CHAPTER III

DESIGN OF THE STUDY

3.1 INTRODUCTION

Learning disabilities is the newest special education category in the US, having achieved national status as a field in 1963 when the Association for Children with Learning Disabilities was founded. In 1979, learning disabilities overtook speech impairment as the largest special education category. By 1982, 41 per cent of the students in special education in US schools were categorized as learning disabled; they constituted 4.4 per cent of all students enrolled in the public schools (Plisko, 1984).

Learning disabilities is commonly viewed as an organically-based disorder within a small percentage of children that interferes with their ability to learn to read and write normally. Hallahan and Cruickshank (1973) have offered an interpretation of why the field emerged when it did, that has been widely accepted within special education. They date it back to the early 1900s when European physicians began to document behavioral and language patterns of individuals with known brain damage. Kurt Goldstein was one of the earliest of these; he studied the behavior of World War I soldiers who had suffered head wounds. Goldstein's work greatly influenced two German scientists, Heinz Werner and Alfred Strauss, who left Germany in the 1930s and eventually came to the US, where they continued their research on neurological foundations of perceptual motor dysfunction. Their line of research was extended by William Cruickshank, who studied intellectually normal children with Learning disability.

Through the efforts of these and other physicians, psychologists, and educators (such as Kephart, Getman, Barsch, Frostig, Orton, Mykelbust, and Kirk), the foundations were laid for a data base about neurological impairment and its effects on learning behavior. A variety of methodological procedures are employed in the area of learning and memory (Howard, 1995).
1. Archetypal experiments in learning and memory involve learning, retention and testing phases. The individual learns particular facts or skills in the learning phase, engages in another activity or rests, then is tested for retention. Subjects may also be tested with no initial learning phase, to measure exiting knowledge.

2. Recall tasks require the individual to learn and later remember a list of words. The number of correctly recalled words, reaction time, and order of recall may serve as the dependent variables.

3. Paired associates involve exposing individuals to word pairs, then later presenting the first word and having them remember the second in the testing phase.

4. Recognition presents individuals with a list of stimulus words then in the testing phase identifying the words they previously viewed from a list of previously viewed or unviewed words. Accuracy, reaction time, self ratings on perceived accuracy, and patterns of error can be employed as dependent measures for recall, recognition and the paired associates tasks.

5. Physiological methods such as PET scans (Positron Emission Tomography) allow for the investigation of different areas of the brain that are involved in the performance of a particular task.

6. Self-reports by individuals can be employed as a measure of their knowledge and organization in a particular area of interest, and to gain an understanding of why they performed in a certain manner.

7. Neuropsychological evidence of how memory functions in the brain is provided through the study and examination of those individuals with damage to particular regions of the brain. The focus of this method is upon individual cases, unlike previous experimental methods.

8. Computer simulation is employed either in conjunction with subjects, or alone. Simulation requires the researcher to be very explicit about the memory and
learning processes, and makes more salient the assumptions that may have previously been obscured or unnoticed. (Howard, 1995)

3.2 INCLUSIVE EDUCATION AND LEARNING DISABILITIES

Disability is a multi-dimensional and complex construct and there is no single universally accepted, unproblematic definition of disability. Not only do definitions differ across countries but these also differ and change within a country with evolving legal, political and social discourses. It is very difficult to find reliable data about the prevalence of disability in India. In general, the search for a single prevalence rate is an illusion, and the range of estimates, and their varied origins, makes it difficult to say very much with assurance about people with disabilities. The two main large data-sets are the 2001 Census (Registrar General of India, 2001) and the 2002 National Sample Survey 58th Round (NSSO, 2003). Unfortunately, as Mitra and Sambamoorthi (2006) point out, the definitions of disability used by these two enquiries differ in some fundamental ways. Article 41 referring to children with disabilities, states: The State shall within the limits of its economic capacity and development make effective provision for securing the right to work, old age, sickness and disablement. Physically handicapped, the blind, deaf, dumb and the mentally retarded also fall in this category.

Efforts for the education of the various constituents of this category have been made for more than a century now, both by the state and voluntary agencies. However, it is only since independence that the efforts have been pursued vigorously. Article 46 of the Indian Constitution provides for the promotion of the educational interests of tribal and scheduled caste people and for their protection against social injustice and exploitation. Education provides a shield against such injustice and exploitation. Each society has a traditional system of education. These traditional mechanisms may not be centrally institutionalized and may have to be sought in various social institutions. These systems are likely to be affected by the introduction of a new educational system. The various educational inputs, their function and their impact have to be assessed so that flaws uncovered may be corrected promptly and then negative consequences nipped in the bud and to enhance educational interest of physically challenged children. Such analysis has
to be undertaken at various levels, right from the elementary stage through the secondary and university stages and in special professional institutions. Recently, adult, non-formal and continuing education have been introduced with a view to serving the interests of these disadvantaged groups.

Human beings are the ocean of the capacities and abilities. Having capacities and abilities are not assurance and seal for success, but the realization of the capacities and abilities is the guarantee for success. A person gets the concept of his abilities in the society; his concept about his own capacities, abilities and characteristics is known as educational interest. The educational interest plays a vital role and has a vital significance in the existence and life of an individual. If a person understands and realizes himself in a right way, he develops positive educational interest and he turns into a star. If he does not understand and realize himself in a right way, he develops negative educational interest and turns into a waste.

Children having special learning needs arising out of there intellectual, psychological, sensory and physical defects are required to be in special schools for special care. In India although some remarkable progress has been done by way of creating an awareness regarding educability of children with varying nature and degree of handicaps, yet enrolling all the handicapped children in special schools appears a distant goal. In Kashmir handicapped children as a segment of child population has to a great extent been neglected by the society. No government or voluntary agencies have so far done any commendable job in identification, treatment of this category of children. There are very few institutions in Kashmir where hearing impaired, visually impaired and crippled children are admitted.

As we know that our country has long back set an objective of universalisation of elementary education. To keep this objective in view, the physically challenged student (which constitutes only 10 percent of total population) cannot be ignored. They too are an important and essential component to make this object a fact. The most important role in their academic achievement is played by a teacher. A teacher after knowing the educational interest, level of educational aspiration and academic achievement of
physically challenged students can change his teaching methodologies, teaching aptitude and attitude towards this group, so that we will get good academic results.

The present study shall be the guideline for the future educational planners, teachers, administers and policy makers while taking any decision regarding the education of learning disabled students.

3.3 STATEMENT OF THE PROBLEM

The title of the problem is given as "A Comparative Study of Cognitive Strategy of Learning Disabled and Normal Students in Inclusive Schools".

3.4 OBJECTIVES OF THE STUDY

The objectives of the study are give below:

1. To study the cognitive strategy of learning disabled students studying in inclusive schools.

2. To study the cognitive strategy of learning disabled boys studying in inclusive schools.

3. To study the cognitive strategy of learning disabled girls studying in inclusive schools.

4. To study the cognitive strategy of non-learning disabled students studying in inclusive schools.

5. To study the cognitive strategy of non-learning disabled boys studying in inclusive schools.
6. To study the cognitive strategy of non-learning disabled girls studying in inclusive schools.

7. To compare the cognitive strategy of learning disabled students and non-learning disabled students studying in inclusive schools.

8. To compare the cognitive strategy of learning disabled boys and learning disabled girls studying in inclusive schools.

9. To compare the cognitive strategy of non-learning disabled boys and non-learning disabled girls studying in inclusive schools.

10. To study the problem faced by the teachers in Inclusive Schools.

3.5 HYPOTHESES

In the present study the following null hypotheses are formulated:

1. There is no significant difference between cognitive strategy of learning disabled students and non-learning disabled students studying in inclusive schools.

2. There is no significant difference between the cognitive strategy of learning disabled boys and learning disabled girls studying in inclusive schools.

3. There is no significant difference between cognitive strategy of learning disabled boys and non-learning disabled boys studying in inclusive schools.

4. There is no significant difference between Cognitive strategy of learning disabled girls and non-learning disabled girls studying in inclusive school.

5. There is no significant difference between cognitive strategy of non-learning disabled boys and non-learning disabled girls studying in inclusive schools.

6. The teachers do not face any difficulty in teaching in inclusive schools.
3.6 OPERATIONAL DEFINITIONS OF KEY TERMS USED

**Cognitive Strategy:** The word cognitive comes from Latin word –cognate which means to know hence cognitive psychology is the study of the behavior of knowing or thought, cognitive strategies are constructs that help to explain the ways that personality variables affect cognition.

Cognitive strategy as defined by Witkin (1971) is the characteristic self-consistent Mode of functioning, which individuals show in their perceptual and intellectual Activities.

**Inclusive Schools:** Inclusive schools means educating students with disabilities in regular classroom, the LRE principle requires that students with disabilities be educated in setting as close to the regular class as possible in which an appropriate program can be provided and the child can make satisfactory education progress. For many students with disabilities an inclusive classroom and least respective environment are one the same but it is not always. So much discussion and controversy and many misconception have arisen regarding the inclusion of student with disabilities in regular classroom.

**Learning disabilities:** Specific learning disability means a disorder in on or more of the basic psychological process involved in understanding or in using language spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculation. Such term includes such condition as perception disabilities, brain injury, Manimal brain dysfunction, dyslexia and development aphasia, such term does not include a learning problem that primarily result of visual, hearing promoted disabilities of mental retardation of emotional disturbance or of environmental, cultural or economic disadvantage.

The classification of specific learning disabilities is based on the difficulties in the acquisition of learning abilities. In the classification of the learning disabilities, we uses, some most common disorder we finds normally are as below:
a. **Dyslexia:** It is a specific language–based on disorder of constitutional origin characterized by difficulties in single word decoding, usually reflecting insufficient phonological processing.

b. **Dysgraphia:** Dysgraphia is the inability to performed motor movement or extremely poor handwriting.

c. **Dyscalculia:** The technical term for mathematical disorder called dyscalculia, it refers to selective impairment mathematical thinking or in calculation skills.

d. **Dysphasia:** The technical term for auditory–linguistic disorder called dysphasia, it refers to interference with comprehension and expression of written language in addition to visual symbols – sound integration.

e. **Dysmetria:** Dysmetria is inability of vestibule – cerebellar movement or in coordination of range of coulometer movements interferes with visual perception.

f. **Dysgnosia:** Dysgnosia is ability in performing visual – spatial relationship. It refers to the interference with recognition of visual spatial stimuli patterns.

g. **Dyspraxia:** The technical term for the difficulty in acquisition of Articulo-Graphic language or we can say it refers to the interference with exposition of written language.

h. **Apraxia:** Loss of specific habits as a result of brain; difficulty controlling voluntary muscular movements with usually no motor or sensory impairment.

3.7 METHODOLOGY

The present research work was descriptive in nature which was correlational. In which the data was analyzed and correlation between two variables was calculated. The investigator visited various middle and secondary schools of Faridabad and Palwal of Haryana state to get 100 learning disabled and 100 non-learning disabled children comprising equal number of boys and girls in each group. The investigator consulted the
principals of the schools and the class teachers of class 6\textsuperscript{th} and class 7\textsuperscript{th} to find out learning disabled and normal children in inclusive setting. Thus she prepared a list of students containing names and identification of learning and non-learning disabled children. There was no problem to get the sample of normal children but there was too much problem to get learning disabled children. Thus the investigator visited many middle and secondary schools to get 100 learning disabled children.

3.7.1 Population: the population of the present study is comprised of the students of the 6\textsuperscript{th} and 7\textsuperscript{th} standard from various schools located at district Faridabad of Haryana state.

3.7.2 Sample: Purposive sampling technique was applied for the selection of sample for the study. The sample for the study consists of 200 students of class 6\textsuperscript{th} and 7\textsuperscript{th} comprising 100 in each group i.e. 100 learning disabled and 100 non-learning disabled students with equal proportion of boys and girls in each group. The procedure of selection of sample is given below:

![Fig-3.1: Sampling Proedure](image)

<table>
<thead>
<tr>
<th>6\textsuperscript{th} &amp; 7\textsuperscript{th} Standard Students (N=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Disabled (100)</td>
</tr>
<tr>
<td>Boys (N=50)</td>
</tr>
<tr>
<td>Girls (N=50)</td>
</tr>
<tr>
<td>Non-Learning Disabled (100)</td>
</tr>
<tr>
<td>Boys (N=50)</td>
</tr>
<tr>
<td>Girls (N=50)</td>
</tr>
</tbody>
</table>
3.8 TOOLS USED IN STUDY

In a scientific and systematic research selection of measuring tools is quite important. Selection of tools is decided by many factors i.e. purpose of study, suitability of tools to the sample, their availability, their reliability and validity. Moreover feasibility and facilities available to investigators also play a vital role in the selection of measuring instruments. The investigator has used “Cognitive Capabilities Test For Transition Period” Developed by Dr. (Mrs.) Vasundhara Padmanabhan. The test booklet has three parts and has both quantitative and qualitative aspects.

3.8.1 Description of Cognitive Strategies Inventory:

The cognitive capabilities test for transition period a tool for assessing cognitive capability status of children of age group 10-13 years who are in a transition period of thinking from concrete to formal operational stage developed by Dr. (Mrs.) Vasundhara Padmanabhan was used for the collection of data for the study. The detailed description of the Cognitive Capabilities Test for Transition Period Developed by Dr. (Mrs.) Vasundhara Padmanabhan is given below:

Introduction: The researcher standardized the cognitive capabilities test for transition period (CCT-T) in order to provide a tool for assessing cognitive capability status of children of age group 10-13 years who are in a transition period of thinking from concrete to formal operational stage.

In many school systems, transfer from primary to secondary phase of education is marked by discontinuity and lack of communication. It is often assumed that the children entering secondary level education are ready for abstract concrete. The upper primary pupils (children of age 10 to 13 years studying in 6th & 7th std.) are expected to deal with abstractions, which are not related to their everyday experiences.
The upper primary school years should stand as a bridge between the primary school learning and the more formal study of abstract concepts in secondary school years. However, there is widespread uncertainty as to how this bridge should be constructed.

Piaget’s model of cognitive development characterized by sequential stages offers an effective liaison between the developmental nature of the child and the curriculum of the school.

Keeping in view the need and importance of transition period concrete to formal operational as described by Piaget, being a period of transition from primary to secondary education, this test should be of great value to assess the cognitive development of children in transition stage.

**Theoretical Basis:** Although Piaget’s detailed sequential stage-based theory of cognitive development has generated large amount of research, the focus of most of the Piagetian research has been on concrete operational stage, apart from a few studies on formal operational stage. Based on the review of the related literature, the following concepts and mental operations could be considered characteristic of the transition period from concrete operational to formal operational stage:

**(a) Late Concrete Operations**

1. Class-inclusion

2. Projective Geometry and Euclidean Geometry
   
   (i) Co-ordinate systems

   (ii) Geometrical sections

3. Time and Motion

4. Conservation of Area

5. Conservation of Mass, Weight and Volume
(b) Early Formal Operations

1. Chance or Probability
2. Proportions and Correlations
3. Combinatorial Thinking
4. Formulating and Testing of Hypotheses

Keeping in your mind the considerations a set of ten ‘schema’ representative of the transition period were identified by the researcher. Then the Piagetian and Piaget-type tasks were selected and modified into paper pencil from in order to prepare a tool for assessing the cognitive capability status of upper primary pupils.

The ten ‘schema’ representative of the transition period from concrete to formal operation are:

1. Combinatorial Thinking (CT)
2. Class Inclusion (CI)
3. Proportionality (PR)
4. Time and Motion (TM)
5. Geometrical Sections (GS)
6. Co-ordinate Systems (CS)
7. Conservation of Area (CA)
8. Conservation of Weight (CW)
9. Conservation of Volume (CV)
10. Formulation & Testing of Hypotheses (FTH)
Definition of Cognitive Capabilities of Transition Period: Cognitive capabilities are the characteristics of an individual that determine the stage/level of an individual performance (when maximal performance is attempted) on the selected cognitive tasks appropriate to late concrete and early formal operational stage of Piaget’s theory of cognitive development.

Many cognitive psychologists have tried to modify the original Piagetian tasks into paper pencil from in order to overcome the limitations of his well-known ‘clinical method’. However, the essential features of the Piagetian interview have also been appreciated by many researchers, which could be retained in paper-pencil form. Many research studies provide supporting evidence that translation of conventional Piagetian tasks into reliable written forms is feasible and that their results are comparable with Piagetian results – Russel’s (1962) paper-pencil test to measure the reasoning ability of adolescents, Dodwell’s (1961) test on children’s number concepts, R.A. Walker et al’s (1979) well known written diagnostic Piagetian Task Instrument (PTI) on formal thought. Shayer and Adey’s (1981) standardized ‘Science Reasoning Test’ (SRTs), etc.

The following assumptions provided the basis for assessing the Cognitive Capability Status in the study:

- The operative theory of cognitive development as formulated by Piaget, unlike the theories on the structure of intelligence, can be applied to illuminate changes of mental structure or modes of thought in relation to the child’s age.

- The sequence of mental structure and cognitive capabilities, one succeeding another in a certain order following a definite evolutionary principle, can make for an instrument capable of furnishing an index of Cognitive Capabilities Status.

- Such a judgement would be given in terms of clearly designated sub-stages with qualitatively different distinguishing features or capabilities, rather than numerical scores on a normative frame (as given by conventional intelligence tests).
- Cognitive Capability Status can be seen not as a point in the natural progression or a step on the ladder or cognitive development but as representing the overall cognitive capability of the individual which in turn consists in a variety of specific capabilities that can be defined in terms of different concepts and schemes of thought appropriate to the age level and emphasized by Piaget himself.

Thus, it could be concluded that it is possible to meaningfully reconcile the two approaches – qualitative and quantitative, for assessing cognitive capabilities; and the cognitive capability status of individuals can be assessed by a reliable tool adopting contents of cognitive development as described by Piaget together with psychometric approach of standardized test items yielding individual scores that can be summated into a total cognitive capabilities status score.

**Selection and Modification of Piagetian and Piaget-type Tasks into Paper-pencil Form:** The selection of Piagetian/Piaget-type tasks for the purpose of the study had to be guided by many important conditions. The original Piagetian tasks – with individualized technique – had to be modified into suitable paper-pencil tasks to be used in groups of VI and VII grades. This warranted modifications in the nature of the task, presentation of illustrations, diagrams and demonstrations, questioning procedures inviting answers, explanations, predictions or judgements in the written form.

**(a) Criteria for selection:** Keeping in mind these considerations, the following criteria were followed while modifying the tasks into paper-pencil form:

1. The essence of the problem should be retained though the materials, the mode of questioning or the assessment technique may be changed.

2. The tasks should cover both late concrete and early formal stage.

3. Assessment procedures should be provided for qualitative judgment/expressions/explanations in the written form (qualitatively on the basis of stage criteria of Piagetian transition stage and quantitatively on the basis of scoring procedures to be developed).
4. Two-dimensional diagrams with sufficient examples/illustrations should be provided with the selected tasks wherever necessary.

5. Demonstration of the tasks by the investigator for the whole group should be tried out wherever the tasks do not seem to be appropriate in the two dimensional form.

6. A wide variety of tasks should be selected covering ten selected schemes of thought so that the assessment of overall cognitive capabilities status of transitional stage is possible through the number of tasks under each scheme of thought may vary.

Thus, a set of twenty six tasks covering the ten schemes of thought were selected and modified, which were further subjected a preliminary try-out for further refinement of the tasks. The list of Cognitive Capabilities Tasks thus selected and modified for the intended test is presented below along with sources from which they were selected:

I. Class Inclusion (CI)

(i) Classification of animals (Piaget, 1959)
(ii) Classification of rectangles (Vaidya, 1979)

II. Co-Ordinate Systems (CS)

(iii) Drawing a line standing on another line (Piaget, 1960)
(iv) Drawing a rectangle and locating a point in it (Love Healy and Rowland, 1968)

III. Geometrical Sections (GS)

Predicting the cut surfaces of a cylinder and a cone (Piaget, 1956)

IV. Time and Motion (TM)

Doll race through tunnels task (Piaget, 1949)
V. Conservation of Area (CA)

Pasture and barns task (Piaget, 1948)

VI. Conservation of weight (CW)

Identical clay balls task (Piaget, 1941)

VII. Conservation of Volume (CV)

Task of bricks and boxes (Lovell and Ogilvie, 1968)

VIII. Combinatorial Thinking (CT) (Padmini and Yoganandan, 1989)

i. Forming a number of groups of four children out of the given five;

ii. Buying things from a shop for a fixed amount;

iii. Equalizing the values of A and B by different combinations of the numbers given;

iv. Identifying all possible routes from home to school in the given figure;

v. Identifying the shortest routes from one point to the other in the given figure;

vi. Naming all the triangles that can be formed using the five given points;

vii. Naming all the quadrilaterals that can be formed using the five given points;

viii. Forming different combinations of four given colorless liquids to get the desired effect;

IX. Proportionality (PR) (Padmini and Yoganandan, 1989)

i. Finding the proportion between the objects and their shadows;

ii. Finding the length of a side of a triangle compared to a bigger, identical triangle.
iii. Finding the proportion of water mixed to the juice.

iv. Finding the length/breadth of rectangles when the area and a side is given;

v. Balancing an equal-arm balance using different weights;

vi. Balancing an equal-arm balance using the given weight;

vii. Finding the relation between force, weight and velocity.

X. Formulating and Testing of Hypotheses (FTH)

Formulating hypotheses for the situation “filling of a beaker with a liquid” and testing one of the hypotheses thus formulated (Padmini Sukumaran, 1982).

Thus, the tool consisting of twenty-five tasks on Cognitive Capabilities was named “Cognitive Capabilities Test-Transition Stage” (CCT-T). The term ‘transition’ was used to denote the transition from concrete operational to formal operational stage as described by Piaget. The test has ten sub-tests – representing the selected ten schemes of thought – each having one to nine test-tasks set with one or more specific test situations and calling for single or multiple responses. The test has a maximum score of 125.

Further, it was decided to divided the test into three parts and administer these on three different days in a week for the sake of convenience in administering the total test without creating mental fatigue to the students. The first two parts covered the items in the form of test booklets with separate answer sheets.

As the part III tasks needed demonstration the test booklet for part III were prepared in such a way to provide them the diagrams of the demonstrated situations followed by the specific questions to be answered by them.

The following Table 1 presents the details of the Cognitive Capabilities Test tasks under the parts I, II and III
TABLE 3.1: Cognitive Capabilities Test: Details of the tasks under Parts I, II and III

<table>
<thead>
<tr>
<th>Sub-Tests</th>
<th>No. of Tasks</th>
<th>No. of Test Situations</th>
<th>Max. Marks</th>
<th>Time Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part I</strong> (Test Booklet-I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I Combinational Thinking</td>
<td>8</td>
<td>8</td>
<td>46</td>
<td>30 min</td>
</tr>
<tr>
<td>II Class Inclusion</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Part II</strong> (Test Booklet-II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III Proportionally</td>
<td>7</td>
<td>13</td>
<td>21</td>
<td>25 min</td>
</tr>
<tr>
<td>IV Time &amp; Motion</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5 min</td>
</tr>
<tr>
<td>V Conservation of Area</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>10 min</td>
</tr>
<tr>
<td>VI Geometrical Sections</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>5 min</td>
</tr>
<tr>
<td>VII Co-ordinate Systems</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>15 min</td>
</tr>
<tr>
<td><strong>Part III</strong> (Test Booklet-III)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIII Conservation of Weight</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>10 min</td>
</tr>
<tr>
<td>IX Conservation of Volume</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>10 min</td>
</tr>
<tr>
<td>X Formulation and Testing of Hypotheses</td>
<td>1</td>
<td>1</td>
<td>11</td>
<td>20 min</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>10</td>
<td>25</td>
<td>40</td>
<td>125</td>
</tr>
</tbody>
</table>

116
Procedure of Administration: As the test consisted of a series of group tasks inviting individual responses in the written form, the following procedure was considered necessary for administering the whole test so as to enable the analysis of data both qualitatively and quantitatively.

Part I and Part II Tasks:

1. After building up a good level of rapport with the students, test booklets with the answer sheets should be distributed among the subjects of the whole class - with a maximum of 40 to 50 students for a session.

2. The instructions given in the title page of the booklet should be read out by the investigator slowly to make sure that each student understood the nature of the test.

3. The first task should be read out by the investigator followed by simple explanation of the task. Here, the attention of the students should be drawn to the illustration/diagram/example given in the booklet to enable them to proceed to solve the task on their own and write their answers in the answer sheets.

4. Clarifications sought by the students for each task should be provided by the administrator while explaining the task and before the children commence the solving of the problem.

5. The time prescribed for each task should be allowed (with a margin of one or two minutes) before passing on to the next task.

6. The students should, then, be instructed to proceed to the next task with the same procedure as explained above for the first task.

Part III Task:

7. This being a set of demonstration items, the investigator, after distributing the answer sheets for Part III, should demonstrate each item with sufficient ease.
8. The demonstrations should be visible to the whole class; questions/clarifications should be attended to before they proceed answering/explaining the tasks in the answer sheets provided to them.

9. Diagrams of the situations demonstrated which are provided in the answers sheets should and the students to solve the problems taking their own time.

Thus, a compromise between individual and group testing was arrived at top the whole test following the above mentioned procedure for administering the test.

Hence the test CCT-T was subjected to a try-out following the procedure of a ministandardization to establish the item difficulty and discriminate power and validity and reliability of the test as a whole. The details of the Try-out and item analysis are given in the following sections.

**Table 3.2: Distribution of sample for the try out for item analysis**

<table>
<thead>
<tr>
<th>Schools</th>
<th>Type of school</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>VI</td>
</tr>
<tr>
<td>I</td>
<td>Aided Schools</td>
<td>21</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>IV</td>
<td>Unaided Schools</td>
<td>20</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>52</td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>VII</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>240</strong></td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td><strong>500</strong></td>
</tr>
</tbody>
</table>
(b) **Item analysis**: Item analysis was done for all the twenty five tasks of the test to determine with response points-their discrimination index and difficulty values, the top group and bottom group (27% of 500 students) being formed on the basis of performance on the whole, battery of ten test, different appropriate formulate were used for computing difficulty level and discriminatory index for single and multiple response items. The table gives the details of each item. As the discriminatory index ranged from 0.10 to 0.66 and the difficulty level ranged from 14 percent to 65 percent. It was decided to retain all the tasks in the test in view of the age range of the subjects (10 to 13 years) as well as two different grades VI and VII. However, few examples questioning procedures and instructions for students were further refined on the basis of the results of the try-out.

**Table 3.3: Difficulty Value and Discriminatory Index of the Cognitive Capabilities Tasks**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Schemes of thought</th>
<th>Cognitive Capabilities Test</th>
<th>Difficulty Value</th>
<th>Discriminatory Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>C.T.</td>
<td>1. Forming a number of groups of four children out of the given five.</td>
<td>36.00</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Forming a list of things one can buy from a fixed amount.</td>
<td>29.00</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Identifying all possible routes from home to school.</td>
<td>33.00</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Identifying the shortest routes from one point to another.</td>
<td>30.00</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Equalizing the value of A and B by different combinations of the given numbers.</td>
<td>22.00</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Naming all the triangles that can be formed from the given points.</td>
<td>30.00</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Naming all the quadrilaterals that can be formed from the five given points.</td>
<td>37.00</td>
<td>0.56</td>
</tr>
<tr>
<td>II</td>
<td>C.I.</td>
<td>8. Forming different combinations of colourless liquids to get the desired effect</td>
<td>33.00</td>
<td>0.33</td>
</tr>
<tr>
<td>------</td>
<td>----------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>9. Classification of animals.</td>
<td></td>
<td>42.00</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>10. Classification of rectangles.</td>
<td></td>
<td>35.00</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>11. Finding the proportion between objects and their shadows.</td>
<td></td>
<td>30.00</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>12. Finding the proportion of water mixed to juice.</td>
<td></td>
<td>35.00</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>13. Finding the length of a triangle compared to a bigger identical triangle.</td>
<td></td>
<td>49.00</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>14. Finding the length and breadth of the rectangles when area and one side are given.</td>
<td></td>
<td>45.00</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>15. Balancing the equal arm balance using different weights.</td>
<td></td>
<td>43.00</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>16. Balancing the equal arm balance using same weight.</td>
<td></td>
<td>46.00</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>17. Finding the relation between force, weight and velocity.</td>
<td></td>
<td>30.00</td>
<td>0.41</td>
</tr>
<tr>
<td>III</td>
<td>P.R.</td>
<td>18. Predicting the shape of the cut surface of a cylinder and a cone.</td>
<td>26.00</td>
<td>0.61</td>
</tr>
<tr>
<td>V</td>
<td>T.M.</td>
<td>19. Doll race through tunnels.</td>
<td>43.00</td>
<td>0.55</td>
</tr>
<tr>
<td>VI</td>
<td>C.A.</td>
<td>20. Pasture and barns task</td>
<td>35.00</td>
<td>0.45</td>
</tr>
<tr>
<td>VII</td>
<td>C.W.</td>
<td>21. Identical clay ball task</td>
<td>57.00</td>
<td>0.38</td>
</tr>
<tr>
<td>VIII</td>
<td>C.V.</td>
<td>22. Bricks and boxes task</td>
<td>37.00</td>
<td>0.35</td>
</tr>
<tr>
<td>IX</td>
<td>C.S.</td>
<td>23. Drawing a line standing on another line</td>
<td>27.00</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>24. Locating a point in a rectangle.</td>
<td></td>
<td>29.00</td>
<td>0.29</td>
</tr>
<tr>
<td>X</td>
<td>F.T.H.</td>
<td>25. Formulating hypotheses for a given situation and testing one of them.</td>
<td>14.00</td>
<td>0.21</td>
</tr>
</tbody>
</table>
(c) **Validity and Reliability of the Test:** Adequate construct validity of the test was ensured through scrutiny, discussion and preliminary try out. All the cognitive Capabilities tasks were essentially meant as criteria based items – to find out whether the subject had a certain capability in good measure or not; the items included were representative or transition state as described by Piaget with adequate variety of context and content. (Construct validity is the degree to which the scores on a test can be accounted for by the explanatory construct of a sound theory).

Concurrent validity was found out by validating the test Premlatha’s (1961) Non-verbal Group Test of intelligence and the validity co-efficient was found to be 0.57 significant at 0.01 level. (Concurrent validity refers to the usefulness of a test in closely relating to other measures such as teacher ratings or scores on another test of known validity).

The reliability of the test was also found out using the split half method. The reliability coefficient of the whole test was estimated using the Spearman-Brown formula. The Reliability Co-efficient of the half tests was found to be 0.70 and that of the whole test 0.82.

**Establishment of the Norms:** In order to establish the norms for the test was administered on a large Sample of students drawn from a large cross section of schools in Mumbai. The sample consisted of 2243 students studying in VIth and VIIth standards in aided and unaided schools of Maharashtra board and also a few following CBSE and ICSE syllabus. The following Table 3.4 represents the sample class wise and gender wise:

**Table 3.4: Showing the sample for collection of data in order to establish norms**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI</td>
<td>671</td>
<td>514</td>
<td>1185</td>
</tr>
<tr>
<td>VII</td>
<td>575</td>
<td>483</td>
<td>1058</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1246</td>
<td>997</td>
<td>2243</td>
</tr>
</tbody>
</table>
The tests were administered keeping in mind the instructions and the three parts of the test were administered on three separate days in order to avoid fatigue factor. Whenever the students had any doubts clarifications were given. Whenever necessary extra time was also given to see that the students was non-affected by the time factor.

After scoring the answer sheets as per the scoring key the data was tabulated and subjected to statistical analysis in order to find out mean S.D. standard scores and percentile norms. The following tables present the norms that were established for the test.

**Stage Criteria for Qualitative Analysis:** The qualitative judgement/ explanations/predictions on the modified cognitive capabilities tasks selected for the test available in the form of written responses for each task provided the basis for assigning each subject into a particular stage/sub-state of cognitive development.

The stage criteria followed for each task was based on the explanations Piaget and his associates. Further, the sub-stages of transition from concrete operational to formal operational stage were designed – 2B (Late Concrete Operational Period), 2B/3A (Transition Period), and 3A (Early Formal Operations Stage) as defined by Shayer and Adey (1981). Thus, the criteria to assign the students into a particular stage of development were considered separately for each task as summarized in Table 3.5.
Table 3.5: Stage Criteria for the Qualitative Analysis of the Ten Schemes of Thoughts

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Schemes of thought</th>
<th>Stage 2B</th>
<th>Stage 2B/3A</th>
<th>Stage 3A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Combinational Thinking</td>
<td>Failure/Partial Combinations</td>
<td>Random/Repeated Combinations</td>
<td>Complete and Systematic Combinations</td>
</tr>
<tr>
<td>2.</td>
<td>Class Inclusion</td>
<td>No logical groupings</td>
<td>At least one logical grouping</td>
<td>All logical groupings</td>
</tr>
<tr>
<td>3.</td>
<td>Proportionality</td>
<td>No logical Proportional Thinking</td>
<td>Partial Proportional Thinking</td>
<td>Complete Proportional Thinking</td>
</tr>
<tr>
<td>4.</td>
<td>Time and Motion</td>
<td>Incorrect Judgement</td>
<td>Partially Correct Judgement</td>
<td>Fully correct judgment</td>
</tr>
<tr>
<td>5.</td>
<td>Co-ordinate systems</td>
<td>Failure to draw the figures</td>
<td>Partially correct figures</td>
<td>Fully correct figures</td>
</tr>
<tr>
<td>6.</td>
<td>Geometrical Sections</td>
<td>Failure to draw the figures</td>
<td>Partially correct figures</td>
<td>Fully correct figures</td>
</tr>
<tr>
<td>7.</td>
<td>Conservation of Area</td>
<td>No conservation</td>
<td>Partial conservation</td>
<td>Complete conservation</td>
</tr>
<tr>
<td>8.</td>
<td>Conservation of weight</td>
<td>No conservation</td>
<td>Partial conservation</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Conservation of volume</td>
<td>No conservation</td>
<td>Partial conservation</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Formulation and Testing of Hypothesis</td>
<td>Failure formulate and test the hypothesis</td>
<td>a. Formulation of hypotheses only</td>
<td>Formulation and systematic testing of hypotheses</td>
</tr>
</tbody>
</table>
3.9 SAMPLING TECHNIQUE AND DATA COLLECTION: The investigator visited the selected schools personally taking prior permission of the principals to administer the tool to collect the required data from schools. Thus she gathered the data.

3.10 ANALYSIS AND INTERPRETATION OF DATA: Statistical Techniques such as mean, standard deviation, Pearson’s correlation and t-test was used for the analysis of data.

3.11 DELIMITATIONS OF THE STUDY

1. The study was carried out in the schools of Faridabad in Haryana.

2. Only 6th and 7th standard students were taken for study.

3. There were 200 students comprising of 100 in each group.