CONCEPTUAL FRAMEWORK
CHAPTER III

CONCEPTUAL FRAMEWORK

<table>
<thead>
<tr>
<th>S.NO</th>
<th>CONTENT</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>INTRODUCTION</td>
<td>126</td>
</tr>
<tr>
<td>3.2</td>
<td>COGNITIVE SCIENCE</td>
<td>127</td>
</tr>
<tr>
<td>3.3</td>
<td>COGNITIVE NEUROSCIENCE</td>
<td>130</td>
</tr>
<tr>
<td>3.4</td>
<td>NEUROSCIENCE</td>
<td>137</td>
</tr>
<tr>
<td>3.5</td>
<td>NEUROPSYCHOLOGY</td>
<td>142</td>
</tr>
<tr>
<td>3.6</td>
<td>BRAIN COMPATIBLE AND NEUROCOGNITIVE LEARNING ENVIRONMENT</td>
<td>149</td>
</tr>
<tr>
<td>3.7</td>
<td>THE BRAIN AND BRAIN MAP</td>
<td>150</td>
</tr>
<tr>
<td>3.8</td>
<td>NEURAL NETWORK AND FUNCTIONAL DISORDER</td>
<td>158</td>
</tr>
<tr>
<td>3.9</td>
<td>NEURO COGNITION</td>
<td>172</td>
</tr>
<tr>
<td>3.10</td>
<td>ROLE OF NEURO COGNITIVE THERAPY</td>
<td>173</td>
</tr>
<tr>
<td>3.11</td>
<td>THERAPY IS DIFFERENTIATED FROM TRAINING</td>
<td>177</td>
</tr>
<tr>
<td>3.12</td>
<td>NEUROCOGNITIVE STRATEGIES</td>
<td>179</td>
</tr>
<tr>
<td>3.13</td>
<td>TEACHER COMPETENCE</td>
<td>186</td>
</tr>
<tr>
<td>3.14</td>
<td>CLASSIFICATION OF TEACHER COMPETENCIES</td>
<td>189</td>
</tr>
<tr>
<td>3.15</td>
<td>COMPETENT TEACHER</td>
<td>197</td>
</tr>
<tr>
<td>3.16</td>
<td>CHARACTERISTICS OF A GOOD TEACHER</td>
<td>200</td>
</tr>
<tr>
<td>3.17</td>
<td>IMPORTANCE OF TEACHER COMPETENCE</td>
<td>203</td>
</tr>
<tr>
<td>3.18</td>
<td>ACADEMIC ABILITY</td>
<td>205</td>
</tr>
<tr>
<td>3.19</td>
<td>NEUROCOGNITIVE LEARNING IN TEACHING SCIENCE</td>
<td>209</td>
</tr>
<tr>
<td>3.20</td>
<td>A MODEL TO DEVELOP COMPETENCE IN TEACHING SCIENCE THROUGH NEUROCOGNITIVE INTERVENTION STRATEGIES AND NEUROCOGNITIVE THERAPY</td>
<td>213</td>
</tr>
</tbody>
</table>
3.1 INTRODUCTION

Education is the most powerful instrument whose effective use requires the strength of will, dedicated work and sacrifice. Since this instrument is in the hands of teachers, they must possess the qualities for its effective use. Education develops desirable habits, skills and attitudes which make an individual a good citizen. Primary education is one of the cornerstones of development. It plays an important role in laying the proper foundation of child’s cultural, social, moral, emotional, intellectual, physical and spiritual development. Primary education contributes to national development also. Article 45 of the directive principles of state policy in the constitution urges to provide free and compulsory education to all children below 14 years. The importance of education is quite clear. Education is the knowledge of putting one’s potentials to maximum use. One can safely say that a human being is not in the proper sense till he is educated.

The quality of a nation depends upon the quality of its citizens. The quality of the citizens rests upon the quality of their education. The quality of their education depends upon the competence, dedication and quality of school teacher and the classroom, but the dialogues rapport and interactions supported by deeds, between the learners and the teachers, all the time developing within its four walls can make or mar the destiny of the youngsters and in turn that of the nation.
3.2 COGNITIVE SCIENCE

Cognitive science is a multi disciplinary field, comprising cognitive psychology, artificial intelligence, linguistics, neuroscience and anthropology.

A) DESCRIPTIONS AND DEFINITIONS

Several authors have attempted more rigorous definitions of cognitive science.

- A cognitive information processing account, for example, views the mind as an information-processing system that selects, transforms, encodes, stores, retrieves and generates information and behaviour. (Lachman and Butler field 1979)

- “Cognitive science” sometimes explicitly, and sometimes implicitly, tries to elucidate the workings of the sort that is carried out by the digital computer, but of a sort that lies within the broader theory of computation” (Johnson – Laird, 1988)

- Early cognitive scientists viewed the mind as a sequential processor, similar to the early digital computer. The mind was seen as a passive recipient of information, which was registered in a short-term memory, and perhaps encoded long-term memory.

- Recent cognitive scientists pointed out that the mind is a parallel processor. (PDP Research Group)

- Neisser (1976) & Lakoh (1987) emphasized that mental structures are active and that they occur within a particular context.
Further understanding of cognitive science can be gained by discussing its origins. The development of cognitive science models was encouraged by various factors, including the failure of behaviourism, the invention of the computer, and various theoretical advances.

A number of other developments consolidated the importance of computational constructs for psychology. Thus, it was proposed that certain concepts were useful in explaining both computing machines and human brains. This was clearly formulated at a seminal meeting in 1948, the Hixon symposium on “Cerebral Mechanisms in Behaviour” and which Muculloch, a professor of psychiatry and von Neumann were the opening speakers. The all or none property of neuronal activation can be compared with the determination of Boolean statements as either true or false.

In addition, it was argued that certain constructs were useful in explaining both computing machines and human minds. Hebb (1949) suggested that synaptic strengthening in neuronal networks led to learning. Wiener (1947) proposed that machines and minds that had feedback mechanisms displayed purposefulness. Central to control and communication engineering was the notion message, whether this was transmitted by electrical, mechanical or neural means. Miller illustrated the importance of empirical studies on cognition by discussing work on the constraints of short-term memory processes.
**Cognitive science models can be contrasted and compared with the clinically familiar models of behaviorism, psycho-analysis and neurobiology. The behaviorism, self-consciously makes the mind into a “black-box”, asserting that only observable stimuli and responses can be studied. In contrasts, the cognitive model holds that what is most interesting are the mental structures in the “black box” and the processes (operations) whereby they generate cognitive products (thoughts and feelings).

While the behaviorist model is limited to inputs (stimuli) and outputs (responses), the cognitive model is concerned with inputs, processing and outputs.

The classical psycho analytic model of the mind was energy based one. Freud (1894), “in mental functions something is to be distinguished – a quota of affect or sum of excitation. Which possess all the characteristics of a quantity, which is capable to increase, diminution, displacement and discharge, and which is spread over the memory traces of ideas some what as an electric charge is spread over the surface of a body”.

Cognitive science and psycho analysis both focus on the structures of the mind, and the way in which these determine mental phenomena. Neurobiological models attempt to explain the biological basis of mental processes and products, proponents of these models may state that all psychological explanations are reducible to neurobiological ones. This view
contrasts with the cognitive science argument that cognitive phenomena necessarily require psychological explanations.

### 3.3 COGNITIVE NEUROSCIENCE

Cognitive neuroscience is an academic field concerned with the scientific study of biological mechanisms underlying cognition, with a specific focus on the neural substrates of mental processes and their behavioral manifestations. It addresses the questions how psychological cognitive functions are produced by the neural circuitry.

**(i) ANXIETY DISORDERS**

The programme includes a skills training component and an exposure component. First youth are thought a four step coping plan called the FEAR. (ie) feeling, frightened, expecting bad things to happen, Actions and attitudes and Results and rewards). The following steps are developed and tested for childhood anxiety disorders.

- Recognition of anxious feelings and somatic reactions.
- Role of cognition and self-talk in exacerbating anxious situations.
- The use of problem solving and coping skills to manage anxiety.
- Self-evaluation and self-reinforcement strategies to facilitate the maintenance of coping.
(ii) STRESS DISORDER

The treatments focused on

- education and coping interventions
- Communication, modeling and exposure intervention
- Behaviour management skills.

Child treatments for anxiety disorders involved three modules:

- Coping skills training
- Gradual exposure intervention
- education and prevention training

(iii) AGGRESSIVE BEHAVIOUR

The high personal and societal costs associated with conduct problems and violence in youth has inspired a significant body of research on the development, maintenance and treatment of these behavioural problems. Although most children occasionally display aggressive behaviours, aggression may be indicate of psychopathology when it is severe and frequent or occur across multiple settings.

Biological and family factors play an important role in understanding aggressive behaviour in childhood. ICBT programme emphasizes the acquisition and mastery of problem solving skills.
Feindler (1986) has elaborated a similar GCBT programme, including arousal management, cognitive restructuring and problem solving and prosocial skills training components. Relaxation training and visual imagery may also be introduced as means of controlling physiological arousal and children are encouraged to apply these strategies in difficult interpersonal situations.

(iv) ATTENTION - DEFICIT & HYPERACTIVITY DISORDER

AD & HD represents one of the most common reasons for a child’s referral to a school counselor. Distinguished by the three symptoms they are, clusters of inattention, impulsivity and hyper activity. In addition to the three core symptoms, associated features of ADAD include:

- academic under achievement
- cognitive and language performance deficit
- Inconsistent task performance
- Limited performance in rule governed situations
- Impaired social functioning in peer and family settings
- Conduct disorder (CD) and oppositional defiant disorder (ODD)
- Anxiety disorder (GAD) and depression

CBT approaches have been applied with ADHD youth. These interventions typically involve rewards and response cost contingencies, modeling of problem solving strategies, affective education, homework tasks, self-evaluation training, perspective taking activities and ample in session and
extra session practice of these skills. The overall goal of the programmes lies in assisting youth in the application of problem-solving that delays immediate behavioral response and fosters consideration of other possible and hopefully more adjustment enhancing responses.

One particular programme developed by Kendall and Braswall (1993) for impulsive children presents social problem solving steps as self instructions.

- defining the problem
- approaching the problem
- focusing attention
- selecting an answer
- self-reinforcement

Children are also encouraged to develop individualized, meaningful. Self-statements and together with the therapist, create individualized ‘stop and think steps’

(V) DEPRESSIVE DISORDER

Cognitive factors in Depression

- Self-evaluation
- Identification of skill Deficits
- Evaluation of life experiences
- Self-talk
- Automatic thoughts
- Irrational ideas and beliefs
- Over generalizing or catastrophizing
- Cognitive Distortions
- Pessimistic Thinking

(i) SELF EVALUATION

Self-evaluation is a process that is ongoing. We evaluate how we are managing life tasks, and we evaluate whether we are doing what we should, saying what we should, or acting the way we should. Psychologists assume that self-evaluation, in depressed individuals, is too critical and feeds low self-esteem and a sense of failure.

(ii) IDENTIFICATION OF SKILL DEFICITS

A depressed person may accurately identify a skill deficit. However, in depression, the person assumes that he/she cannot learn how to do what is necessary to achieve a better outcome. The depressed person believes that he/she cannot learn how to act differently. Accurate identification of social skill deficits complicates depression, because it provides a reality base for the other irrational and exaggerated negative perceptions of the depressed person.

Psychologists help depressed persons identify their social skill deficits, and also help them develop a plan to improve those skills. This part of
cognitive therapy is more behavioural, as the psychologist teaches the depressed person how to manage their life problems.

(iii) EVOLUTION OF LIFE EXPERIENCE

When depressed, a person will focus on minor negative aspects of what was otherwise a positive life experience, if anything goes wrong, the depressed person evaluates the entire experience as a failure, or as a negative life experience. As a result, memories are almost always negative. This is reflective of unrealistic expectations.

Psychologists help to develop realistic expectations about life, and help to determine what we need versus what we want.

(iv) SELF TALK

Self talk is a way of describing all the things we say to ourselves all day long as we confront obstacles, make decisions, and resolve problems, usually, it is part of our thinking process, or what we call “stream of consciousness”.

Self-talk is not bad, or wrong or a sign of psychological problems. It is normal. But, negative self-talk prevents us from solving problems, and can contribute to a variety of psychological problems, including depression.

Psychologists help depressed individuals identify negative self-talk, and also teach them how to challenge these negative statements, and how to replace them with positive self-talk.
(v) AUTOMATIC THOUGHTS

Automatic thoughts are repetitive automatic self-statements that we always say to ourselves in certain situations. Psychological problems develop when our automatic thoughts are consistently negative.

When automatic thoughts control our emotional response to people, problems and events, we ignore evidence that contradicts the automatic thought, psychologists help to identify our negative automatic thoughts, and how to develop positive challenges to those negative ideas.

(vi) OVERGENERALIZING OR CATASTROPHIZING

Catastrophizing is a negative overgeneralization. Cognitive distortions are another way of describing the irrational ideas, over generalizing of simple mistakes, or developing false assumptions about what other people think about us, or expect from us. We are distorting reality by the way we are evaluating a situation. The concept of cognitive distortion highlights the importance of perceptions, assumptions and judgments in coping with the world. Psychologists help us determine what evaluations or distortions by providing objective feedback about our evaluations of the world, and by teaching us how to change the way we perceive problems.

(Vii) PESSIMISTIC THINKING

Pessimistic thinking does not cause depression, but it appears to be easier to become depressed if we tend to view the world with considerable pessimism, pessimism feeds the negative cognitive distortions and self-talk. Hopelessness
is a central feature of depression. Pessimism encourages the negative assessments of our life. Optimism prevent us from reaching those conclusions. If fact, psychologists have researched ways to learn how to be more optimistic, as a way of fighting depression.

### 3.4 NEUROSCIENCE

Neuroscience is disclosed as an important information about the brain and how it learns. It is uncovered "unprecedented revolution of knowledge about the human brain, including how it processes, interprets and stores information" (Sousa, 1998). The new brain-based learning theory "require[s] that we now shift our focus to the learning process" (Sousa, 1998). This information can be used to "facilitate learning" (Jackson, 1999). A learner feeling is very important to their learning process, the learner is enthusiastic and doesn't feel stress, and the learning will take place. If the conditions are negative and the learner doesn't feel safe, learning will not take place. Neuroscientists discovered this information about the learning process as they are researching the way the brain learns.

According to David Sousa, "yesterday's methods worked well for yesterday's students. But the student brain of today is quite different from the one of 15 years ago" (Sousa, 1998). It is therefore necessary to study how students' brains work today so that it is possible to enhance their learning. "Today's children spend much more time with television and other electronic media than with their parents" (Sousa, 1998).
Technology can cater to these neuroscience brain-based findings in the computer lab as well as for online learning courses. Various Microsoft tools such as PowerPoint presentations, Excel, Word processor and other software with multimedia functions can be used by the teacher and students instead of using conventional outdated class tools. Since today's brain needs a TV like environment, both sound and animations can be used to suit today's learner. Lessons can be prepared by utilizing the information that is readily available on the internet. However to avoid frustrations and stress that can interfere with learning, lessons must be planned very carefully "to helps structure and focus students' explorations of the Net" (Deal, 1998). This will direct them to the goals at hand. Today's students experience different "patterns" (DeJong, 1999) from those of the past. Brain-based learning findings reveal that "the search for meaning is innate..., occurs through "patterning"... and [that] emotions are critical to [these] patterning" (DeJong, 1999). Meaning must be based on previous interests and "emotions interact with reason to support or inhibit teach (Sousa, 1998). How students feel in the classroom "determines the amount of attention they devote to ... [the lesson] (Sousa, 1998). It is very important for learners to feel relaxed and safe in the learning environment. Feeling threatened will shut down the learning process and as Daniel Goleman claims, "hijack" the rest of the brain (Viader, 1996). Teachers can help students understand the impact negative and positive emotions have on learning.
"Positive emotions such as love, excitement, enthusiasm and joy enhance the ability to process information and create permanent mental programs" (Sylwester, 1996). Learning cannot take place unless the learner feels "safe" (Sylwester, 1996). "Stress and constant fear, at any age, can circumvent the brain's normal circuits" (Viadero, 1996). And yet, emotions are critical to learning.

"Larry Cahill, James McGaugh, and their colleagues...have found that people were better at recalling stories or slides that had aroused strong feelings in them than those that were devoid of emotional context" (Viadero, 1996). Emotions can improve memory. Another finding was that emotions can either add or detract from learning. Since learning is based on individual patterning and experiences (Caine, 1997), in this case electronic media, it is only natural that these environments be duplicated in school. Learning can no longer be limited to a single confined environment, such as the classroom. Teachers need to "establish an environment that is free from intimidation and rejection, high in acceptable challenge and where the learner experiences active participation and relaxed alertness" (Dwyer, 2002). This can be done by giving constant positive and encouraging feedback to the students while they are working in the computer room. Monitoring these rooms is much easier than in a conventional classroom. Each student has work assigned to him. Individualized lessons are possible so that each learner can find meaning in his particular assignment.
Computer based learning such as project work (Deutsch. 2003) or working on Web Quests in teams of three or four is a great way to keep emotions alive. It is very challenging to work with others on a mutual goal. Since social skills are developed at this age, it is only natural for students to want to work in teams. This leads to many discussions and calls for decision making. Students develop character and responsibility on the team. At the same time it is very important for the teacher to interact with the students to make sure that team spirit is high. If there are social problems some learners may feel threatened and uncomfortable. This will detract from their learning. Regular reflections and team discussions will help keep the team busy with their work. Daily journal reports are an excellent way to encourage both team and individual reflections on how students feel. These should be handed in regularly. Technology and computer work is very important. It's a challenge to do projects and learn collaboratively. However, feelings must be taken into account. Teachers must monitor the room at all times.

Careful attention should be given to teams that are having difficulties. This gives the teacher a chance to sit with each team in order to discuss the team's progress and encourage them. Feelings are part of the learning process. Students should learn about emotions and their importance to the learning process.
Teaching students how to feel enthusiastic about their assignments and projects will enhance their learning. Students can be empowered to find freedom in the Web instead of getting caught in it (Deal, 1998). It is up to educators to find ways of integrating brain-based learning with technology.

Neuro science is a field that is devoted to the scientific study of the nervous system. Such studies may include the structure, function, development, physiology, pharmacology and pathology of the nervous system. The scope of neuroscience has now broadened to include any systematic scientific experimental and theoretical investigation of the central and peripheral nervous system of biological organisms.

The task of neural science is to explain behaviour in terms of the activities of the brain. The last frontier of the biological sciences their ultimate challenge is to understand the processes by which we perceive, act learn and remember. Neurons form functional circuits, each responsible for specific tasks to the behaviours at the organism level. Thus, neuroscience can be studied at many different levels, ranging from molecular level to cellular level and systems level to cognitive level.

At the cognitive level, cognitive neuroscience addresses the questions of how psychological / cognitive functions are produced by the neural circuit. The emergence of powerful experimental techniques such as neuro imaging, electrophysiology and human genetic analysis allows neuroscientists to address abstract questions such as how human cognition and emotion mapped to specific neural circuitries, many mental processes previously thought to be...
beyond scientific understandings have been shown to have robust neural correlates.

Cognitive neuroscience is an academic field concerned with the scientific study of biological mechanisms underlying cognition, with a specific focus on the neural substrates of mental processes and their behavioural manifestations. Cognitive neuroscience is a branch of both psychology and neuroscience, unifying and overlapping with several sub-disciplines such as cognitive psychology, psychobiology and neuro biology.

3.5 NEUROPSYCHOLOGY

The term neuropsychology refers to the scientific study of brain-behavior relationships. This branch of knowledge is multidisciplinary; its foundations come from psychology, medicine, physiology, anatomy, and other scientific disciplines. The development and expression of normal brain-behavior activity involves the integrated functioning of a vast number of neural systems, ranging from the simplest stimulus-response reflexes to our highest and most diffusely organized intellectual and self-regulatory conscious functioning. Neuropsychology is the study of how the nervous system—the brain—works at its most sophisticated level. That is, at the level of behavior. Our behavior is a function of how our brain operates. The term behavior refers to virtually any activities in daily life, learning, emotions, and all aspects of cognition.
3.5.1. BASIC FEATURES OF NEUROPSYCHOLOGY

There are six basic features for the process neuropsychology are as follows:

1. Higher cerebral functions are multidimensional. Therefore, the neuropsychological evaluation of cognitive functioning in known or suspected brain disease also multidimensional. When the brain is healthy and the function is normal, the basic dimensions of cognitive function like Orientation, Attention, New-Learning and Memory, Intellectual Functioning, Language Functioning, Visuospatial, Visuoperceptive, and Visuoconstructive Functioning; Sensorimotor Functioning; Executive Functioning; and Personality Functioning are normal.

2. Neurobehavioral function is the primary goal for neuropsychological consultation and the basis for neuropsychological recommendations.

3. Performances during neuropsychological evaluation are interpreted in terms of quantitative scores, qualitative performances.

4. Evaluations are flexible and the individual's present their problems, the history of the problem, and the context in which the evaluation is requested and executed.

5. Performances on neuropsychological evaluations are examined in terms of neurobehavioral syndromes.

6. Neuropsychological consultation challenges the development of effective and cost-efficient rehabilitation.
3.5.2. COGNITIVE FUNCTION OF NEUROPSYCHOLOGY

The major dimensions of normal cognition from a neuropsychological view are as follows;

a. **Orientation** is basically a functional level of alertness. It represents the changing awareness of place in time and space. Accurate temporal orientation is an essential component of basic mental competence.

b. **Attention** is a cognitive function and considered to be a multidimensional. That means it can be broken down as a system into a number of reliable cognitive subsystems. Like orientation, attention appears as a diffusely organized function in the brain and is sensitive to diffuse or multifocal brain disorders. The Reticular Activating System of the brainstem and midbrain, the Thalamus, and the Frontal Lobes are particularly important regions for normal levels of alertness and attention.

c. **New-learning and memorization** are cognitive functions, like attention, it is also multidimensional systems. There are a number of ways to distinguish the different stages of learning and memory. Memory—which is quite sensitive to attention functioning and is relatively short-term—and long-term memory, which represents the stored fund of knowledge. Learning is the process of memory and involves encoding and storage of new information. A final process in memory functioning is the retrieval
of stored information, which may involve free recall, cued recall, and recognition memory.

d. **Intellectual functioning** represents a global representation of overall functioning. Intellectual functioning is compromised by severe brain trauma and by the neurodegenerative diseases, such as Alzheimer's.

e. **Language functioning** is defined by a number of subsystems at both a cognitive and an anatomical level. These components of language include: verbal production, word-retrieval, repetition of phrases, controlled verbal association, comprehension, higher-order verbal-conceptual functioning, spelling, reading, and writing. These abilities are largely sub served by the dominant cerebral hemisphere, typically the left hemisphere.

f. **Visuospatial, visuoperceptive, and visuoconstructive functioning.** Visuoperception is the area of processing that deals with what an object is. Visuospatial functioning is the area of processing that deals with where we are relative to objects and the relative positions of different objects or the relative positions of different parts of objects. Finally, visuoconstruction is a psychomotor function involving our ability to create and manipulate objects. Regarding the brain, these cognitive functions appear mediated predominantly by the functioning of the right hemisphere. There appears to be an anatomical distinction between the spatial and perceptual functions, with spatial functioning mediated by
areas of the right parietal lobe and perceptual functioning mediated by areas of the right temporal lobe.

g. **Sensorimotor functioning** includes basic features like psychomotor speed, fine-motor control and dexterity, and visual acuity.

h. **Executive functioning** are functions which reflect our own form of internal government, functions which allow for self-control over our behavior and emotions. For self-control, one could also say regulation, modulation, initiation, shifting, and termination.

Teaching is generally a delightful experience when we focus on activities that student’s brain enjoying doing and do well, such as exploring concepts, creating metaphors, estimating and predicting, cooperating on group tasks, and discussion moral or ethical issues conversely, teaching loses much of its luster when we force students to do things their brain don’t enjoy doing and do poorly, such as reading text books that compress content, writing and rewriting reports, completing respective worksheets, and memorizing facts that they consider irrelevant.

There is explosion of recent theory which is dramatically increasing our understanding of the brain. Active brain imaging techniques give us windows through we can view the brain in action. Sophisticated physiological methods, undreamed of but a decade ago, are allowing us to watch the reactions of single neurons as learners to different kinds of stimuli. Clearly, teaching with be more effective if it use methods which are aligned with how the brain best attends to
understands and retains information. Although some have warned that is too early at this point to make valid inferences about teaching methods based on brain science, many are making the attempt to build bridges from theory to practice, and educators are being urged through books and workshops to make classrooms (brain-compatible)

Members of principles of Brain-based learning have been derived, and educators are attempting to practices with these principles. In times out, though, that we do not have to reinvent the wheel. Teaching practices undergo a natural selection process, those, which work, survive, those, which do not, drop away. Effective teaching practices are effective precisely because they are brain based. Neuropsychology is a structured, objective, and scientific discipline for peeking into individual brains by way of formally observing behaviors. Clinical neuropsychology seeks, ultimately, to understand the individual mind and brain (and its normal as well as errant behaviors). The discipline uses experimental and objective procedures to compare performance among persons with known differences in their biological brain structures (within the limited criteria currently available for defining these differences), and to search for the myriad sources of brain variance that produce individual differences in behavior. These sources include biological factors (e.g., genetic, diseases, and injuries) as well as psychological factors (e.g., learned behaviors and personality) and social factors (e.g., economics, family structure, and cultural values).
In the application of clinical neuropsychology, understanding the biological sources of individual differences, particularly, helps identify brain-based disorders in memory, personality, self-awareness (conscious experience), cognition, and emotional expression. Working backwards, then, from a look at abnormal behavior obtained using formal tests, reasonable inferences about brain disorders can be reached. Understanding these neurofunctional changes (i.e., abnormalities) as a result of brain changes (i.e., injury) defines parameters for current and future behavioral expectations in the lifestyle of the individual. Combined with additional understanding of biopsychosocial factors that change into behavioral expression, the neuropsychologist can gain a comprehensive impression of what is normal or abnormal behavior. As our knowledge of recovery from brain injury improves, such understanding provides realistic expectations for remediation (restoration or adjustment) of disordered behavior. Neuropsychological understanding is achieved through a comprehensive exploration of the neurophysiological foundation of behavior and seemingly infinite potential contributing factors. Everyone’s brain is wired differently, a product of native biological structure, past experiences, physical health, learned responses and personality, injuries and diseases, and a host of other factors. Clinically, it is the role of the neuropsychologist to sort out the factors that influence how the brain is working in order to understand disease expression, progress, and recovery.
3.6 BRAIN COMPATIBLE AND NEUROCOGNITIVE LEARNING ENVIRONMENTS

New technologies such as FMRI (Functional Magnetic Resonance Imaging), the NMRI (Nuclear Magnetic Resonance Imaging) and PET (Positron Emission Tomography) allow us to view and study brains that are alive and functioning versus those only available through autopsy. The sequences of thinking measured across very narrow areas of the brain. Viewing the brain in terms of the right and left hemispheres or lower, mid and higher brain areas is now outdated. Today’s research encourages a “whole brain” approach to learning. Current research is also proving a connection between brain chemicals and how they relate to one’s success as a learner. For example, more or less serotonin, dopamine or other related compounds have an impact on attention, motivation and behavior. Neuroscience is begun to prove that learning environments are needed, in the classrooms. Brain Zephyr, (1999) identified that the following environment classrooms.

- Set a safe emotional climate
- Create a rich learning environment through challenge, choice and space
- Teach mind skills for life (critical, creative thinking)
- Develop learner skillfulness through a variety of teaching methods
- Challenge learning through experience
- Target multiple intelligences
- Transfer learning through reflection
- Balance assessment measures
Dr. Jeff Lackney summarized the brain space design principles. While these may seem logical and simple, that can be significant in their impact on teaching and learning. Create rich, stimulating environments with “teaching architecture,” colorful, tactile displays that are created by students (not the teacher) so that students have connection and ownership of the product. Build places for group learning like breakout spaces, alcoves and table groupings to facilitate social “The Intelligence Friendly Classroom” (Kappan, May 1998)

3.7 THE BRAIN AND BRAIN MAP

Scientists divide the brain into four different sections which are called lobes. The lobes are responsible for many different things such as emotions, reasoning, hearing, vision, and more responsibilities.

FIG – 3.1

REGIONS OF THE HUMAN BRAIN

150
The frontal lobes are considered as emotional control center and home to personality. There is no other part of the brain where lesions can cause such a wide variety of symptoms (Kolb & Wishaw, 1990). The frontal lobes are involved in motor function, problem solving, spontaneity, memory, language, initiation, judgment, impulse control, and social and sexual behavior. The frontal lobes are extremely vulnerable to injury due to their location at the front of the cranium, proximity to the sphenoid wing and their large size. There are important asymmetrical differences in the frontal lobes. The left frontal lobe is involved in controlling language related movement, whereas the right frontal lobe plays a role in non-verbal abilities. Some researchers emphasize that this rule is not absolute and that with many people, both lobes are involved in nearly all behavior.

Disturbance of motor function is typically characterized by loss of fine movements and strength of the arms, hands and fingers (Kuypers, 1981). Complex chains of motor movement also seem to be controlled by the frontal lobes (Leonard et al., 1988). An interesting phenomenon of frontal lobe damage is the insignificant effect on traditional IQ testing. Researchers believe that the IQ tests typically assessing convergent rather than divergent thinking. Frontal lobe damage seems to have an impact on divergent thinking, or flexibility and problem solving ability.
The frontal lobes are also thought to play a part in our spatial orientation, including our body's orientation in space (Semmes et al., 1963). One of the most common effects of frontal damage can be a dramatic change in social behavior. A person's personality can undergo significant changes after an injury to the frontal lobes, especially when both lobes are involved. There are some differences in the left versus right frontal lobes in this area. Left frontal damage usually manifests as pseudo depression and right frontal damage as pseudo psychopathic (Blumer and Benson, 1975). Sexual behavior also effected by frontal lesions. Orbital frontal damage can introduce abnormal sexual behavior, while darsolateral lesions may reduce sexual interest (Walker and Blummer, 1975).

(b) Temporal lobe

Kolb & Wishaw (1990) have identified eight principle symptoms of temporal lobe damage: 1) disturbance of auditory sensation and perception, 2) disturbance of selective attention of auditory and visual input, 3) disorders of visual perception, 4) impaired organization and categorization of verbal material, 5) disturbance of language comprehension, 6) impaired long-term memory, 7) altered personality and affective behavior, 8) altered sexual behavior.

Selective attention to visual or auditory input is common with damage to the temporal lobes (Milner, 1968). Left side lesions result in decreased recall of verbal and visual content, including speech perception. Right side lesions result in decreased recognition of tonal sequences and many musical abilities.
Right side lesions can also effect recognition of visual content (e.g. recall of faces). The temporal lobes are involved in the primary organization of sensory input (Read, 1981). Individuals with temporal lobes lesions have difficulty placing words or pictures into categories.

Language also affected by temporal lobe damage. Left temporal lesions disturb recognition of words. Right temporal damage can cause a loss of inhibition of talking. The temporal lobes are highly associated with memory skills. Left temporal lesions result in impaired memory for verbal material. Right side lesions result in recall of non-verbal material, such as music and drawings. Seizures of the temporal lobe can have dramatic effects on an individual's personality. Temporal lobe epilepsy can cause preservative speech, paranoia and aggressive rages (Blumer and Benson, 1975). Severe damage to the temporal lobes can also alter sexual behavior (e.g. increase in activity) (Blumer and Walker, 1975).

(c) Occipital lobe

The occipital lobes are the centers of our visual perception system. They are not particularly vulnerable to injury because of their location at the back of the brain, although any significant trauma to the brain could produce subtle changes to our visual-perceptual system, such as visual field defects and scotomas. The posterior region of the occipital lobe is involved in visuospatial processing, discrimination of movement and color discrimination (Westmoreland et al., 1994).
Damage on one side of the occipital lobe causes homonymous loss of vision with exactly the same "field cut" in both eyes. Disorders of the occipital lobe cause visual hallucinations and illusions. Visual hallucinations (visual images with no external stimuli) can be caused by lesions to the occipital region or temporal lobe seizures. Visual illusions (distorted perceptions) can take the form of objects appearing larger or smaller than they actually are, objects lacking color or objects having abnormal coloring.

(d) Parietal lobe

The parietal lobes are divided into two functional regions. One involves sensation and perception and the other is concerned with integrating sensory input, primarily with the visual system. The first function integrates sensory information to form a single perception (cognition). The second function constructs a spatial coordinate system to represent the world around us. Individuals with damage to the parietal lobes often show striking deficits, such as abnormalities in body image and spatial relations (Kandel, Schwartz & Jessel, 1991). The damage of the left parietal lobe results in "Gerstmann's Syndrome." It includes right-left confusion, difficulty with writing (agraphia) and difficulty with mathematics (acalculia). Damage of the right parietal lobe results in neglecting part of the body or space (contralateral neglect), which can impair many self-care skills such as dressing and washing.
<table>
<thead>
<tr>
<th>Frontal Lobe</th>
<th>Location</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Diagram1.png" alt="Frontal Lobe Diagram" /></td>
<td>The frontal lobe is found in the area around the forehead.</td>
<td>It is concerned with emotions, reasoning, planning, movement, and parts of speech. It is also involved in purposeful acts such as creativity, judgment, and problem solving, and planning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parietal Lobe</th>
<th>Location</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Diagram2.png" alt="Parietal Lobe Diagram" /></td>
<td>The parietal lobes are found behind the frontal lobes, above the temporal lobes, and at the top back of the brain.</td>
<td>They are connected with the processing of nerve impulses related to the senses, such as touch, pain, taste, pressure, and temperature. They also have language functions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temporal Lobe</th>
<th>Location</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Diagram3.png" alt="Temporal Lobe Diagram" /></td>
<td>The temporal lobes are found on either side of the brain and just above the ears.</td>
<td>The temporal lobes are responsible for hearing, memory, meaning, and language. They also play a role in emotion and learning. The temporal lobes are concerned with interpreting and processing auditory stimuli.</td>
</tr>
</tbody>
</table>
### Occipital Lobe

**Location**
The occipital lobe is found in the back of the brain.

**Characteristics**
The occipital lobe is involved with the brain's ability to recognize objects. It is responsible for our vision.

---

**TABLE – 3.2**
THE BRAIN AND ITS FUNCTIONS

<table>
<thead>
<tr>
<th>Part</th>
<th>Location</th>
<th>Functions</th>
<th>Other Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cerebral Cortex</td>
<td>This newspaper sized &quot;white matter&quot; is the 1/4&quot; outside covering of both brain hemispheres.</td>
<td>The cerebral cortex controls the thinking, voluntary movements, language, reasoning, and perception.</td>
<td>In higher mammals the cortex looks like it has lots of wrinkles, grooves and bumps. Grooves and bumps are also called &quot;gyros.&quot; Cortex is the Latin word for &quot;bark.&quot;</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>The cerebellum is a cauliflower-shaped structure located in the lower part of the brain next to the occipital area and the brain stem.</td>
<td>The cerebellum controls the movement, balance, posture, and coordination. New research has also linked it to thinking, novelty, and emotions.</td>
<td>The very word cerebellum comes from the Latin word &quot;little brain.&quot;</td>
</tr>
<tr>
<td>Hypothalamus</td>
<td>The hypothalamus is part of the limbic system. It is located in the internal portion of the brain under the thalamus.</td>
<td>The hypothalamus controls the body temperature, emotions, hunger, thirst, appetite, digestion and sleep.</td>
<td>The hypothalamus is composed of several different areas and is located at the base of the brain. It is only the size of a pea (about 1/300 of the total brain weight), but is responsible for some very important behaviors.</td>
</tr>
<tr>
<td>Thalamus</td>
<td>The thalamus is part of the limbic system so it is located in the internal portion of the brain or the center of the brain.</td>
<td>The thalamus controls the sensory integration and motor integration.</td>
<td>The thalamus receives sensory information and relays it to the cerebral cortex. The cerebral cortex also sends information to the thalamus which then transmits this information to other parts of the brain and the brain stem.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Pituitary Gland</td>
<td>The pituitary gland is part of the limbic system although it hangs below the rest of the limbic system.</td>
<td>The pituitary gland controls the hormones and it helps to turn food to energy.</td>
<td>Without pituitary gland, we could eat but we wouldn't get any energy from the food.</td>
</tr>
<tr>
<td>Amygdala</td>
<td>The almond shaped amygdala is part of the limbic system so it is located in the internal portion of the brain.</td>
<td>The amygdala (there are two of them) control our emotions such as regulating when we are happy or mad.</td>
<td>Amygdala is very important. Without it we could win the lottery and feel nothing.</td>
</tr>
<tr>
<td>Hippocampus</td>
<td>The crescent shaped hippocampus is found deep in the temporal lobe, in the front of the limbic system.</td>
<td>The hippocampus forms and stores your memories (scientists think there are other things unknown about the hippocampus) and is involved in learning.</td>
<td>Hippocampus is one of the most important parts of our brain. If we didn't have it, we wouldn't be able to remember anything. People with Alzheimer's Disease loose the functioning of their hippocampus.</td>
</tr>
<tr>
<td>Mid-brain</td>
<td>The mid-brain is an area located in the middle of the brain behind the frontal lobes.</td>
<td>The mid-brain controls your breathing, reflexes, and swallowing reflexes.</td>
<td>The mid-brain includes the thalamus, hippocampus, and amygdala. Every living thing has to have a mid-brain.</td>
</tr>
</tbody>
</table>
3.8 NEURAL NETWORK AND FUNCTIONAL DISORDER

(I) dyspraxia used to be called "Clumsy Child Syndrome" and in its very simplest terms, that is what it manifests itself as. It is caused by an immaturity of the brain resulting in messages not being properly transmitted to the body. It affects at least 2% of the population in varying degrees and 70% of those affected are male. Dyspraxics can be of any degree of intelligence - from below average to well above - but are often behaviourally immature. They try hard to fit in to the socially accepted behaviour when at school but often throw tantrums when at home. They may find it difficult to understand logic and reason. The most obvious symptom, however, is extreme clumsiness:

Dyspraxics may experience the following symptoms and problems:

- general clumsiness
- poor posture
- clumsy or awkward walking
- confused about which hand to use
- poor body awareness
- poor sense of direction
- cannot throw or catch a ball properly
- cannot hop, skip or ride a bike
- very sensitive to touch
- find some clothes uncomfortable
dislike having hair or teeth brushed, or nails and hair cut

sticking plasters are too uncomfortable to wear

poor short term memory, they often forget tasks learned the previous day

reading and writing difficulties

cannot hold a pen or pencil properly

slow to learn to dress or feed themselves

cannot answer simple questions even though they know the answers

speech problems - slow to learn to speak or incoherent speech

phobias or obsessive behaviour

unusually impatient

Not all children with dyspraxia will have all these symptoms - in fact, it would be very unusual to find all of these problems in one individual. Similarly, children who are not dyspraxic may have some of these problems, and indeed some could be symptoms of a different disorder, but a combination of them should indicate that further investigation is called for and parents of a dyspraxic child, even if not diagnosed, will know that their child is "different." These is no cure for dyspraxia but the earlier a child is treated then the greater the chance of improvement. Occupational therapists, physiotherapists and extra help at school can all help a dyspraxic child to cope or overcome many
difficulties. A lot of the skills that we take for granted will never become automatic to a dyspraxic and they will have to be taught.

(II) **Cerebral Palsy** (CP) is a group of disorders whose major feature is brain damage. In most cases this damage occurs before/during or shortly after birth and can be due to a variety of causes. This brain damage is characterized by an inability to control motor function, either partially or completely. Depending on exactly what part of the brain is damaged and how badly, a child with CP may be unable to walk or walk only with aids, may be unable to speak or speak very indistinctly, and may make random, involuntary movements. Intellectual ability varies as with the rest of the population and is not necessarily directly related to the degree or type of brain damage. About 25% of individuals with CP also have some degree of learning disability, but the range of intellect ranges from severe learning disability to genius level. About half of all children with CP also suffer from seizures which in most cases are not dangerous, but nevertheless are alarming if they occur in the classroom and the teacher and pupils are unprepared.

Cerebral Palsy can also be caused by a brain injury such as a fall down stairs or a car accident, but when this is the cause it is more commonly called Traumatic Brain Injury, especially when the damage occurs after the age of 3 years. CP is not a disease or illness. It isn't contagious and it doesn't get worse, but it is not something you "grow out of." Children who have CP will have it all their lives. There should be no reason why a child with CP and of a normal intelligence, or with slight to moderate learning problems, should not be able to
be educated in a mainstream school alongside his/her peers. If the child has serious mobility problems then the school may have to address the problem of physical access - ramps, handrails, toilets etc. - and will probably have to employ a non-teaching assistant to support the child on a one-to-one basis; children with CP will almost invariably have a Statement of Special Educational Need which will go some way towards securing extra funding.

For the vast majority of people, speech is their main means of communication. If their speech or language is impaired for any reason then they could well have difficulty in communicating ideas, desires and intentions and will have problems in socialization and relationships.

FIG – 3.2
NEURAL NETWORK AND FUNCTIONAL DISORDER

161
(III) **Speech and language disorders** refer to problems in communication and related areas such as oral motor function. These delays and disorders range from simple sound substitutions to the inability to understand or use language or use the oral-motor mechanism for functional speech and feeding. Some causes of speech and language disorders include hearing loss, neurological disorders, brain injury, social deprivation, maternal drug abuse, physical impairments such as cleft lip or palate, learning difficulties, and vocal abuse or misuse. Frequently, however, the cause is unknown. A child's communication is considered delayed when the child is noticeably behind his or her peers in the acquisition of speech and/or language skills. Sometimes a child will have greater receptive (understanding) than expressive (speaking) language skills, but this is not always the case.

(IV) **Speech disorders** are difficulties producing speech sounds or problems with voice quality. They might be characterized by an interruption in the flow or rhythm of speech, such as stuttering, which is called dysfluency. Speech disorders may be problems with the way sounds are formed, called articulation or phonological disorders, or they may be difficulties with the pitch, volume or quality of the voice. There may be a combination of several problems. People with speech disorders have trouble using some speech sounds, which can also be a symptom of a delay. They may say "see" when they mean "ski" or they may have trouble using other sounds like "l" or "r". Listeners may have trouble understanding what someone with a speech disorder is trying to say. People with voice disorders may have trouble with the way their voices sound.
Language disorders are impairment in the ability to understand and/or use words in context, both verbally and nonverbally. Some characteristics of language disorders include improper use of words and their meanings, inability to express ideas, inappropriate grammatical patterns, reduced vocabulary and inability to follow directions. One or a combination of these characteristics may occur in children who are affected by language learning disabilities or developmental language delay. Children may hear or see a word but not be able to understand its meaning. They may have trouble getting others to understand what they are trying to communicate.

While many speech and language patterns can be called "baby talk" and are part of a young child's normal development, they can become problems if they are not outgrown as expected. In this way an initial delay in speech and language or an initial speech pattern can become a disorder which can cause difficulties in learning. Because of the way the brain develops, it is easier to learn language and communication skills before the age of 5. When children have muscular disorders, hearing problems or developmental delays, their acquisition of speech, language and related skills is often affected.

Speech and language disorders are usually easy for parents, teachers and anyone else working with the child to spot: speech and language are such integral parts of society that any departure from the norm quickly becomes apparent. Assessment and therapy from trained professionals in speech and language is the usual course, and is generally arranged through the child's school, although younger children should be referred via their doctor. It is NOT...
necessary for a child to have begun to talk before therapy is started if language / speech delay is already apparent.

(VI) Dyslexia is a much-misunderstood condition. Not all poor readers and spellers are dyslexic, and not all dyslexics are poor readers and spellers. The word 'Dyslexia' comes from two Greek words and it means 'difficulty with words.' Dyslexia can affect reading, spelling, writing, memory and concentration, and sometimes maths, music, foreign languages and self-organization. There is still a tendency in some areas to refuse to officially recognise the condition and instead it is called a 'specific learning difficulty.'

Dyslexia is caused by a difference in the part of the brain that deals with language. Recent scientific research indicates that dyslexic people have physical differences in their brain which cause them to process information differently. These differences are not caused by brain damage at birth or upbringing but are part of the genetic makeup of the individual - it is nobody's "fault," just part of the general diversity of mankind.

The condition tends to run in families - there may be a history of literacy problems - and continues throughout life : it cannot be "cured" but it can often be overcome. Around 4% of the population is severely dyslexic and further 6% have mild to moderate problems. It occurs in people from all backgrounds and of all abilities, from people who never learn to read or write to those who go on to gain university degrees. Dyslexic people may have creative, artistic, and practical skills and they can develop strategies to cope with their
areas of difficulty. Many indeed go on to achieve marked success in their chosen field.

Classic symptoms of Dyslexia include:

- difficulty in sequencing - unable to recite days of the week in order, months of the year, putting things in alphabetical order etc;
- poor self-organisation and time management
- difficulty in organising thought clearly, giving rise to inability to explain verbally or put things down on paper
- poor sense of direction and confusion of left and right
- poor memory, particularly when it comes to sequences, time etc.
- poor or hesitant reading
- erratic spelling
- letter and word reversals (b for d, n for u, saw for was etc.)
- misreading of words or text, leading to poor comprehension

Not all dyslexics will have all the above symptoms and some will have other symptoms too, as dyslexia is sometimes allied with ADD/ADHD or associated with non-specific behaviour problems caused by frustration.

(VI) Coping with Dyslexia

People with dyslexia do not learn in the same way as their peers and so need a different approach, particularly where literacy is concerned. In order to compensate for weaknesses in memory and organisational skills, a
**multisensory approach** is most frequently adopted. This means that the pupil will

- look / see
- listen / hear / speak
- write / feel

a new word or sound, involving all the senses (apart from smell!) in imprinting the information on the brain. There are also some controversial theories in the field which, though still unproven, cannot do any harm and may well bring benefits: the most widespread of these is the use of coloured transparent sheets to use as overlays on print: these do seem to work for some people, with different colours seeming to give the best results for different individuals, and if successful can be made into coloured lenses for reading glasses. The reasoning behind this system is unclear, but those for whom it DOES help report that the text seems "clearer" and "less muddled."

**(VII) Special Educational needs** "if he or she has a learning difficulty which needs special teaching. A learning difficulty means that the child has significantly greater difficulty in learning than most children of the same age. Or, it means a child has a disability which needs different educational facilities from those that schools generally provide for children of the same age in the area. The children who need special education are not only those with obvious learning difficulties, such as those who are physically disabled, deaf or blind. They include those whose learning difficulties are less apparent, such as slow learners and emotionally vulnerable children. It is estimated that up to 20% of
school children may need special educational help at some stage in their school careers."

By far the greatest proportion of children in mainstream schools who have Special Educational Needs are those with Moderate Learning Difficulties which result in them learning at a slower rate than other children of the same age in the same school; these children can be successfully supported to reach their potential with the help of Child Support Assistants/Teachers' Aides and specialist teachers from the learning support services.

(VIII) Attention Deficit Disorder (with or without Hyperactivity) is a neurological condition which is probably genetic in origin, where the sufferer has a very reduced ability to maintain attention without distraction, has little control of doing or saying something due to impulsivity and lack of appropriate forethought, and, where hyperactivity is also present, no control over the amount of physical activity appropriate to the situation.

The following behaviour patterns are characteristic of Attention Deficit Hyperactivity Disorder and usually occur before the age of 7, with at least 8 of the following symptoms present which are excessive and consistent, and over which the sufferer has no control:

- fidgeting/restlessness
- difficulty remaining seated when required to do so
- easily distracted
- difficulty awaiting turn in games or group situations
- often blurts out answers to questions
- difficulty following instructions
- difficulty sustaining attention
- often shifts from one incomplete activity to another
- difficulty in playing quietly
- often talks excessively
- often interrupts or intrudes on others
- often does not seem to listen
- often loses things
- often engages in physically dangerous activities without considering the consequences
- chronic procrastination

Onset of ADHD will usually actually begin at about 18mths, becoming more noticeable by age 3 and peaking around Primary school age. Often hyperactivity is improved at puberty, but ADHD does not just disappear and usually continues into adult life, sometimes with a slight variation or reduction in symptoms.

There are no known cases of an adult developing ADHD, but there are many instances of adults who were never diagnosed as children (or misdiagnosed) who are diagnosed later in life.
(IX) **Autism** encompasses a whole range of cognitive disorders which fall within the Autistic Spectrum. Classic Autism is a complex developmental disability which is the result of a neurological disorder that affects the functioning of the brain. Autism is four times more prevalent in boys than girls and knows no racial, ethnic, or social boundaries. Family income, lifestyle, and educational levels do not affect the chance of autism's occurrence. Although a single specific cause of autism is not known, current research links autism to biological or neurological differences in the brain. In many families there appears to be a pattern of autism or related disabilities, which suggests there is a genetic basis to the disorder although as yet, no one gene has been directly linked to autism.

Autism affects the normal development of the brain in the areas of social interaction and communication skills. Children and adults with autism typically have difficulties in verbal and non-verbal communication, social interactions, and leisure or play activities. The disorder makes it hard for them to communicate with others and relate to the outside world. In some cases, aggressive and/or self-injurious behavior may be present. Persons with autism may exhibit repeated body movements (hand flapping, rocking), unusual responses to people or attachments to objects and resistance to changes in routines. Individuals may also experience unusual sensitivities in the five senses of sight, hearing, touch, smell, and taste.
Children with classic Autistic characteristics are unlikely to succeed in mainstream education beyond Primary level, and then only with a high degree of support, but children with other disorders from within the Autistic Spectrum may succeed in being educated alongside their peers, albeit with specialized help and support.

(X) **Asperger's Syndrome** is a neurobiological disorder named for a Viennese physician, Hans Asperger, who in 1944 published a paper which described a pattern of behaviour in several young boys who had normal intelligence and language development, but who also exhibited autistic-like behaviour and marked deficiencies in social and communication skills. Asperger's is sometimes referred to as High-functioning Autism.

Individuals with AS can exhibit a variety of characteristics and the disorder can range from mild to severe. Persons with AS show marked deficiencies in social skills, have difficulties with transitions or changes and prefer sameness. They often have obsessive routines and may be preoccupied with a particular subject of interest. They have a great deal of difficulty reading nonverbal cues (body language) and very often the individual with AS has difficulty determining proper body space. They are often excessively sensitive to sounds, tastes, smells, and sights, so the person with AS may prefer soft clothing, certain foods, and be bothered by sounds or lights no one else can hear or see. Children with AS perceive the world very differently and those characteristics which seem odd or unusual are due to those neurological differences and not the result of intentional rudeness or bad behaviour.
(XI) **Semantic-Pragmatic Disorder** is another of the conditions which fall within the Autistic Spectrum. The term 'Semantic Pragmatic Disorder' has been used for nearly 15 years. Originally it was only used to describe children who had these problems but were demonstrably not autistic. Features it includes are:

- delayed language development
- learning to talk by memorizing phrases, instead of putting words together freely
- Repeating phrases out of context, especially snippets remembered from television programmes or overheard from adult conversations, etc.
- confusing 'I' and 'you'
- problems with understanding questions, particularly questions involving 'how' and 'why'
- difficulty following conversations
- marked difficulty understanding figurative and non-literal expressions
- problems understanding the meaning and significance of events

Children with this disorder have problems understanding the meaning of what other people say, and they do not understand how to use speech appropriately themselves.
3.9 NEURO COGNITION

Neuro cognition is an information processing approach for example, views the mind as an information processing system that selects, transforms encodes, stores, retrieves and generates information and behaviour (Lachman and Butterfield 1979)

The internal structures and process that are involved in the acquisition and use of knowledge, including sensation, perception, attention, learning, memory, language, thinking and reasoning.

Neuro cognition includes every mental process that may be described as an experience of knowing, perceiving, recognizing, conceiving and reasoning, as distinguished from an experience of feeling or of willing.

Neuro cognition is a diffuse term, used in different ways by different discipline. In psychology, it refers to an information processing view of an individual’s psychological function. Other interpretations of the learning of cognition link it to the development of concepts; individual minds, groups organizations, and even larger coalitions of entities, can be modeled as societies which co-operate to form concept.

Neurocognition is a term used to describe cognitive functions closely linked to the function of particular areas, neural pathways, or critical networks in the brain. Therefore their understanding is closely linked to the practice of neuropsychological and cognitive neuroscience, two disciplines that broadly
seek to understand how the structure and function of the brain relates to thought and behaviour.

The scientific study of the nervous system underwent a significant increase in the second half of the twentieth century, principally due to revolutions in molecular biology, neural networks and computational neuroscience. The task of neural science is to explain behaviour in terms of the activities of the brain. The ultimate challenge is to understand the biological basis of consciousness and mental processes by which we perceive, act, learn and remember. The brain is the leader for co-coordinating our physical activities. It comes as little surprise then, that exercise strengthens the brain's interconnections and rejuvenates the mind.

The chemical link between the mind and body is best exemplified by the brain derived neurotrophic factor (BDNF), a protein found in our brain which helps brain cells to stay healthy, sprout new connections and develop plasticity. The short-term and long-term exercise both lead to a release of BDNF from various parts of our brain, the cortex, basal forebrain and hippocampus, which are the areas considered vital for learning, higher thinking and memory.

3.10 ROLE OF NEUROCOGNITIVE THERAPY

The neurocognitive therapy is based upon certain irrefutable facts concerning brain function, which are applied to the treatment of children's developmental difficulties, it is now unchallengeable that the brain is capable of
changing its structure and function in response to the environment in which it finds itself.

The brain takes information from the sensory environment, through the eyes, ears, nose, mouth and skin. Specific areas are responsible for processing this information and then re-routing it to the appropriate part of the cortex for further, attention, evaluation and action. When the brain is working properly, all the executive or cognitive functions are achieved with the maximum efficiency. The brain does not work always in a proper way. For many students, the sensory information does not reach the relevant part of cortex or the signal has been weakened sufficiently so that processing becomes impossible. For other students, the sensory stimulus reaches the cortex for processing in a distorted manner and the child is overwhelmed by the world be perceives.

The sensory environment to which the child is exposed in order to encourage the regions of the brain, which are responsible for processing the sensory stimuli, to re-tune and to process information more normally. Providing an adapted sensory environment to dampen the incoming sensory stimuli and the designing activities intended to enrich sensory experience. This approach influences the brain function and development of its structure.

The role of NCT (Neurocognitive therapy) in learning difficulties utilizes vygotoky’s concept of the “zone of proximal development”. The child’s current developmental level in terms of his/her cognitive development and abilities are reinforced and provide support to enable him to attain this ability. (This
support encompasses Bruner’s concept of ‘Scaffolding and Rogoff’s concept of ‘apprenticeship’). The developmental task of the child is breaking into smaller; simpler sub-components thus enable the child to succeed. As the child improves his functioning at the desired cognitive / developmental task, the scaffolding (support) is gradually removed until he is performing the desired task automatically. This is the proper way for the students to learn. So the investigator selected this approach for the student teachers to facilitate the teaching competency in science.

Neurocognitive therapy focuses on changing attitudes and thought patterns as well as behaviours. As a client moves from asking what is wrong with me” to asking “what are my strengths and weaknesses”. The therapist begins to guide him to find a good match between his interests, abilities and traits that help him to reach his real potential at school or at work.

Neurocognitive functioning is strongly affected by stress levels, hormonal fluctuations, sleep, exercise, health habits and many other environmental factors. Help to bring beneficial changes in the student’s environment is an essential part of neurocognitive therapy. In neurocognitive therapy, the therapist takes an active role in guiding his students as he works to develop friendly environment at work and his relationships with others. The neurocognitive therapist needs to be extremely familiar with the diagnosis and treatment of many commonly co-existing conditions such as anxiety, disorders, depression, learning disabilities and bi-polar disorder.
Based on Neuro – Cognitive technology developed at the ACE (advanced Cognitive enhancement) initially used a variety of modalities including computer assisted programs as well as neuro feedback to treat cognitive deficits.

Intensive research resulted in the development of a series of cognitive exercises that helped improve specific brain activity associated with effective cognitive processing. Further testing and analysis yielded a method of normalizing brain wave activity and improved engagement of the frontal lobes. The frontal lobes are part of the brain where concentration and learning take place. This area is also associated with working memory as well as all our executive functions including prioritizing. Organizing, planning and behaviour – control.

Dr. Gottfried identified two problematic areas that existed below language and math skills, and found effective solutions to solve these problems. One area includes the neurological foundation of cognitive processing. The second area is what he refers to as “pre-language” where the brain uses skills to process the basic elements of math and language to provide effective learning and improve overall cognitive performance.

These two layers proved the foundation of learning and have been found to be impaired to varying degrees in individuals.
So the investigator made an attempt to study the role of neurocognitive therapy in facilitating teaching competence in science education.

3.11 THERAPY IS DIFFERENTIATED FROM TRAINING

Therapy is differentiated from Training in their basic approach to helping. Training is commonly conceptualized at surface level, advice – giving approach, whereas therapy generally helps replace to address root causes. Some fundamental distinctions between training and therapy are as follows.
TABLE 3.3
DIFFERENCE BETWEEN THERAPY AND TRAINING

<table>
<thead>
<tr>
<th>S.No</th>
<th>Basic Concepts</th>
<th>Training</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Primary Focus</td>
<td>Deals with healing emotional pain (or) defective with in an individual (or) focus on the future.</td>
<td>To help the person’s to design and act toward the future. While positive feelings maybe a natural outgrowth the primary focus is on creating actionable strategies for achieving specific goals in one’s work.</td>
</tr>
<tr>
<td>2.</td>
<td>Subject Focus</td>
<td>Feelings</td>
<td>Action and outcomes</td>
</tr>
<tr>
<td>3.</td>
<td>Model</td>
<td>relying on diagnosis</td>
<td>Learning / develop mental, focusing on attainable goals, and possibilities</td>
</tr>
<tr>
<td>4.</td>
<td>Nature of Issue</td>
<td>Identifiable distinction</td>
<td>Generally a functional person desiring a better situation</td>
</tr>
<tr>
<td>5.</td>
<td>Treatment</td>
<td>Understand and resolve the past</td>
<td>understanding the past as the context in which future goals are set</td>
</tr>
<tr>
<td>7.</td>
<td>Goals</td>
<td>Help person’s to resolve old pain and improve emotional states</td>
<td>Help the person to learn new skills and tools to build a more satisfying successful future, focuses on goals.</td>
</tr>
<tr>
<td>8.</td>
<td>Accountability for goals</td>
<td>The goals of training are often necessarily vague (or) intangible (or) not easily measured. It is difficult to identify the success particularly.</td>
<td>Therapy goals are usually with one’s external world and behaviour and therefore it is measured.</td>
</tr>
<tr>
<td>9.</td>
<td>Relationship</td>
<td>Trainer – Trainee Relationship</td>
<td>Co-creative equal partnership</td>
</tr>
<tr>
<td>S.No</td>
<td>Basic Concepts</td>
<td>Training</td>
<td>Therapy</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>10.</td>
<td>Function</td>
<td>Professional expertise and guidelines to provide a path to healing</td>
<td>The therapist stands with clients and helps him (or) her to identify the challenges, them to turn challenges into victories, holding client accountable to reach desired goals.</td>
</tr>
<tr>
<td>11.</td>
<td>Style</td>
<td>Nurturing evocative, indirect and parenting</td>
<td>Catalytic, challenging, direct, straight talk, and accountable.</td>
</tr>
<tr>
<td>12.</td>
<td>Rate of change</td>
<td>Progress is often slow.</td>
<td>Growth and progress are rapid and usually enjoyable</td>
</tr>
<tr>
<td>13.</td>
<td>Responsibility</td>
<td>The trainer is responsible for both process and the outcome</td>
<td>The therapist for the process and the client for the results.</td>
</tr>
</tbody>
</table>

Therapy is a very effective method of self-growth and self-actualization. In addition therapy helps the people to develop many positive qualities of self, self – esteem and affection. So the investigator selected the therapeutic approach for this research instead of giving training for the student – teachers.

3.12 NEURO COGNITIVE STRATEGIES

The strategies, utilized for neurocognitive therapy are guided by the variables of neurological and neurobiological recovery. Compensatory strategies are used in neurocognitive therapy development, and are for the skills treatment deficits. For example, over self talk is utilized for self – monitoring while a retention memory deficit will required compensation. Accuracy supercede speed, self- esteem and independence are always an underlying goal. Maximize the likelihood of correct responses rather than correcting in correct answer.
Neurocognitive and behavioural growth is achieved through the person’s internalization successes resulting in the reconstruction of confidence and internal locus of control and strangled eco identity. Cognitive function is hierarchical in nature. Deficits in complex attention are revealing themselves in learning and memory deficit. In neurocognitive therapy, first the nature of the deficit is understood (retention vs recall) and then the strategies are adopted.

Neurocognitive strategies are equally effective in assisting the person in their integration back to work (or) school and serve as an excellent supplement to attention training. The person’s expectations of the outcome come from NCT are realistic and attainable. NCT (Neurocognitive therapy) is divided into three categories.

(i) Attention prosthetics, (ii) conscious monitoring (iii) psychosocial support.

The primary goal of the Neurocognitive therapy is to identify the impairment (S) and then force the brain to restructure the damaged areas. These strategies adopted to involve the child to recognize, label and self-monitor physiological and emotional cues. These approach fostering the child’s awareness of feeling and situations that pose difficulties and cortical and sub-cortical emotion-generative systems.

As an essential part of understanding emotion regulatory mechanisms is characterizing the processes that generate emotions. Current models posit that emotions are balanced responses to external stimuli and or internal mental...
representations that (i) involve changes across multiple response systems (eg. experimental, behavioral and peripheral physiological (ii) are distinct from moods, in that they often hence identifiable objects on triggers, (iii) can be either unlearned responses to stimuli with intrinsic affective properties or learned response to stimuli with acquired emotional value, (iv) and can involve multiple types of appraisal processes that assess the significance of stimuli to current goals, (v) depend upon different neural systems.

Recent imaging work has investigated two types of cognitive regulation, attention control and cognitive change.

(I) ATTENTION CONTROL

Attention is often referred to as the selective aspect of information processing; enabling to focus on goal relevant and ignore goal-relevant information. In general, studies have indicated that behavioral and neural responses to attend as compared with unattended stimuli are either facilitated or inspired. When responses to attended and unattended inputs do not differ, processing is considered to be relatively automatic.

Several studies have manipulated the amount of attention paid to emotional stimuli by asking participants to selectively judge either their emotional or their perceptual features.
(II) COGNITIVE CHANGE

The use of higher cognitive abilities such as working memory, long-term memory and mental imagery to support learning, judgement and reasoning has been a primary focus of research in cognitive neuroscience. In general, these abilities have been shown to depend upon interactions between prefrontal systems that support control processes and posterior cortical and sub cortical systems that represent different types of modality specific information.

The use of cognitive change to regulate an existing or ongoing emotional response has also been studied in the context of three different forms of higher cognition and learning.

The cognitive regulation is known as reappraisal and involves reinterpreting the meaning of a stimulus to change one’s emotional response. In general, studies have found that reappraisal of negative emotion activates dorsal ACC and PFC systems that support the selection and application of reappraisal strategies and decreases, increases or maintains activity in appraisal systems.

(III) NEURO COGNITIVE TRAINING

The fascinating information being uncovered by those studying the brain and mind body connection is reshaping and actually causing a paradigm shift in the field of psychology. Out of that have come new ways of helping people therapeutically that are called neurological therapies.
Neuro therapy training is aligned with scientific understanding about the mind and body and mind / body interaction. Neurological therapies focus on the process of stress and emotion in the body. The goal is to teach and enable people to use more of their own minds. Neuro therapy consists of two processes.

(i) Teaching and (ii) doing mental work

(i) TEACHING

The people will learn in a clear, simple and visually illustrated manner about such things as, the mind and the scientific basis of its interaction with the body, the nature of emotion as a physical and chemical process, the nature of the concentrated state they will learn to practice daily and the powerful neurological tools.

(ii) DOING MENTAL WORK (TRAINING THE BRAIN)

Each session involves being guided by the specialist into an altered mental state and through a series of mental exercises. The primary focus of neuro-therapy training is building self-control through self-generated mental training methods. Further, it focuses on the process of emotion not on the myriad of constantly changing stimuli that trigger those physical and chemical responses.

Neuro-therapy training evolved as a way of using a concentrated state of mind that helps people better manage the process or physiology of emotion. It does not merely focus on individual emotional stimuli. It offers a way of
training people using neurological tools, new ways of stimulating the hardware of the brain to respond in a manner that sustains healthier states of mind and body thus, healthier feelings and behaviours. The neurological tool of neuro-therapy training is called “sub-verbal shifting”.

(IV) SUBVERBAL SHIFTING KIT

The four basic ways are each based on a therapeutic model or underlying belief system as defined below:

(A) ANALYTICAL MODEL

This therapeutic model is based on the belief we are as we are because of deep seated anxieties and underlying conflicts emerging from the events of our lives. Methods based on the analytic model would be those involving some from of age regression or analysis of people’s life events or memories and involving cathartic release of emotions surrounding the events on memories focus. If a concentrated mental state is used, its primary purpose is to facilitate that regression and cathartic release of emotion.

(B) BEHAVIOURAL MODEL

This model is based on the belief we are as we are because of our behaviours. Problems in life are seen to emerge because of in effective or in appropriate behaviours. Methods based or the behaviorual model attempt to train people in new, more effective, behaviours. If a concentrated mental state is used the method is one of reprogramming the mind using suggestions and directed visualizations while a person are concentrating.
(C) COGNITIVE MODEL

This model is based on the belief because how we perceive our lives and circumstances. Methods based on the cognitive model focus on reframing specific interactions and perceptions. If a concentrated mental state is used, use of suggestion and directed visualization occur to facilitate the reframing. A current approach based on the cognitive model is NLP.

(D) NEUROLOGICAL MODEL

This model is based in the most current knowledge emerging from the neurological sciences. Though people are certainly shaped by many factors, the belief system behind the neurological model is that we are us we are because of the inner working of the mind and body. Going further, it is based in the realization that mental activities such as thought and emotion have at their basis, physical and chemical reactions.

Neuro-therapy training, which is based on the neurological model, teaches people to use a mental training method to improve the working of the mind and body. This method of mental training, more specifically, teaches people to better manage the physical and chemical reactions that cause negative emotions. Feelings and behaviors change because the processes in the body underlying them change. In this training, students receive the complete sub verbal shifting training package, a revolutionary way for therapeutic professionals to “train the hardware of the brain” to dissipate the damaging physical and chemical basis of negative emotions.
3.13 TEACHER COMPETENCE

Teacher's main aim is to make students learn effectively and efficiently. For doing so, a teacher has to do several activities such as plan properly, provide effective instruction and evaluate the learning using appropriate methods and techniques. That means, a teacher has to perform a host of activities inside and outside the classroom. The effectiveness or ineffectiveness of teaching is closely linked to teacher competence. Competent teacher create the classroom conditions and climate, which are conducive for student learning.

There are many more activities apart from these that the teacher has to perform more activities in the classroom and outside the classroom in order to provide the required learning experiences to the students. Some of these are, planning for the class, preparing the necessary learning material, giving a demonstration, conducting seminars and supervising practical work. There are many more. All of these comprise teaching activities. And hence, one may say that teaching is what the teacher does not only for providing instructional experiences, but also for generating a climate conducive for learning. This would mean that 'teaching' will also include maintaining discipline, etc. It is clear from the preceding discussion that teaching is what the teacher performs for the organizing of learning experiences as well as for providing the supporting climate necessary for effective learning.
Competency is a term used extensively by different people in different contexts. So it is defined in different ways. Teacher education and job performance of a teacher are the contexts in which this term is used. Competencies are the requirements of a competency based teacher education, which includes knowledge, skills and values the trainee teacher, must demonstrate for successful completion of the teacher education programme (Houston 1987). A few characteristics of a competency are as follows.

1. A competency consists of one or more skills whose mastery would influence the attainment of the competency.

2. A competency has its linkage with all the three domains under which performance can be assessed. It covers the domains of knowledge, skill and attitude.

3. Competencies, since have a performance dimension of them, are observable and demonstrable.

4. The competencies are observable, they are also measurable.

It is not necessary that all competencies of a teacher have the same extent of knowledge, skill and attitude. There may be some competencies of a teacher which have the same extent of knowledge, skill and attitude. There may be some competencies involving more of knowledge than skill and attitude, whereas, some competencies may be skill/performance loaded. That there is a large number of instructional and related activities to be performed by the teacher inside and outside the classroom. These activities are of varied types.
The effective organization of these activities would require that a teacher possesses a certain amount of knowledge and also certain attitudes and skills. This is known as teacher competence. In other words, teacher competence refers to "the right way of conveying units of knowledge, application and skills to students". The right way here includes knowledge of content, processes, methods and means of conveying content.

Teacher competence depends on teaching in a particular setting, the culture and values held in the community. It also depends on the innumerable teacher and student characteristics and the classroom context. Nevertheless, in order to know if we possess the necessary competencies in a given situation, we have to be judged on the basis of our ability to produce certain effects. But, there are as many ways of being effective as there are effects. Moreover, there could be disagreement even amongst ourselves over the effects that a teacher is expected to produce.

The research studies conducted so far indicate that there does not have a single set of competencies which all the effective teachers possess. We should collect information regarding when, how, who and what the purpose of each competency is most likely to be useful to. In other words, the concept of teacher competence is highly situational one and involves value judgments when one absolute set of competencies is effective in relation to all kinds of learner groups.
3.14 CLASSIFICATION OF TEACHER COMPETENCIES

Essentially, teachers have two major roles in the classroom: i) to create the conditions under which learning can take place (i.e) the social side of teaching. ii) To impart, by a variety of means, 'knowledge' to their learners (ie) the task oriented side of teaching. The first term indicates that the 'enabling' or management function and the second, the instructional function. These complement with each other the latter would be, more or less impossible without the former.

(i) Management function

While setting the learning activities in the classroom, the teacher is often required to play a managerial role which includes motivating, organizing the learning group, classroom management (control and discipline) and evaluation.

(ii) Instructional function

The instructional side of a teacher's role includes different presentations and Communication skills like lecturing, questioning, explaining, dramatizing, using audiovisual aids, etc. The Classroom interaction include, the teacher, students and the different contexts/opportunities that facilitating learning. These contexts/opportunities include the different teaching modes (discussions, demonstrations, lectures, etc.), evaluation, motivation, classroom management, and constitute the process aspect of teaching. These have certain antecedents to it that mainly include planning and knowledge of subject matter.
**FUNCTION OF PLANNING AND INTERACTION IN CLASSROOM**

<table>
<thead>
<tr>
<th>Planning</th>
<th>Interaction in classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting objectives</td>
<td>Diagnosing</td>
</tr>
<tr>
<td>Need analysis</td>
<td>Motivating</td>
</tr>
<tr>
<td>Selecting content</td>
<td>Presenting</td>
</tr>
<tr>
<td>Selecting method</td>
<td>Questioning</td>
</tr>
<tr>
<td>Preparing teaching materials</td>
<td>Controlling</td>
</tr>
<tr>
<td>Preparing evaluation tools</td>
<td>Discussing</td>
</tr>
<tr>
<td></td>
<td>Evaluating</td>
</tr>
<tr>
<td></td>
<td>Providing feedback</td>
</tr>
<tr>
<td></td>
<td>Answering</td>
</tr>
</tbody>
</table>


The teacher’s teaching competencies are classified by the Repertoire constitute the following: (i) Knowledge of subject matter, (ii) Planning for the course lesson including teaching strategies, teaching materials, and classroom organization, (iii) motivating the learner groups, (iv) Presentation and communication skills including lecturing, explaining, eliciting response,
questioning, discussing, dramatizing, reading, demonstrating, using audio-visual aids, etc.(v) Evaluation includes informal observations of student progress, diagnosing learning difficulties, encouraging peer and self-evaluation, handling evaluative discussions, etc.(vi) Classroom management and discipline. Some of the main competencies are discussed in detail as follows Knowledge of Subject Matter

a) ADEQUATE KNOWLEDGE IN THE CONTENT

Adequate knowledge in the content is essential for any teacher to perform competently. The acquisition of knowledge and understanding of any subject would not be just a matter of collecting facts and information about the subject, but it is learning to think in a way that the characteristic of that discipline. For example, a teacher of Physics expects knowledge about the physical world or arrives at generalizations regarding the physical phenomena not by authority of another person or a book but by a verification process, which is typical of the way in which the knowledge in Physics is built. Also, the knowledge, thus, acquired are organized conceptually to provide a conceptual structure to the discipline of Physics, which is coherent and stable.

The ability to organize thought, to interpret facts, and to apply them, is more important than the knowledge of facts or the widening of information base. Learners are intrinsically interested and naturally inclined to explore new worlds. The teacher’s main task is to set up dialogues in which learners reshape and reorganize their existing knowledge through interaction with others. Learners are as capable of setting up the criteria for assessment of performance
as the teachers. Learners already know a great deal and also have the ability to extend and refashion their knowledge. These two different sets of beliefs have several implications in the teaching style and classroom management activities. The first type of teacher, also called the transmission teacher, will need to maintain a high degree of control over the learners in order to create the conditions under which the subject can be right. The other type of teacher, called the interpretation teacher, would prefer to allocate the responsibilities for learning amongst the learners; control is maintained by persuasion and by appeal to the better judgment of the learners. But, in actual practice one has to arrive at some synthesis of both these sets of beliefs, depending particularly on (a) the entry behavior of the learners- their previous knowledge and their ability to comprehend and learn on their own, etc. and (b) the structure of the topic that one is being introduced.

(B) PLANNING

Teachers' planning refers to that aspect of teaching where teachers formulate a course of action. It is an activity that is typically carried out in the absence of students and before the actual teaching. Teachers' plan, serve as a 'scripts' (whether they are done on paper or in one's mind), include decisions on what to teach and how to teach the chosen content. Long range planning or planning for a semester or a year, may not involve deciding what to teach- if the course of study is prescribed for a given level. It includes some kind of (probably an informal) assessment of what students come to teachers for. This may not uniformly relate to the entire class. planning involves the
(re)structuring of the course and the kind of treatment that each unit, topic/lesson should receive; deciding on which one(s) should be dealt with in details and which cursorily, which ones need more time and effort on the teacher's and student's part. The competency required to perform those tasks involved in planning are mostly cognitive and can be mastered by practice.

(C) MOTIVATION

Even when the plan is good, the important function of the teacher in implementing it to motivate the learners. There are several ways in which one can achieve this by giving students meaningful, relevant and interesting things to do; by adopting a positive attitude towards learners (praising and encouraging the positive efforts by learners will help to keep up motivation); by giving encouraging feedback to their responses to oral questions or written assignments; by involving learners in the classroom activities that demand inter-student communication and co-operative efforts on their part.

(D) PRESENTATION AND COMMUNICATION

After ensuring the students' interest in the learning, a teacher in the classroom is to transact with the students in the context of a specific subject matter. The teacher is expected to communicate with the students in a number of ways so that the learners attain various types of learning outcomes. In order to achieve this effectively, the teacher may have to manifest various types of skills including lecturing, explaining, eliciting through questions, conducting discussion, dramatizing, reading, demonstrating; using audio-visual aids, etc. all
these may be categorized into skills for effective presentation and communication in the instructional situation.

(E) EVALUATION

Evaluation of the students' achievement of a pre-specified objective is part and parcel of a teacher's function, what would be the evaluation skills include? Preparation question papers, Taking viva voce, all these are included in the evaluation process. But these are only a part of the total evaluation function of a teacher. He has to observe the students in many different situations in order to judge the extent to which the expected terminal behaviours have been actually achieved by them. This includes so many activities. One side the tools are decided on, one has to set about measuring the concerned behaviour. This would give the actual achievement of the terminal behaviour. A teacher should compare the actual terminal behaviour of the students with their expected behaviour. This helps him to judge the extent to which the expected terminal behaviour has been achieved. The gap between the two indicates the areas in which the students have not learnt. The teacher should make use of this feedback to improve his teaching as well as to provide the necessary remedial help to the students.

(F) CLASSROOM MANAGEMENT AND DISCIPLINE

Instructional process in the class can go on effectively only when there is a healthy and conducive climate in the class. Thus, classroom management becomes a very critical function of a teacher. The teacher has to possess various
skills which would help him in managing the class in such a way that a healthy and conducive climate prevails. These skills are so important that, unless a teacher possesses these to a reasonable extent, he/she will not even be able to stand up or stay for a while in a class to manifest his presentation or evaluative skills.

(G)IMPROVE CLASSROOM PRACTICE

Improving classroom practice depends solely on the competencies of a teacher. Hence, the teacher competencies discussed in the previous section would help, considerably, improve classroom practice. Apart from these, a teacher should take into account certain other aspects. They are discussed hereunder.

I) MEDIATING BETWEEN THEORY AND PRACTICE

Any change or improvement in the classroom practices occurs in more than one ways. It may be prompted by the findings of research on teaching or it could also be due to some policy decisions taken by the administrative body, which issues directives for changes in the existing practices. Under both these circumstances, the teacher, who is the practitioner at the classroom level, mediates the change. Teachers translate the principles into practice and turn ideologies into realities in the classroom. Hence a teacher needs to consider this role expectation seriously in order to be effective in classroom practice.
Whether the teachers experienced or not, whether they trained in the methodology and theory of teaching or not, they have certain (strong) ideas as how we should teach, probably, from our experience of being students. Therefore, they teach the way that they were taught or the way they are used to. The important point here is that, the teachers are able to understand the relationship between theoretical principles and practical techniques. This understanding is enabling us to mediate changes in pedagogic practice. Competent teachers adjust the teaching procedures, modify plans, and in general, to actual classroom setting. They refer techniques back to principle, testing each one out against the other in a continuous process of experimentation.

ii) TEACHER’S SELF-IMPROVEMENT

The seed to improve one's performance and to excel in one's own job is felt by most of us-as adult intelligent persons. The key to the self-improvement programme is self-monitoring and self-correcting. For this, the teacher has to collect data regarding his own teaching performance and its impact on others. There are many procedures to collect such data. Some of the techniques are Flanders’s Interaction Analysis, Micro-teaching and Competency Based Teacher Education (CBTE).
3.15 COMPETENT TEACHER

Teaching is one of the professional jobs a person can have with a bachelor’s degree alone. Most of the training received in university is the subject matter they will be specialized to teach, and a few months of practicum experience before being thrown in to the classroom to sink or swim. Therefore, the credibility of teachers has come into question. Parents want their children taught well. Everyone wants his or her baby to be taught by a super-teacher. As well, school boards want to have high standardized test results. This means they need to have teachers that understand how to teach to a test and create a successful learner (as defined by the test). Students want someone who, at best, inspires them, or at worst, leaves them alone so they do not have to participate in class activities. Caught in the middle are teachers, who want to impart knowledge, get a good paycheck, and develop a rapport with the students. Every teacher define the competency in a different way, here the competence is identified in five major areas the teacher is competent. They are as follows;

1. The ability to teach

2. Good classroom management skills

3. Strong administrative skills

4. A commitment to professional development

5. Investing in extra-curricular involvement
i) THE ABILITY TO TEACH

The ability to teach emphasizes the basic teaching skills that are taught at university or through practicum and teaching experience. A certified teacher has come through university understanding the subject he or she will teach, the importance of teaching it, and will also understand how to deliver the curriculum as stated in the course guides published by the school district or state. Through the practicum, a competent teacher will understand a variety of teaching strategies such as lecture, guided discussion, group work, independent learning, and the use of technology. As Richard Felder (1993) puts it, teaching methods can be effective in different situations and when teaching different subjects. A teacher has an understanding of the learning domains of Bloom’s taxonomy and the levels of synthesis involved in each one (2006), it develops him or her intellectual tools to teach subjects according to the way they best fit into a student's schema of transformative learning. The teacher has to recognize the limits of what is taught to a student and for how long. This includes a good amount of lesson and unit planning. Hand in hand with this is the competency to recognize the teachable moment, and when it is used to augment the curriculum and make the lessons more interesting and relevant to the student.

ii) GOOD CLASSROOM MANAGEMENT SKILLS

“Strong classroom management skills are essential for successful teaching” (Hopkins, 2005). A teacher is able to maintain respect and discipline in the classroom. There need a strong amount of mutual respect, understanding, and empathy between the teacher and the students, as well as the students
toward each other. This is demonstrated when there is an effective interaction between the teacher and the student. A teacher should have the ability to make a good classroom environment that students feel comfortable. Making the student come forward in the class is the teacher gives an opportunity and makes a role model to the student.

iii) STRONG ADMINISTRATIVE SKILLS

Teachers possess strong administrative skills to aid in running his or her classroom effectively. This includes keeping meticulous records on student progress and keeping notes on events (both good and bad) that happen in the classroom. The student do something against the rules, the teacher take a record of the date, what happened, and what is done to resolve the issue. This saves the teachers’ reputation in case there is some sort of accusatory defamation later. Administration also entails keeping and understanding the department, school, and the district directives and memos. Nowadays, it is easy, since most material is communicated through email. Competent teacher interact well with other teachers and staff. “Teaching practices, diversity, and the relationships among administrators, teachers, parents, and students contribute to a nurturing school climate” (McBride, & Brandt, 1997)

iv) COMMITMENT TO PROFESSIONAL DEVELOPMENT

Teachers need a commitment to the professional development for their future. The teachers attend the teachers’ conventions and seminars and also they enroll in the courses that are appropriate to their subject they teach.
The teacher considers a plan to gain higher degrees or more certification in the specialization of their trained area or in new area. Commitments to professional development also reflect in the competent teacher.

v) INVESTING IN EXTRA-CURRICULAR INVOLVEMENT

The last major area of competency a teacher has is a commitment to extracurricular involvement. This means taking part in school clubs or teams. A teacher that volunteers his or her time shows that they are committed to the school community. It is a way of developing the student in a holistic manner. The students view their teacher as not only a person of delivering knowledge and managing a class but also an advisor, and coach,. There still needs a professional boundary, but it is relaxed slightly in an extra-curricular atmosphere.

3.16 CHARACTERISTICS OF A GOOD TEACHER

1. INTERPERSONALLY COMPETENT

The teacher, who is interpersonally competent, is a good manager. Such a teacher creates a friendly and cooperative atmosphere and creates open communication. Such a teacher promotes the independence of the students and tries to reach a good balance between - directing and accompanying- leading the way and following- confronting and reconciling- correcting and stimulating.
2. PEDAGOGICALLY COMPETENT

The teacher, who is pedagogically competent, gives the students something to hold on and also structure in a safe learning and work environment, to such an extent that the pupil can develop socially, emotionally and morally in a good way. Such a teacher ensures as follows i) the students know that they belong to the group and appreciated. ii) the students respect each other and are challenged to take responsibility for each other. iii) the students can take initiatives and can work independently. iv) the students learn to discover their affinities and ambitions and on that basis they can make choices with regard to their studies and careers.

3. COMPETENT WITH SUBJECT MATTER (CONTENT) & METHODOLOGY

The teacher, who is competent with subject matter issues (content) & methodology, helps his students to make them familiar with the cultural baggage which is needed for every participant of our society in order to function in a satisfactory level. Such a teacher tunes the subject matter content as well as his behaviour of the students and takes individual differences into account and decides, the opportunities for learning in and outside the school and learning with the context in their professional practice. Motivates the students in their learning and work tasks, challenges them to do their utmost and helps them to reach a successful conclusion. Teaches the students to learn and work in order to promote their independence or other objectives.
4. ORGANIZATIONALLY COMPETENT

The teacher, who is organizationally competent, ensures his students to work in an orderly and task-oriented environment. Such a teacher takes care of the students to know what they can expect and how much freedom they have for personal initiatives and also to know what they have to (or can) do, how and why they have to (or can) do this.

5. COMPETENT IN COOPERATING WITH COLLEAGUES

The teacher, who is competent with respect to cooperation with his colleagues, supports a good pedagogic and teaching climate in his school, supports good mutual cooperation and a good school organization. Such a teacher communicates and cooperates well with their colleagues. Constructive participation of meetings and other forms of school consultation and the activities needed to ensure a well-functioning school supports the development and improvement of his school.

6. COMPETENT WITH RESPECT TO COOPERATION WITH THE ENVIRONMENT

Teacher who is competent with respect to cooperation with the environment ensures that there is a good communication and harmony with parents or careers of the students with companies or institutions. (The students are involved with respect to his education). He adequately uses the professional network of the school with respect to the education of the student or the care for
the student. He handles the contacts on behalf of the school, with the environment of the school, with care and responsibility.

7. COMPETENT WITH RESPECT TO REFLECTION AND DEVELOPMENT

Teacher tries to keep his professional activities up to date and to improve them. Such a teacher knows what he thinks is important for his teaching profession and what his basic values, standards and educational views are good. He tunes his own development to the policy of his school and uses the opportunities the school offers for further development.

3.16 IMPORTANCE OF TEACHER COMPETENCE

In Australia, the University of Sydney has developed an elaborate set of generic competence for beginning teachers (Eltis & Turney, 1992). Hence, determining competence is both the concern of the accreditation party and the teacher education institute. Though teachers are certified, beginning teachers rarely attain the competence of effective teachers. Teachers are expected to develop their competence throughout their professional lives. Researchers are particularly interested in the comparison of the competence of the novice and the experienced teachers. This is the situation which Reynolds (1992) tried to describe as "competent teaching along a continuum of experience". With competence as an indicator in teacher accreditation and teacher development, there is a call for the re-focusing of teacher education programmes. In discussing the need for reform in Science Teacher Education, Yager (1993), has
suggested that science teacher education programmes are “based upon the
determination of competence of teachers, there is little consensus among
educators on its definition.

This is understandable as fundamental questions like "what is good
teaching?", "what constitutes teacher effectiveness?" are hard to define (Brophy
and Good, 1986; Lanier, 1986) due to the complex nature of teaching as a
profession. Edmund Short (1985) attempted to clarify the confusion by
presenting four different conceptions of competence. Firstly, competence is
taken as behaviour or performance, the doing of particular things independently
of purpose or intent. Secondly, competence is taken as command of knowledge
or skills, involving choosing and knowing why the choice is appropriate.
Thirdly, competence can be seen as level of capability which has been
'insufficient' through some judicious and public process and this sufficient
indicator may fluctuate since it involves a value judgment. Fourthly,
competence involves the quality of a person or state of being, including more
than characteristic behaviours :"performance, knowledge, skills, levels of
sufficiency, and anything else that may seem relevant, such as intent, or
motives, or attitudes, or particular qualities". According to Short, the fourth
definition implies that many theories about teacher competence can exist, all of
which can be justified .In addition to qualitatively different conceptions of
teaching, developmental and contextual variations also play a role in defining
teacher competence. Thus, how teacher competence defined depends on a
number of things (Ashburn, 1987).
The definition depends on the outcomes desired from teaching, which ranges from increased classroom average scores on standardized objectives, generally expressed in performance terms that delineate a variety of instructional skills and competence”. Taylor, Middleton, and happier (1990) have also advocated that the major thrust of teacher education programmes is to maximize the professional competence of teachers.

The identification and determination of teacher competence are thus crucial in teacher education and development. First, teacher certification groups are using competence as an indicator. Secondly, teacher education institutes are planning their programmes which aim to maximize teacher competence. Thirdly, teacher educators are using teacher competence to reflect various stages of teacher development.

3.17 ACADEMIC ABILITY

Academic ability is one expression of human intellectual competence that, increasingly, is recognized as the universal currency of technology advanced societies. Academic ability, capabilities such as the following:

- Literacy and numeracy
- Mathematical and verbal reasoning
- Skills in creating, recognizing and resolving relationships.
- Problem solving from both abstract and concrete situations, as in deductive and inductive reasoning
• Sensitivity to multiple contexts and perspectives

• Skill in accessing and managing disparate bodies and chunks of information

• Resource recognition and utilization

• Self-regulation including metacognitive competence and metacomponential strategies.

Academic ability appears to be the product of exposure to the demands of specialized cultural experiences schooling being the most common that interact with a wide variety of human potential of Scribner 1974; Hunt 1966; Martinez, 2002 Sternberg 1994). The National study group for the Affirmative Development of Academic ability met together though out 2002 and 2003 to investigate these issues.

The National study group reviewed strong evidence that academic ability is a developed (and developable) ability, one that is not simply a function of one’s biological endowment or a fixed aptitude.

Recognizing academic ability as a malleable ability, the National study group argues that closing the gaps in academic achievement between groups of students’ from different social division (class, ethnicity, gender & language) will require the development of intellective competence in a wide range of individuals through interventions in our homes, communities and schools.
Affirmative development of academic ability is nurtured and developed through (1) high-quality teaching and instruction in the classroom; (2) trusting relationships in school; (3) supports for pro-academic behavior in the school and community. These pedagogical and social activities and environmental supports build a developmental scaffolding around and within which students find support for growth in abilities and dispositions to

- Perceive critically
- Explore widely
- Bring rational order to chaos
- Bring knowledge and techniques to bear in the solution of problems
- Test ideas against explicit and considered moral values and empirical data
- Recognize and create relationships between concrete and abstract phenomena.

Intellectual competence reflects the effective orchestration of affective, cognitive, and sedative mental processes in the service of sense making and problem solving. These competencies focus not only on what we want learners to know and how but also on what we want learners to be and become—that is, compassionate and independently critical thinking members of humane communities. Intellective competence reflects intellective character.
This report describes one approach that necessitates simultaneous interventions at the classroom, school and community levels – in order to reach that goal.

The national study groups’ conclusions and recommendations were guided by the following ideas and are addressed in the body of the report in the following order.

- The nature, extent the academic achievement gaps between majority and minority students.
- Teaching and learning for knowledge acquisition, improved comprehension, and understanding in the classroom.
- The psychological processes especially trust, associated, with minority academic achievement in schools.
- The environmental support the necessary for the development of intellective competence.

Demographic shifts in our nation’s publication mandate that we attend specifically to these students’ achievement if we expect as a nation to maintain our standard of living, our level of prosperity, and our place in the global economy. A systematic approach to closing achievement gaps and improving learning for all students necessitates access to a combination of educational interventions in the classroom, school and community. High levels of academic ability can be obtained for all students by applying proven pedagogical practices and adopting policies that are within our reach.
3.17 NEUROCOGNITIVE LEARNING IN TEACHING SCIENCE

The teacher should be able to kindle the curiosity among the wards with the profound knowledge of what is to be taught and with lucid expression. He/she should enable the students to participate in the learning process by encouraging questioning and interactive sessions. Creativity, developing the quality to analyze things without any bias and to find reason in the proper perspective should be the ultimate aim of teaching science. There are several aspects involved in teaching science. The student of science should possess the knowledge about the development of science, its components, functions and relevance to human and societal welfare. Its role as a deciding factor in taking a lead in the economic well being of a country is widely appreciated. Science is essential for the betterment of human life and upliftment of society as a whole.

As science deals with the materialistic aspects of the world, which is supposed to be governed by laws, a basic understanding of the relationship between materials and the laws is highly essential. The falling apple attracted Newton and it led to the development of "Newton's law of gravitation". Thus observation made in the material world has ultimately resulted in finding the governing forces responsible for a particular behaviour or happening. In the case of Newton, it is evident that science develops through the following stages: Observation, hypothesis (developing a statement), theory (developing a verifiable statement), experiments (to prove the hypothesis) and finally laws (explaining the definite relationship between materials and forces).
Therefore, it is imperative to expose students to these stages of development of science. The sequential development of knowledge has several implications. Students understand that each and every understanding of nature has a history of continued toil with concerted efforts. Also, it is made known that any perspective of science should have universal acceptance. With imparting this initial background the aims of teaching science can be achieved in an effective manner.

(i) CURIOSITY

The initial desire to learn with eagerness is an important aspect in science teaching. It is needed to develop 'scientific thinking', which is an essential quality for preciseness and exactitude. The lack of curiosity leads to dullness and indifference. The teacher should be able to kindle the curiosity among the wards with the profound knowledge of what is to be taught and with lucid expression.

He should enable the students to participate in the learning process by encouraging questioning and interactive sessions. The facility made available to the teacher is another important factor. Models, equipments, pictures (photographs charts and maps) help in a long way to build curiosity among the students.

The ease with which these are handled by a teacher in the class and allowing the students to organise themselves into smaller groups creates a sense of confidence, shedding all the hesitations and inhibitions. Any situation that
criticizes the ability to grasp on the part of the students must be avoided. Only a curious mind can be creative.

ii) CREATIVITY

Teaching is not just the transmission of knowledge. Students should be able to understand the subject and develop the ability to recall at the time of examination. The learning process must also lead to encountering problems and finding effective solutions. This is possible only when a person is able to think objectively and creatively. Imagination both by the teacher and students is essential in developing creativity.

Another method is assigning projects to students and assessing them periodically. Projects need systematic collection of data, organization of ideas and an ability to analyze them within a stipulated time. It gives them a sense of involvement and commitment. It is important that the students must have a freedom to learn and work independently. Thus projects provide co-operation and interaction among the students and the teacher, students and society.

The contributions made by the students must be given immediate recognition. Besides, the development of creative power the students also learn and develop socially desirable qualities. (The creative thinking helps the mind to be unbiased in analysing the problems).
iii) ANALYTICAL ABILITY

Performance in a project depends on the ability to analyse situations. Students should play an active role in the analysis of problems and data collected, to find solutions to those problems. The role of a teacher in developing the analytical ability of students lies in dividing the problem into number of work elements. Identification of work elements and providing proper explanation about these elements to the students is the responsibility of the teacher. It helps the students in understanding the problem in proper perspective and in general gives an idea on how to proceed in the project. Students are required to collect data from all possible sources (published and unpublished materials, interaction with the people concerned, data collected from experiments and seeking of the expert opinions.). The collected materials must be organised with the help of the teacher. The next step should be correlation of facts and ideas, similar situations and the arrived at conclusions at such situations and time. Meaningful conclusion of a project depends upon the extensiveness of the work of collection, organisation and correlation of data. Guidance by the teacher and other experts in the field is very much required at this stage. The ideas provided by the students must be discussed with an open mind. The places where students use irrelevant information in the interpretation of data must be identified and they must be given specific directions so that the relevancy of the project is fully realized and appreciated by all. Working with the problem and the data collected, the student’s stands to develop an attribute known as analytical ability.
IV) REASONING

Science teachers should also inculcate the reasoning ability among their students. The term reasoning has several connotations. Reaching an inference or conclusion by sound judgment in a good sense and, logical build up of the collected information is yet another important aspect of learning in science. The best way by which this trait is developed is by reflective questioning, which enhances critical thinking and arriving at conclusions in a meaningful way. The approaches of a dynamic and creative teacher in teaching science must be based on not only in making the students to comprehend what he teaches, but also in developing the varied types of thinking, analysing and making sound judgments.

3.18 A MODEL TO DEVELOP COMPETENCE IN TEACHING SCIENCE THROUGH NEURO COGNITIVE INTERVENTION STRATEGIES AND NEUROCOGNITIVE THERAPY

Based on the above conceptual frame work a final model was evolved to develop the competence in teaching science through Neuro Cognitive therapy.

(A) INTEGRATIVE FUNCTIONS OF THE BRAIN BASED ON NEUROCOGNITION

The brain perceives the sensation brought in by the sensory nerves from the peripheral sensory organs. It also initiates the motor action for which the messages are sent to peripheral motor organs through motor nerves, but apart from that the most important thing which brain does, is to interpret the
sensation and integrate it with the information retrieved from the memory before initiating the action. The integrative functions of the brain are as follows

**(i) BRAIN STEM**

It is the lower extension of the brain which connects the spinal cord. Neurological functions located in the brainstem include those necessary for survival and for arousal (being awake and alert)

**(ii) CEREBELLUM**

The portion of the brain (located at the back) it helps to coordinate movements (eye-hand co-ordination, muscle co-ordination). Defective in the function of cerebellum may result in ataxia, which is a problem of muscle coordination. This can interfere with a person’s ability to walk, talk, eat and to perform other self care tasks.

**a) FRONTAL TABLE**

It is a front part of the brain. It is involved in planning, organizing, problem solving, selective attention, personality and a variety of “higher cognitive functions” including behaviour and emotions.

The anterior portion of the frontal lobe is called the pre frontal cortex. It is very important for the “higher cognitive functions” and the determination of personality. The posterior (back) of the frontal lobe consists of the pre motor and motor areas. Nerve cells that produce movement are located in the motor areas. The pre motor areas serve to modify movements.
b) OCCIPITAL LOBE

Region in the back of the brain processes visual information. The main responsible for visual reception not only exists the occipital lobe but also the association of other areas that help in the visual recognition of shapes and colors. Defective in the function of occipital lobe cause visual deficits.

c) PARIETAL LOBE

There are two parietal lobes, one on the behind part of the brain and the on the top of the brain before the frontal lobe, parietal lobe (Right) is important for visuo-spatial processing speed and left lobe for language and spoken. The deficit occurs in right lobe cause visuo-spatial deficits and the left lobe cause disability to understand spoken and or written language.

TEMPORAL LOBE

There are two lobes, one on each side of the brain located at about the level of the ears. These lobes allow a person to tell one smell from another and one sound from another. They also help in sorting new information and are believed to be responsible for short-term memory. Right lobe mainly involved in visual memory (ie memory for pictures and faces)

Left lobe mainly involved in verbal memory (ie memory for words and names) A model to develop competence in Teaching science through Neuro cognitive Intervention Strategies and N.C.T
(B) NEURO COGNITIVE STRATEGIES

Educational vision will dramatically improve students academic performance by enhancing focus, attention, concentration and memory, thus the neurocognitive functions enhance the teaching competence in science.

1. Attention duration - sustaining attention for longer periods
2. Divided attention - focusing on more than one task at a time
3. Selective attention - focusing on one task, while other tasks do not distract.
4. Working memory - retaining necessary information for short periods of time, yet (one enough to complete specific tasks)
5. Sequential processing - Working with pieces of information, one after another.
6. Simultaneous process or multitasking - processing a few pieces of information at the same time
7. Processing speed - the speed with which information is processed.
8. Sensory motor co-ordination - Co-coordinating sensory and motor skills.
10. Auditory processing – working with sounds
11. Audio-visual coordination – working with both sound and visuals.
12. Peripheral vision noticing background details while functioning on a task.
14. Visual blending – bringing letters to from words.
C) NEURO COGNITIVE PROCESS

i. Self fulfilling prophecy – If you view yourself as having a poor memory you will. It will become a self-fulfilling prophecy.

ii. Organize – find a central location to place the things that you use in your daily routine. Being organized enhances your memory and decreases stress.

iii. Focus – Pay special attention to information that you wish to commit to memory. (ie) Take the time necessary to rehearse the information immediately after hearing it in your mind. Repetition makes it easier and reinforces the learned material. Concentrate on the task at hand.

iv. Relax – Memory will be better if we take the time needed to store and recall the information. It is important to allow yourself to complete a task, the time necessary to complete a thought or to express yourself. When we are rushed for time our memory often fails us. Memory always works better when we are well rested and not tried.

v. Limit Distractions – it is much more difficult to access your memory when you surrounded by contradictory stimuli from your senses.

vi. Categorize – placing information into categories makes it easier to remember.

vii. Sense – By using the different senses to aid in our memory we are physically utilizing different portions of our brain to aid in this task.
## Model for Developing Teaching Components through Neuro Cognitive Therapy

<table>
<thead>
<tr>
<th>Articulation of Brain</th>
<th>Neuro Cognitive Strategies</th>
<th>Cognitive Skills</th>
<th>Developing Component</th>
<th>Teaching Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-frontal &amp; Parietal</td>
<td>Working memory</td>
<td>Concretization</td>
<td>Knowledge</td>
<td>Content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sustainability</td>
<td>Background</td>
<td>Contextual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retaining</td>
<td>Presentation</td>
<td>Conceptual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>information</td>
<td>Linguistic</td>
<td>Transactional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analysis</td>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontal Lobe</td>
<td>Attention duration</td>
<td>Mental flexibility</td>
<td>Relative information</td>
<td>Facilitation</td>
</tr>
<tr>
<td></td>
<td>Divided attention</td>
<td>Focalization</td>
<td>Observation</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>Selective attention</td>
<td>Concentration</td>
<td>Selection</td>
<td>Decision making</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consciousness</td>
<td>Take action</td>
<td>Transactional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Executive function</td>
<td>Possible consequence</td>
<td></td>
</tr>
<tr>
<td>Parietal Lobe</td>
<td>Sequential processing</td>
<td>Conceptual</td>
<td>Speed</td>
<td>Information processing skill</td>
</tr>
<tr>
<td></td>
<td>Simultaneous processing</td>
<td>reasoning</td>
<td>Interpretation</td>
<td>Science processing skill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Processing speed</td>
<td>Designing</td>
<td>To develop TLM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response inhibition</td>
<td>Formulating</td>
<td>Content Conceptual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fine motor skill</td>
<td>Controlling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perception</td>
<td>Possible sequence</td>
<td></td>
</tr>
<tr>
<td>Occipital Lobe</td>
<td>Visual blending</td>
<td>Visual recognition</td>
<td>Creative</td>
<td>Conceptual</td>
</tr>
<tr>
<td></td>
<td>Peripheral vision</td>
<td>Visual perception</td>
<td>Impression</td>
<td>Transactional</td>
</tr>
<tr>
<td></td>
<td>Visual processing</td>
<td>Visual scanning</td>
<td>Presentation</td>
<td>Content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual tracking</td>
<td>Perception</td>
<td>Contextual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual information</td>
<td></td>
<td>Processing skill</td>
</tr>
<tr>
<td>Posterior parietal</td>
<td>Sensory – motor</td>
<td>eye-hand</td>
<td>Execution</td>
<td>Management</td>
</tr>
<tr>
<td>cortex &amp; dorsolateral</td>
<td>co-ordination</td>
<td>co-ordination</td>
<td>Communication</td>
<td>Content</td>
</tr>
<tr>
<td>prefrontal cortex</td>
<td>Multitasking</td>
<td>Reasoning</td>
<td>Implementation</td>
<td>Conceptual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Categorization</td>
<td>Classification</td>
<td>Transactional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensory perception</td>
<td>Attraction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understanding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

219
viii. Attach It – It is easier to remember things if they carry some significant meaning.

ix. Preparatory set – prepare our mind in the same way an athlete prepares prior to engaging in sports.

x. Use Humor – Mental image to assist in remembering. When humor is attached to the item to be remembered, it is both entertaining and more easily recalled.

xi. Use it or lose it – Memory is improved through practice.

xii. Label memory files – By consciously closing key word connections with in your mind in order to place memories.

xiii. Create a mental calendar – utilizing a calendar to guide you through your daily activities creates self reliance and confidence and allows you to plan ahead and free up space in your mind for other important memories.

xiv. Mind body connection – It is essential that we take proper care of our body if our memory is to function at its fullest potential.

xv. Come in through the back door – Everyone experiences blocks to their memory at times. This becomes more fueled by frustration and negative self-talk.
xvi. Time is on your side – Our brain uses the element of time to chunk memories together. When we have difficulties remembering something try to reconstruct the time frame associated with that memory.

xvii. Chunk it – chunking involves learning small portions of a concept and later putting them together to form the whole.

xviii. Associate it – Memories are stored through associating new memories with old ones. Information is associated in our brains together rather than in isolation.

xix. Creativity and flexibility – Rigid thinking is often a precursor to poor memory. Creativity and flexibility allow us to find more ways to access the information to be recalled.

xx. Focus on your strengths – Incorporate our individual personality style into our memory techniques. Recognize our preference and start.

xxi. Envision – Means to elaborate on the memory. Make the memory come to life. We can utilize interactive imagery to creative a vivid picture in our mind.

A consolidated summary of various neurocognitive theories along with the corresponding concepts and components related to the research was collected from the review of related studies and from the conceptual framework is presented in the following table.
### TABLE – 3.4

**NEUROCOGNITIVE CONCEPT / THEORY / COMPONENTS**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Concept / Theory</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viadero (1996)</td>
<td>Positive emotions such as excitement, enthusiasm and joy enhance the ability to process information and create permanent mental programs, emotions can improve memory</td>
<td>• Working memory and processing speed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sustain Focus</td>
</tr>
<tr>
<td>Dwyer (2002)</td>
<td>Teacher need to establish an environment that is free from intimidation and rejection, high in acceptable challenge and where the learner experiences active participation and relaxed alertness</td>
<td>• Active participation with multi tasking work and relaxed alertness.</td>
</tr>
<tr>
<td>Brain Zephyr, (1999)</td>
<td>Neuroscience is begun to prove that learning environments are needed, in the classrooms. He identified the environment are, safe emotional climate, rich learning environment, multiple intelligences, reflection, assessment measures and a variety of teaching methods.</td>
<td>• Critical thinking creative.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Multitasking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Visual Blending</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reducing hyper activity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Patience</td>
</tr>
<tr>
<td>Kolb &amp; Wishaw (1990)</td>
<td>The frontal lobes are involved in motor function, problem solving, spontaneity, memory, language, initiation and impulse control.</td>
<td>• Sensory motor function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Processing speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Shift focus</td>
</tr>
</tbody>
</table>
The temporal lobes are involved in the primary organization of sensory input. Individuals with temporal lobes lesions have difficulty placing words (or) pictures into categories.

Correlation between neuroscience and brain based education highlights three facts, the brain leans best through repetition, the emotionality of experience influence retention and the plasticity improving memory.

Self-efficacy was positively correlated with measures of motivation, stimulus control and hopelessness.

The quality of the research largely depends on the treatment adopted by the investigator. Hence with better planning of the teaching learning process, guidance from the experts in the field and with review of related studies, model strategies for the present investigation and tool for assessing were evolved. The general objectives, Neurocognitive strategies, cognitive skills, components and expected outcomes were designed as follows;
<table>
<thead>
<tr>
<th>General Objectives</th>
<th>Specific Objectives</th>
<th>Neurocognitive Strategies</th>
<th>Cognitive Principles</th>
<th>Components</th>
<th>Intervention process</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>To develop the perceiving ability</td>
<td>To teach the concept with proper stress, intonation and pause,</td>
<td>Processing Speed</td>
<td>Attention</td>
<td>Ability to multitask</td>
<td>Stimulates interest of the learner</td>
<td>Self control</td>
</tr>
<tr>
<td>To formulate the ideas in a systematic way</td>
<td></td>
<td>Multitasking</td>
<td>Brightness</td>
<td>Ability to relax</td>
<td>Ensures stability in presentation</td>
<td>Self-discipline</td>
</tr>
<tr>
<td>To Develop their creativity</td>
<td>To engage our self to complete a taste.</td>
<td>Sensor motor co-ordination</td>
<td>Time sequencing</td>
<td>Shift focus</td>
<td>Helps the teacher to face the students all at a time</td>
<td>Reducing Hyperactivity</td>
</tr>
<tr>
<td>To increase their reasoning ability</td>
<td>To use new technique to teach the concept.</td>
<td>Visual Blending</td>
<td>Synchronisation</td>
<td>Sustain focus</td>
<td>Provide audibility to everyone in the classroom</td>
<td>Speed of processing</td>
</tr>
<tr>
<td>To increase the interest towards teaching</td>
<td>To use innovative colors, clippings and models.</td>
<td></td>
<td></td>
<td>Self confidence</td>
<td></td>
<td>Self observation</td>
</tr>
<tr>
<td>To stimulate their imagination</td>
<td>To bring innovative real life situation into a classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To increases the interest of learning the content.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To improve the skill of accurate observation</td>
<td>To stimulate imagination of the students</td>
<td>Visual</td>
<td>Concentration</td>
<td>Sustain focus</td>
<td>Provide challenging situation</td>
<td>Metal flexibility</td>
</tr>
<tr>
<td>To develop scientific attitude</td>
<td>To correlate their experiences with many other situations</td>
<td>Visual Blending</td>
<td>Focalization</td>
<td>ability to select</td>
<td>To discuss their experiences with their follow classmates</td>
<td>Sustainability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Processing Speed</td>
<td>Creativity</td>
<td>ability to relate information</td>
<td></td>
<td>Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Divided attention</td>
<td>Concreteness</td>
<td>Acquires problem solving ability</td>
<td></td>
<td>Self Confidence</td>
</tr>
<tr>
<td>To develop the attitude of independent thinking</td>
<td></td>
<td></td>
<td>Sequencing</td>
<td></td>
<td>Observes the collected details</td>
<td>Co-operation</td>
</tr>
<tr>
<td></td>
<td>To classify the objects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Creative thinking</td>
</tr>
<tr>
<td></td>
<td>To infer results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To develop a systematic presentation of ideas</td>
<td>To begin a new and different topic</td>
<td>Simultaneous processing</td>
<td>Sequencing</td>
<td>Ability to present the concept.</td>
<td>Identifies which a stress is given</td>
<td>Reducing impulsivity</td>
</tr>
<tr>
<td>To enable them to present the ideas to large number of students</td>
<td>To summarizes and review of certain concepts and principles at the end of the lesson</td>
<td>Working memory</td>
<td>Execution</td>
<td>Correlation</td>
<td>Correlates with a suitable example</td>
<td>Ability to multitask</td>
</tr>
<tr>
<td></td>
<td>To explain the lesson by using facts, figures and statistics.</td>
<td>Selective attention</td>
<td>Retaining information</td>
<td>Ability to solve a problem</td>
<td>Narrates the principles with another life situation</td>
<td>Learning ability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sequencing</td>
<td>performing</td>
<td>To avoid confusion</td>
<td></td>
<td>Stimulate thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual perception</td>
<td>Creative</td>
<td>To secure better attention concentration</td>
<td></td>
<td>Summarises the information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual scanning</td>
<td>impression</td>
<td></td>
<td></td>
<td>Symbolic representation</td>
</tr>
</tbody>
</table>
The conceptual framework helped the investigator to form a deeper understanding of a theoretical rationale. This led to the formation of objectives, construction of tools, Methodology and evolving a neurocognitive intervention strategies and neurocognitive therapy based teaching competency model. These are explained in the next chapter.