially language and number related areas, he can be considered to have learning disability.

In order to differentiate the two kinds of limitations, the term ‘General Learning Disability’ is suggested as an equivalent for mental
retardation and the term specific learning disability for disabilities observed only in certain areas of learning. The specific learning disabilities are usually indicated as reading disability, writing disability, spelling disability and arithmetic disability etc.

Dorothy Smith (1996) shares her views that students with specific difficulties are those who, in the absence of sensory defect or overt organic damage, have an intractable learning problem in one or more of reading, writing, spelling and mathematics and who don't respond to normal teaching (Tansley and Panckurst, 1981)

A specific learning difficulty is one of the categories in special education. Difficulties with reading and spelling and associated problems are known as: specific Learning disability, or dyslexia in the United States and occasionally in the United Kingdom (Joy Pollock and Elizabeth Waller, 1997)

In 1969, The National Advisory Committee on Handicapped Students (NACHC) passed an act and developed an acceptable definition. “Students with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia etc. they do not include learning problems which are primarily due to Visual, hearing or motor
handicaps to mental retardation, emotional disturbance or environmental disadvantages" (USOE, 1968, P.34)

**The Federal Definition**

United States office of Educational released the 1977 Federal Register which included the revised definition. ‘Specific Learning Disability’ means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include students who have learning problems which are primarily the result of Visual, Hearing or Motor handicaps, or mental retardation, or emotional disturbance, or of environmental, cultural or economic disadvantage (USOE, 1977, P.65083)

**The NJCLD Definition**

In 1981, The National Joint Committee on learning disabilities revised the definition and agreed on the following:

Learning disability is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. 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 (Hammill et.al.1981)

In western context, particularly in European countries, the term 'Learning Difficulties' is used in the place of 'Learning disabilities.' In American context, the term, 'Learning disability' is used in the place of 'Learning Difficulties'. In this study, the term 'Learning Difficulties' is used synonymously in the place of 'Learning Disabilities'.

In this study, the students with average and above average intelligence whose academic achievement is not on par with their acquired intelligence are considered students with learning difficulties.

Learning Styles

Visual - Auditory – Kinesthetic learning styles

The VAK learning styles model provides a very easy and quick reference inventory by which to assess people’s preferred learning styles, and then most importantly to design learning methods and experiences that match people’s preferences.

According to R.Dunn “Learning style is the way each person begins to concentrate on absorb, process and retains new and difficult information and skills”. Every human being has a learning style
regardless of their I.Q., achievement level or socio economic status and there are no ‘good’ or ‘bad’ learning styles.

According to Barbara Prashing “Learning Style is the way human beings take in new and/or difficult information how they process, store and retrieve it”. Learning preferences of students are most important in difficult learning situations and don’t need to be matched all the time, because there is also very important factor of flexibility which is a strength in itself in adverse learning situations. In addition to that, motivation plays an important role and can override non-preferences, but generally only for a certain period of time. However, teachers of younger students need to be aware under which conditions and how they learn best; mature students can study more effectively by knowing their personal learning style.

Grasha (1996) has defined Learning styles as “Personal qualities that influence the student’s ability to acquire information, to interact with peers and the teacher, and otherwise particular in learning experiences”.

Another prominent definitions was put forth by Riding and Rayner (1998) Who saw learning styles has an individuals repertoire of learning strategies (the ways in which learning tasks are habitually responded to) combined with cognitive style (the way information is organized and represented). They maintain that while it may be possible for learning strategies to change over time, the cognitive style dimensions in their model (wholist-analytic, the tendency to either
organize information into wholes or parts; and verbal – imagery, the tendency to represent information while thinking either verbally or in images) do not.

**Stenberg** offers his own definition of styles: Habitual patterns or preferred ways of doing something that are consistent over long periods and across a variety of activities. He defines five dimensions of learning styles function (Creative, task oriented or evaluative) forms singular or distributed focus, flexible or prioritized levels (concrete or global) scope (intrapersonal or interpersonal and learnings [liberal or conservative].

The Research literature on learning styles comes from several disciplines contributing to the disjointed, inconsistent and often contradictory information regarding what learning styles are and how they can be measured.

According to **De Bello (1990)** there are nearly as many definitions of learning styles as there are theorists. **Stenberg (2001)** reports that most learning styles research studies have yet to be replicated. Further, studies tend to be tied to a particular instrument often without sufficient evidence of construct validity or internal consistency and whatever the particular instruments measures is called a Style.
Teaching and Learning Styles are the behaviour or actions the teachers and learners exhibit in the learning exchange. Teaching behaviours reflect the beliefs and values that teachers hold about the learner's role in the exchange *(Heimlich and Norland 2002)*. Learners' behaviours provide insight into the ways learners perceive, interact with and respond to the environment in which learning occurs *(Ladd and Ruby 1999)*.

Students may have very different preferences: when, where and how often to learn. While many instructors are aware that different learning styles exist, the application of this knowledge is often inconsequential. Some faculties simply opt to utilize a wide variety of teaching activities, hoping that they will cover most student learning preferences along the way.

This method, though expedient, may not be the most effective or systematic way to address students' learning preference in the classroom. Also, faculties are assuming that teaching styles, and accompanying classroom processes, are like a "master key" and thus appropriate for any setting.

In this study the investigator tried to find out the learning styles of students with learning difficulties by using Learning Style Identification Test (LSIT). This LSIT was developed by the investigator for this study. On the basis of the LSIT score the students with learning difficulties were grouped into four categories viz. Visual learners, Auditory learners, Kinesthetic learners and students with
mixed learning styles. For this study, the investigator considered only students with Visual, Auditory and Kinesthetic learning styles.

**Instructional Strategy (or) Method**

According to Longman’s Dictionary of contemporary English (1995) “instruction” refers to the printed information that tells you use a piece of equipment etc and “strategy” refers to a ‘well planned series of actions for achieving an aim’. Instructional strategy refers to the process of helping students become self-regulated learners, individuals to have knowledge how they have to use effectively what they have learned.

In this study, instructional strategies refer to the skillful planning, execution and implementation of the comprehensive strategy incorporating the appropriate technology to overcome learning difficulties of students with different learning styles in learning environmental science concepts. The investigator applies Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL) instructional strategies to overcome learning difficulties in learning Environmental science concepts.

The investigator defines that

**CT instructional strategy** is a traditional chalk and talk method. In this strategy, chalk and blackboard were used to teach environmental science concepts.
CATL instructional strategy is an aid to teach environmental science concepts by using computer and software.

EL instructional strategy is an activity oriented method to teach environmental science concepts and direct experience will be provided in the learning process.

Effectiveness

According to Oxford Dictionary (1975) Effectiveness is "being able to bring about the result intended." Chamber’s Twentieth Century Dictionary (1972) defines effectiveness as ‘being successful in producing a result or effect.’

As far as this study is concerned effectiveness refers to the impressive result produced in learning of Environmental science concepts by the students with learning difficulties with different learning styles, consequent to the operation of instructional strategies. It also refers to the degree of realization of higher level attainment.

1.9 STATEMENT OF THE PROBLEM

To study the effectiveness of different instructional strategies to overcome the learning problems of the students with different learning styles, the investigator has taken up the research problem entitled “EFFECTIVENESS OF CERTAIN INSTRUCTIONAL STRATEGIES ON THE ACHIEVEMENT OF LEARNING DIFFICULTY STUDENTS WITH DIFFERENT LEARNING STYLES”. This study attempts to compare the achievement levels of
students in the learning of Environmental science concepts through Conventional Teaching (CT), Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL) strategies.

1.10 NEED AND IMPORTANCE OF THE STUDY

To study the effective improvement in the quality of education, it is necessary to focus on classroom instruction. There are a number of things to look into the instructional strategies for students with learning difficulties (SLD) with special reference to different learning styles (Auditory, Visual and Kinesthetic).

Their learning styles have to be carefully monitored and systematically analyzed. Such analysis would lead to the identification of suitable methods of instructional strategies for SLD. Based on such systematic analysis, it is possible to evaluate and modify the teaching strategies followed by the teachers so as to increase the efficiency of learning.

A beginning has just been made in India to investigate the effective instructional strategy for SLD in classroom. The lecture method, a major mode of instruction in classroom becomes difficult for many students, who are unable to understand the teaching in the form of verbal communication. Thus there is an urgent need for research in this area.

In the classroom, it is the nature and efficiency of teaching that forms the basis for successful learning. So, the investigator must take
interest in finding out the appropriate instructional strategies for better achievement of SLD in the learning of Environmental science concepts with different learning styles (Auditory, Visual and Kinesthetic).

In this context, the investigator tried some of the Instructional strategies such as Conventional Teaching (CT), Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL). Keeping this in mind, the investigator attempts to study the effectiveness of different instructional strategies to overcome learning difficulties of students with different learning styles in learning of Environmental science concepts.

1.11 OBJECTIVES OF THE STUDY

1. To adopt tools and assess learning styles of students at the primary level.

2. To identify students with learning difficulties and assess learning styles of students at the primary level.

3. To develop certain Instructional Strategies [Computer Assisted Teaching Learning (CATL), Experiential Learning (EL) and Conventional Teaching (CT)] to teach Environmental science concepts to the students with learning difficulties.
4. To study the significance of different Instructional Strategies (CATL, EL and CT) on the post test achievement of students with learning difficulties especially with regard to their learning styles (Auditory, Visual and Kinesthetic).

5. To study the significance of different Instructional Strategies (CATL, EL and CT) on the retention ability of students with learning difficulties especially with regard to their learning styles. (Auditory, Visual and Kinesthetic).

6. To study the significance of the difference in the mental ability of the students with learning difficulties with regard to their learning styles (Auditory, Visual and Kinesthetic).

7. To study the significance of the relationship between mental ability and academic achievement (Post test scores) of the students with learning difficulties with different learning styles (Auditory, Visual and Kinesthetic).

1.12 HYPOTHESES OF THE STUDY

1. There will not be significant difference in the post test achievement of the students with learning difficulties with Auditory Learning Style learnt through different Instructional strategies [Conventional Teaching (CT), Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL)].
2. There will not be significant difference in the post test achievement of the students with learning difficulties with Visual Learning Style learnt through different Instructional strategies [Computer Assisted Teaching Learning (CATL), Experiential Learning (EL) and Conventional Teaching (CT)].

3. There will not be significant difference in the post test achievement of the students with learning difficulties with Kinesthetic Learning Style learnt through different Instructional strategies [Experiential Learning (EL), Computer Assisted Teaching Learning (CATL) and Conventional Teaching (CT)].

4. There will not be significant difference in the retention test achievement of the students with learning difficulties with Auditory Learning Style learnt through different Instructional strategies [Conventional Teaching (CT), Computer Assisted Teaching Learning (CATL) and Experiential Learning (EL)].

5. There will not be significant difference in the retention test achievement of the students with learning difficulties with Visual Learning Style learnt through different Instructional strategies [Computer Assisted Teaching Learning (CATL), Experiential Learning (EL) and Conventional Teaching (CT)].

6. There will not be significant difference in the retention test achievement of the students with learning difficulties with Kinesthetic Learning Style learnt through different Instructional
strategies [Experiential Learning (EL), Computer Assisted Teaching Learning (CATL) and Conventional Teaching (CT)].

7. There will not be significant difference in the mental ability of the students with learning difficulties with regard to their different learning styles (Auditory, Visual and Kinesthetic).

8. There will not be significant relationship between mental ability and academic achievement (Post test scores) of the students with learning difficulties with Auditory Learning Style.

9. There will not be significant relationship between mental ability and academic achievement (Post test scores) of the students with learning difficulties with Visual Learning Style.

10. There will not be significant relationship between mental ability and academic achievement (Post test scores) of the students with learning difficulties with Kinesthetic Learning Style.

1.13 SCOPE OF THE STUDY

The students with different potentialities and different limitation are distributed in the classroom. Each child requires specific learning strategy to understand classroom activities. For instance, the students with low intellect prefer concrete method of teaching rather than abstract one in the classroom. On the other hand high intellects may not be satisfied with concrete instruction method, they may require abstract method of instruction.
Similarly, the audiovisual equipments and experiential learning activities attract some group of students in the classroom, in another dimension, the learning style of the students and understanding levels vary from child to child.

Hence, it is essential to modify the teaching strategies to cater the students with learning difficulties with different learning styles in the classroom. In this context, the investigator attempts to develop a remedial instructional strategy keeping in mind for the students with learning difficulties in learning of Environmental science concepts with different learning styles, this study provides valid information on use of educational technology for teaching the students with learning difficulties with different learning styles.

**1.14 DELIMITATIONS OF THE STUDY**

1. The study is confined to 5th standard students only.
2. Since the present study is experimental in nature, the size of the sample selection is limited.
3. The SLD of the English medium only in Coimbatore area are considered for this study.
4. Only selected software package and experiential learning instructional kit have been made use of in the study.
1.15 ORGANISATION OF THE THESIS

The dissertation is presented in five chapters

First chapter deals with introduction, concept and meaning of learning difficulties or disabilities and learning styles, need for the study, objectives of study, scope of the study and limitations of the study.

The review of related literature is presented in the second chapter.

Third chapter deals with methodology adopted for this study. Further construction of the tools, selection of the sample and data gathering procedure explained in detailed manner.

The tabulation, analysis and interpretation of the data collected for this study is given in the fourth chapter.

Fifth chapter deals with the findings and conclusions of the study. It also includes suggestions for further research on the topic, bibliography and appendices also included.

The review of related literature follows in the Chapter - II