CHAPTER 3

METHODS AND PROCEDURES

The methodology of the study is the blueprint of the procedure that enables the researcher to test the hypothesis for reaching valid conclusions about the variables under study. Leedy (1996) describes research methods and procedures as “the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon in which we are concerned or interested.” The present chapter consists of the description of: design of the study, sample of the study, tools used for the study, conduct of the experiment and statistical techniques employed for data analysis.

3.1 DESIGN OF THE STUDY

Very frequently single subject baseline research designs have been employed for the study of behavioural interventions with the special needs population primarily due to individualized intervention non-availability of groups of special needs cases and this population being scattered thinly. Also baseline designs are selected for their primary emphasis on therapeutic impact as compared to their contribution to a research base (Gay & Airason, 2003). Experimental designs with control and experimental group in this area have also been reported by Glavin et al (1971) and Lahey & Drabman (1974), Eckert et al. (2002)

For the present study a pre-test post test control group design was thought as the most appropriate. This design was preferred to single subject baseline as well as simple pre test – post test design owing to the feasibility for the researcher to employ this design as the number of similar type of LD cases required for both the control group and the experimental group were
available and the cases were attending remediation classes in the Learning Centre where the researcher is a special educator. This design was also preferred to factorial design because the **pre-test scores could serve as baseline performance** which helped in determining the retention of effects due to treatment, one of the objectives under consideration in the present study.

The **pre-test and post test control group design involves two groups** **ie control group and experimental group**. The experimental group was given treatment in the form of Token Economy (TE) while undergoing remediation in the learning centre for learning skills in reading, writing and spelling, whereas the control group was given no such treatment. It attended the regular remediation (in reading, writing and spelling) classes at the Learning Centre of the school. **Each of the two groups** **ie experimental and control groups had LD students belonging to three grades ie grades I, II & III.**

A pre-test and post test on Language achievement was administered (ie LAT) to assess the effectiveness of TE treatment on the criterion variable of performance. Thus the design involves an experimental group that is given TE as the treatment (independent variable) the effect of which was seen and compared with remediation without TE treatment, the control group on the dependent (criterion) variable of performance on Language Achievement Test of LD students at three grade levels I, II & III. **In between the pre-test and the post test, the two groups were treated differently.**

Remediation classes in the Learning Centre of the school are held for three non-academic periods per week per grade in the regular school time table. For the purpose of experimentation, ie remediation with and without
treatment to each of the experimental and control group, **instructions were carried out in these three non-academic periods** by taking one group (experimental or control group) belonging one of the three grades at a time of the researcher herself. For each group 19 sessions were held with 3 periods of the school time table constituting 1 session (ie 19 x 3 = 57 classroom periods). Each period was of 35-40 minute duration. Three periods in each session were devoted to remediation with treatment (for the experimental group) and remediation without treatment (for the control group) in reading, writing and spelling. This required the investigator to take 3 classes per grade every day.

The experiment was conducted in two phases. In the first phase the control group received only remediation, whereas the experimental group was given remediation with TE for 19 sessions. After which period a post test (LAT) was administered to the whole sample (Post Test 1). **The data collection for the first phase was accomplished in the months of July, August and September.** The second phase started after a gap of one month. This gap was on account of sports day practices and Diwali holidays in October.

The LAT was administered to the total sample as pretest 2 just prior to the experiment in the second phase. The same experimental procedure as followed in the first phase was repeated for 19 sessions (ie 19 x 3 = 57) for the second phase, **data collection for which was taken up in the month of November, December and January.** At the end of the treatment period all subjects were again post tested on LAT (ie post test 2). Administration of treatment during Phase II was given with the same procedure for the same time by the researcher herself.
Gain scores, that is post test minus pre test scores were used as the measure of each of the three criterion variables namely performance on skills of (i) reading (ii) writing (iii) spelling. Along with this total gain scores for each student ie reading + writing + spelling were worked out. In all, there were four measures of the criterion variable in respect of gain scores. This was done to take care of the variations in pre test, a co-variate of the criterion variable. Gain scores were worked out separately for phase I (ie post test1 – pre test 1), Phase II (post test 2- pre test 2) and total duration of the experiment spread over 38 sessions (ie 114 classroom periods) ie Phase I + Phase II.

In addition fifteen days before and after the cessation of the experiment GLAD test (GLADa and GLADb) were administered. GLADa (given 15 days prior to the experiment) served the purpose of confirming referred cases as learning disabled, whereas GLADb was used to assess improvement if any in the functional Levels (ie Frustrational, Instructional and Independent) of the LD students.

A figural representation of the experiment is given in figure 3.1.
FIGURE 3.1: FIGURAL REPRESENTATION OF THE EXPERIMENT

CONTROL GROUP

EXPERIMENTAL GROUP

NO TOKEN ECONOMY

TOKEN ECONOMY

NOVEMBER, DECEMBER, JANUARY

JULY, AUGUST, SEPTEMBER

CONTROL

EXPERIMENTAL

105
3.2 CONTROLS INTRODUCED

It is but natural that inspite of the best possible design and sampling procedure certain errors are likely to creep in any experimental study. These errors as described by Lindquist (1951) are commonly of three basic types. They are characterized under Type ‘S’, Type ‘G’ and Type ‘R’ errors. The experimental controls taken for each type of error in the present study were as below.

TYPE ‘S’ ERRORS: Type ‘S’ errors are those errors which characterize random sampling. Such type of error in the present study was minimized by random assignment of LD students into experimental and control groups.

Statistical control also needs to be achieved by including measures on supplementary concomitant variate, in addition to variate of primary interest after the treatment has been applied. Measurement on pre-test (co-variante) obtained prior to the administration of the treatment needs to be adjusted for the measurements on post test (criterion). When pre-test and post test are associated, a part of variance of post test is due to the variation on pre-test. If the variance in the co-variante pre-test is constant over the experimental units there can be corresponding reduction in the variance of post test. Thus in the pretest post test control group design employed for the present study two observations on pre-test (co-variante) and post-test (criterion after treatment) were obtained for each student separately for phase I and phase II of the experiment respectively. The data on criterion variable in the present study was adjusted for concomitant variate by phase wise gains in scores (ie posttest minus pretest scores) which were used as a measure of effectiveness of the treatment to minimize type ‘S’ errors.
TYPE ‘G’ ERRORS: Such errors result from extraneous factors, which tend to have the effect on all members of any one treatment group and which thus, create a systematic difference in the criterion means from group to group in the same replication. These errors are thus associated with the administration of experiment or with the experimenter.

To minimize these errors, the investigator herself taught the same content to both the control group and the experimental group. Copies of the same worksheets were used for the experimental & control group. The number of sessions in each phase i.e., \(19 \times 3 = 57\) was kept constant for each student in both the groups. Attempt was also made to provide remediation with or without reinforcement to the experimental and control group respectively by randomizing the learning classes to the extent possible within the timetable schedule of the school.

TYPE ‘R’ ERRORS: These type of errors arise when a certain type of treatment is better for a particular school, institution or community. This could result from differences in curriculum or in the administrative organization of the schools, equipments or it could be due to any other conditions in the institution, school or community making one method more appropriate or effective than the other for that particular institution, school or community.

To minimize these errors in operation, only one school was selected for experimentation so that all the prospective LD students had the same type of environment. After ensuring the steps to minimize the errors and maximize the validity of the experiment the conduct of study was accomplished.
3.3 SAMPLE OF THE STUDY

The sample was limited to one English medium convent school in Chandigarh, namely St. John's High School. It is an all boys school. The choice fell in favour of this school as the investigator herself is working as a special educator in the Learning Centre of the school. Therefore it was easy to take permission and have the cooperation of the Principal and also have access to the referral cases in the Learning Centre. 34 referred cases with Learning disabilities studying in grade I, II & III and having problems in the academic areas of reading, writing and spelling were taken to constitute the sample.

It may be mentioned here that the referral is made by the class teacher after observing the child constantly over a period of 3 months. This is also supplemented by information from the previous year’s class teacher of the student. The teachers in the above mentioned school are trained to identify and refer LD students. The school has a special referral form for the same purpose (Appendix ‘G’). Thus the sample could be stated as referral sample consisting of three strata that is grade I, II & III. These students were then assigned numbers on the basis of which they were further randomly assigned to experimental and control groups through a lottery system separately for each grade. Thus each of the three strata (ie grades) had one experimental group and one control group. Following this, each student was assigned code as S-1 (Subject 1) to S-34. The group wise split of the sample is given in figure 3.2.
The randomization of subjects on the basis of allotted numbers into experimental and control groups avoided the introduction of biases due to personal judgment and due to the characteristics of the subjects themselves. Ary et al. (1972) have pointed out that through randomization of subjects not only the extraneous variables that a researcher can identify are randomized but also other relevant extraneous variables which are unknown to him can be expected to randomize out. Koul (1987) states that in addition to randomness stratification introduces a secondary element of control as a means of increasing precision and representativeness. Gay & Airason (2003) state that the combination of random assignment and the presence of a pre-test and control group serve to control for all sources of internal validity. Random assignment takes care of the control for regression and selection factors; the pretest controls for the factor of mortality; randomization and the presence of control group act as
control for maturation and also the presence of a control group acts as control for history, testing and instrumentation.

3.4 TOOLS USED FOR THE STUDY:

Owing to a wide variety of characteristics no single test or score can be used to diagnose Learning Disabilities (Richards, 2000). To gather data in order to test the hypothesis under study. Two types of tools were used which can be categorized as:

3.4.1 Assessment Tools

3.4.2 Intervention Tools

3.4.1 ASSESSMENT TOOLS

- Draw-a-man Test for Indian Children (Pathak, 1966)
- Raven’s Coloured Progressive Matrices (Raven, Raven & Court, 1998)
- Grade Level Assessment Device (Narayan, 1997)
- Language Achievement Test (assembled by the researcher)
- **DRAW-a-man test FOR INDIAN CHILDREN (Pathak, 1966)**

This test is an adapted version by Pramila Pathak (1966) of Goodenough (1926). Draw-a-man test is applicable for ages 5+ and 12+ years and can be calculated on five environmental levels. The observers of children’s drawings have noted that in the given mean age group, intelligence is the most important factor in their drawing. Analysis of the drawing activity and its development has shown the imagery, imagination, education of relations, reasoning and memory at work in children drawings. This basic fact about drawings of children has made Draw-a-man test a reasonably valid measure of intelligence.
Choice fell in favour of this test because it is a quick, efficient and easy to administer test of intelligence. It can be administered to a single child at a time or to a group of children. The child has to draw a picture of a full man on a blank sheet of paper which is of 19 x 22 cms approximately. Co-efficients of reliability correlations of the scale using test retest method varies as reported by the author (Pathak, 1966) form 0.57 to 0.95 with different samples scores and variation in the interval between two performances. On comparison with the Good enough – Harris Revision (an adaptation of Draw-a-man scale on American Children) the co-efficient of correlation was found to be 0.87 and on Indian Children the correlation co-efficient ranged from 0.80 to 0.93 with age groups six to nine, the average ‘r’ being equal to 0.87.

This test is used for quick but objective judgment which is needed in a school to locate a group of children who do not achieve commensurate with their age or ability when provided with appropriate educational experience thereby requiring individual attention. Hence, for the present study this test was used to ascertain & ensure that the children constituting the sample have normal or above normal intelligence and also to rule out the factor of a severe discrepancy between expected and actual performance existing due to a condition other than learning disability (e.g, mild mental Retardation, environmental deprivation and the like). The scores obtained by students in the sample are appended in appendix ‘F’

- **RAVEN’S COLOURED PROGRESSIVE MATRICES** (Raven, Raven & Court, 1998)

As the name implies Raven’s Coloured Progressive Matrices is composed of a set of figural matrices that can be used as a measure of general intelligence. Due to minimal language involvement, this test is particularly suited to
assessing the intelligence of individuals with language disabilities and children whose native language is not English (Reynolds et. al, 1990), thus justifying its use in the present study.

The CPM consists of 36 items in three sets of 12 items each in A, Ab and B. These items are figural matrices presented in a multiple choice format, of response categories where the examinee has to identify the missing piece in the pattern. The test is suitable for children under eleven years of ages. The raw scores can be converted to percentile ranks and the students’ performance can be classified under

**Grade I**: “Intellectually superior if the score lies at or above the 95th percentile for people of that age group.

**Grade II +**: if a score lies at or above the 90th percentile.

**Grade II**: “Definitely above the average in intellectual capacity” if a score lies at or above the 75th percentile.

**Grade III**: “Intellectually average”, if a score lies between the 25th and 75th percentiles.

**Grade III -**: if a score is less than the median.

**Grade IV**: “Definitely below average in intellectual capacity if the score lies at or below 25th percentile

**Grade V**: “Intellectually impaired if a score lies at or below the 5th percentile for that age group.

Test retest reliability was worked out and found satisfactory by Rao & Reddy (1968) with pupils in grades one to five in India. They retested a sample of 100 pupils after two-three weeks and reported a value of 0.86. With young
children aged 6 to 7 years internal consistency co-efficient ranging from 0.71 to 0.90 have been reported by Tuddenham et al. (1958). The scores obtained by the 34 students constituting the sample are entered vide appendix ‘F’

- **GRADE LEVEL ASSESSMENT DEVICE (GLAD) (NARAYAN 1966):**
  This tool was developed by Jayanthi Narayan (1997). It can be used by primary teachers to provide an assessment of academic achievement as well as systematic observation and recording of processing problems in children up to class IV level. This device takes into account the standard curricular content of class I to IV in Indian schools. Items are selected from the existing curricula with utmost care to enable representative sample of content for testing. GLAD was used in the present study to assess the academic achievement of students and identify the types of errors made by them in reading, writing and spelling in English.

The GLAD as two formats.

**FORMAT 1:** Format 1 has test booklets of grade 1 to grade IV given in the form of worksheets. For the present study test booklets for grade I, II & III were used. Each class contains worksheets of English, Hind and Maths. For English there are worksheets on matching, identifying, naming of pictures, letters of the alphabet and words with copying tasks. Dictation lists and reading, writing and listening comprehension worksheets are also included. The maximum score a student can obtain in English is 175 in grade I, 90 in grade II, 120 in grade III which is required to be converted to a percentage, which is represented in the matrix in the summary sheets. For Hindi a similar pattern is followed. However the maximum score a student can obtain is 145 in grade I, 100 in grade II, 120 in grade III, which is also to be converted into a percentage. For maths the worksheets are based both on arithmetic computation and reasoning with
concepts of addition, subtraction, multiplication and division. The maximum score a student can obtain is 156 in grade I, 95 in grade II, 95 in grade III. These can be converted into percentages.

Items include tasks requiring verbal and written responses to questions. Each worksheet has the instruction given on the top. Serial number and total score is provided on the top and blank space is provided in the worksheet at the bottom to enter scores if needed. In addition each section at the end namely English, Hindi and Maths has a scoring sheet with the item numbers and maximum possible scores provided in a sequence for the teacher to score. The number of items vary in each section and also in each class level based on the tasks in the curricular content. Hence conversion to percentage for comparison is advised. The scores for each students in the sample are entered in Appendix ‘H’.

**FORMAT 2:** Format 2 is to be used by the teacher for noting observations while the child is performing on format 1. Format 2 has two sections and a summary sheet. Section 1 has provision to note down the child’s background information including personal details, family history and school history which helps the teacher in getting to know the child better. The teacher has to fill each item carefully before starting to test Section II which has items to identify soft neurological signs if any, which the teacher observes (during testing) & can refer to a physician for the needful to be done.

The summary sheet provides for a brief over all picture of the child which includes a matrix, that depicts scores (when converted to percentage) at three levels.

<table>
<thead>
<tr>
<th>Scores</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 70%</td>
<td>Independence Level</td>
</tr>
<tr>
<td>40% to 69%</td>
<td>Instructional Level</td>
</tr>
<tr>
<td>Below 40%</td>
<td>Frustrational Level</td>
</tr>
</tbody>
</table>
The levels of functioning for each student in the experiment are entered in Appendix ‘I’. Test retest reliability co-efficients as reported in the manual of the test are $r= 0.98$ for class I and II, 0.99 for Class III and 0.68 for Class IV. The correlation co-efficients of validity in the manual are 0.76 for class I, 0.86 for class II, 0.76 for class III and 0.74 for class IV. These values indicate it to be a reliable and valid assessment device.

- **LANGUAGE ACHIEVEMENT TEST (LAT)** – This test is a teacher assembled test i.e. the researcher herself assembled it. It was used to pre-test and post test students in both the experimental and control groups for their academic performance in reading, writing and spelling. It comprised of the following items:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Items</th>
<th>Maximum Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alphabet names</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>Consonant Names</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Consonant Sounds</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>Vowel Names</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Vowel Sounds</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Spelling Test (ST)</td>
<td>32</td>
</tr>
<tr>
<td>7</td>
<td>Handwriting</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Reading Words</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Reading Sentences</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Listening Comprehension</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Writing Comprehension</td>
<td>10</td>
</tr>
</tbody>
</table>

The maximum score a student can obtain on this test is 160. A percentage of each student’s score was calculated to check for comparisons. Items 1 to 6 and 8 were taken from Sunday Systems I (Sunday, 2003). Items 7, 9, 10 and 11 were
added by the investigator. For item 7 the final product, ie the handwriting sample was assessed. And for items 9, 10 & 11 comprehension cards Level I, II & III by Central Institute of English as a Foreign Language (CIEFL), Hyderabad were used. This tool is attached as a booklet in Appendix ‘B’

3.4.2 INTERVENTION TOOLS

For the present study the researcher designed and procured:

1. Tokens to be dispensed. (Appendix ‘J’)

2. Token economy progress chart with exchange rate of tokens to monitor performance and delivery of tokens (Appendix ‘K’)

3. Teaching learning material: which consisted of
   
i. Worksheets and probesheets to record the permanent products of the students on-task performance on reading (4 points), writing (3 points) and spelling (3 points). These worksheets were partly designed by the investigator and some were reproducibles from activity books.

   ii. Teaching aids – like story books, flash cards, story pictures starters, English alphabet strip, play dough, colouring sheets, crossword and pictures puzzles were procured. Details of token economy procedures are given along with theoretical basis of Behaviours Analysis and Interpretation in separate Chapter (ie Chapter - 4)

3.5 DATA COLLECTION

The investigator herself carried out the reading, writing and spelling remediation for both the groups ie for the experimental group remediation with TE and for the control group remediation without TE. Data were
collected in two phases. Nineteen sessions of three periods each for reading, writing and spelling were conducted for each of the two groups at each of the three grade levels I, II & III and for both the phases of (first phase and the second phase) of the experiment, thereby making 19x3= 57 classroom periods for each group. Total classroom periods taken for Phase I (19 x 3 = 57) + phase II (19 x 3 = 57) come to be 114 for each group.

The subjects in the control group attended only remediation classes regularly held in the learning centre. Whereas the students in the experimental group were explained the token economy procedure. They were told about (i) The token production component, wherein their correct responses in reading, writing and spelling on the worksheets would earn them points ie for reading (4 points), writing (3 points) and spelling (3 points). A total of the points obtained by them would make them eligible to receive tokens at the end of the third session. 2 points earned is equal to 1 token ie a student could earn a maximum of 5 tokens per worksheet set. (ii) Token exchange component: On the third day of each session, the tokens could be exchanged for backup reinforcers listed in a chart format on the notice board that is to say that they could purchase something in the Learning Centre with a token or tokens earned. For that they would have to pay through tokens earned.

The experimental and control groups visited the Learning Centre at different times ie when the experimental group of grade I visited the Learning Centre, no other experimental or control group of any grade was there for remediation and likewise same was done for experimental groups and control groups for grade II and III. The delivery of points was contingent on permanent products of performance ie. work done in worksheets. And only the experimental group earned tokens on these points. Each worksheet set had a reading, writing and a spelling component. One worksheet set was used for 3
sessions ie one session of reading, one session of writing and one session of spelling remediation. Four points were assigned to reading and three each to writing and spelling. After each session, points were assigned based on the permanent product that is work done on worksheets. Only the experimental group got corresponding tokens for points. The design of the tokens was changed for every session either in terms of drawing, or colour in order to avoid duplication by students. A chart was put up which showed the number of tokens each student in the experimental group was earning as the sessions proceeded from session one to session nineteen. Remediation for both the groups with & without TE was taken up in six areas namely:

1) Auditory Visual Channel
2) Specific Spelling Rules And Cues
3) Training In Comprehension Skills
4) Oral Expression
5) Written Expression
6) Visuomotor Perceptual Aspects

These were incorporated to enable the students to approach language in a systematic manner. The new material was presented in a variety of situations and ways. Worksheets based on all the above were used extensively, few samples of which are attached vide Appendix ‘D’.

3.6 STATISTICAL TECHNIQUES EMPLOYED

The results of both the phases of treatment (Phase I & II) and also for the total period of experiment obtained in respect of gain scores on LAT were used to examine the effectiveness of TE procedure in the three areas of reading, writing and spelling separately and conjointly across all the three grades ie I, II &
III. This was accomplished through quantitative analysis of differences between means of various groups.

Scores obtained on day to day worksheets and tokens earned were examined for arriving at optimum level of learning in all the three skills through qualitative descriptions based on simple percentages and figural representations of individual as well as group data.

Thus a combination of a quantitative and qualitative analyses has been undertaken in the present study. This approach (e.g., quantitative and qualitative) is supported by Borg, Gall & Gall (1993) who state that “many educational phenomena are best studied through a combination of quantitative and qualitative research design. Qualitative approach is best suited for initial investigation of a problem. Qualitative studies can produce thick descriptions of an interesting phenomenon, discover relevant variables and generate hypotheses about cause-and-effect relationships between them. Quantitative approach then can make rigorous measurements of these variables and test for the presence of the hypothesized relationships”, which can further theoretical foundations of the area and enable the researcher to prove a certain level of confidence in arriving at conclusions. In the present study the following statistical techniques were employed to analyze the data:

- Measures of Central tendency and variability that is mean, standard deviation, Skewness & Kurtosis for examining the nature of distribution of scores of the experimental and control group.

- Two way analysis of variance (ANOVA) was employed to evaluate the main and interactional effects of the independent variables of
treatment and grade on the criterion variables of performance in the three skill areas: reading, writing & spelling in English.

- **t-test** was used to find out the significance of differences between means wherever F-values were found to be significant at 0.05 or 0.01 level

- **Graphic presentation** was done through line diagrams & bar graphs wherever these helped in the meaningful interpretation of results. In addition percentages were worked out for use in the qualitative interpretation of the data.