Method & Procedure

Design Of The Study

In every scientific investigation, there is a systematic procedure which is followed. There are many devices and models of designing a research study: Experiments, Quasi-experiments, Descriptive survey, Observation etc. Each has its own importance and is useful in a different setting, suited to answer different types of questions. The present study is experimental in nature following pretest-posttest equivalent experimental and control groups design (Best & Kahn, 1986 p.127-128). This design was used to see the effect of two remedial treatments viz. multisensory instructional and multisensory playway approaches on the spellings of learning disabled children.

In accordance with the nature of the study in this design the pretests and post tests were given on (1) Spellings in Science subjects (2) Intelligence (3) Anxiety (4) Self Concept (5) Locus of Control, in order to see the effect of experimental treatments on dependent as well as independent variables. The dependent variable in this study is achievement in science and independent variables are anxiety, self-concept and locus of control. Intelligence test in this study was given to equate the experimental and control groups as well as taken as an independent variable. All the pretests were administered before the onset of experiment and post tests at the end of the treatment period.

Procedure Of The Experiment

The present study was conducted on class VI students of St.Stephen's school Chandigarh in phased manner.
Stage 1:
Identification of learning disabled children (as per the operational definition) with the help of medical history, Teacher’s Refferal Form, class-room observation, note books and spelling tests. This was further substantiated by Intelligence test.

Stage 2:
Pre-tests on spellings (Commonly miss spelt words) in science subjects; pre test on the variables of anxiety, self concept and locus of control & achievement scores of the first semester examination of the year 1996.

Stage 3:
Experimental treatment i.e. multisensory instructional & multisensory playway approaches given to teach spellings in science subjects.

Stage 4:
Post tests (spelling test in science subjects at the end of the treatment) and the achievement score in science subjects at the end of the session (i.e. 1997).

Stage 5:
Delayed post test on the variables of anxiety, self concept, locus of control and intelligence and achievement in science subjects at the level of session 1998-99, after a gap of one session (i.e. 1998).

Details Of The Procedure Followed To Conduct The Experiment:

Stage 1  Identification Of Learning Disabled Children
At the onset of the experiment, the children with learning disabilities were identified in accordance with operational definition of
After the review of literature following criteria were adopted to identify learning disabled children:

♦ Intelligence test
♦ Medical History
♦ Teacher’s Referral form
♦ Class Room observation
♦ Note books
♦ Spelling tests.

This process required a period of approximately 2.5 months (i.e. from 7th April to 30th Aug, 1996) excluding summer vacations of 50 days for all the section.

♦ Intelligence Test

Raven’s coloured Progressive Matrices (CPM) were used to screen children with low average or above average Intelligence from among the VI graders in the present study.

♦ Medical History

A complete medical history of every pupil was taken to eliminate the chances of auditory and visual defects. This process involved their thorough medical checkup by the school’s Doctor. It was ensured that the children did not suffer from any birth injury or mental imbalance.

♦ Teacher’s Referral Form

A teacher’s Referral Form (Prepared by the investigator) was given to identify the learning disabled children and the problems suffered by them in the areas of Reading, writing and problem behaviours. A list of carefully chosen 10 problems was taken in each area. In all there were 30 items in the referral form. These referral forms were given to the councillor of the School, Language teacher and science teacher. The Referral Form has been given in appendix-A.
Classroom Observation

The general classroom behaviour of the students was carefully observed for over a period of time, to identify the behavioural problems. Since the Investigator was a Science teacher, it helped to observe the students in the classroom everyday.

Exercise Books/Note Books

The science note books of sixth graders were regularly checked by the investigator and it helped to identify the words which were often misspelt by the students. This exercise enabled the investigator to prepare a list of words which was later used to assess their spellings during the treatment period. A list of words in each of the science subjects i.e. Physics, Chemistry & Biology was prepared which is given in the Appendix-B.

Spelling Tests

To test the spellings of the students, dictation from the list of words which were often misspelt was given to them. These spelling tests enabled the researcher to identify whether the spelling mistakes were the result of carelessness of the students or were repeated often due to some other problem. These tests also provided the data to identify the type of mistakes the students usually made i.e. change in meaning, addition of letters, deletion of letters etc. By using the above criteria, a total of 51 students were identified as learning disabled in all the four sections of class VI (13 from section A, 11 from section B, 13 from section C and 14 from Section D). These 51 students identified as learning disabled provided data for the study. Group-wise distribution of sample size is given vide figure 2.1.

Stage 2: Pretests

Pre test on spellings in science subjects; and on the variables of anxiety, self concept, locus of control & intelligence; and achievement scores of the first semester examination of the year 1996.
FIG. 2.1 GROUP WISE DISTRIBUTION OF SAMPLE SIZE (SI)
Achievement in Spellings

After identifying the learning disabled children, at the next step they were given a pre test to measure the achievement in spellings. The spellings in the word list were marked on the basis of the mistakes which the students often made. These mistakes usually resulted in change of meaning by additions or deletions etc. These words were put into different categories like, additions deletions, changes of letters etc. Accordingly spelling tests each containing 10 words usually misspelt were decided. These spellings in different categories were decided to be taught by either multisensory instructional and/or multisensory playway approach or by both the approaches during experimental treatment stage. There were 5 activities included in each type of approach. The list of words taught by activities under multisensory instructional & multisensory playway approach is given vide Appendix D.

Since experimental group I (section A) received both the approaches, having 10 activities, so it was given 10 spelling tests. Experimental group II (section C) received multisensory Instructional approach having 5 activities, so it got 5 spelling tests. Experimental group III (section D) received multisensory playway approach having 5 activities, so it was also given 5 spelling tests. Section B was the control group which though did not receive any approach but was tested on spellings, selecting words from the list.

Section wise details of pre test on spellings is given below in Table -2.1 & also in figure 2.2.
Diagram of Allotment of Various Activities to Experimental Groups

Activities

GROUP I

GROUP II

GROUP III

Control

x₁

x₂

x₃

x₄

x₅

x₆

x₇

x₈

x₉

x₁₀
Table 2.1
Details Of Spelling Tests

<table>
<thead>
<tr>
<th>Sections</th>
<th>Remedial approach</th>
<th>No. of spelling tests at the pre &amp; post test stage</th>
<th>No. of activities</th>
<th>Total no. of words in each spelling tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI A</td>
<td>M.S. Instructional &amp; M.S.P.W.</td>
<td>10</td>
<td>10 (5 in M.S. instruc. &amp; 5 in M.S.P.W.) x 10 words</td>
<td>100 (10 sp.test)</td>
</tr>
<tr>
<td>VI B</td>
<td>No approach</td>
<td>5</td>
<td>No activities</td>
<td>50 (5 sp.test)</td>
</tr>
<tr>
<td></td>
<td>(Control)</td>
<td></td>
<td>(Traditional method of teaching)</td>
<td>x 10 words</td>
</tr>
<tr>
<td>VI C</td>
<td>M.S. Instruction approach</td>
<td>5</td>
<td>5</td>
<td>50 (5 sp.test x 10 words)</td>
</tr>
<tr>
<td>(Exptl. gp.I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI D</td>
<td>M.S.P.W. approach</td>
<td>5</td>
<td>5</td>
<td>50 (5 sp.test x 10 words)</td>
</tr>
<tr>
<td>(Exptl. gp.II)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pretest On Independent Variables
Besides giving the spelling tests at pre experimental stage the students were also given a pretest on the independent variables namely anxiety, self-concept, locus of control & intelligence. The pretest continued from 1st - 22nd Sept' 1996.

Stage 3: Experimental Treatment
At the first step identification of experimental treatments was done with the help of review of literature which suggests various techniques and approaches used to remediate disabilities in the field of listening, thinking, talking, reading, writing, spelling or arithmetic. A list of such approaches is given below:-

- Skill or task training approach
- Process training or basic process approach
- Deficit behaviour or behaviour modification or task approach
- Multisensory approach.
- Cognitive method or cognitive training.
- Elective approaches and clinical teaching.
In the present investigation, multisensory approach was selected as the experimental treatment to be given to the learning disabled students to remediate their spellings in the science subjects (i.e., Physics, Chemistry, and Biology). The approaches classified as multisensory generally emphasize working with academic materials directly. Furthermore, this approach helps in enhancing learning experiences. This approach has been successfully used to teach reading to students who had been considered non-readers, even after they had been in school for a number of years (Cawley, 1968; Kirk, 1933; Linn & Ryan, 1968; McCarthy & Oliver, 1965). Besides reading, there is an evidence in the literature that the Gillingham’s Multisensory approach helps to teach writing and spelling by teaching units of sound or letters of the alphabets (Gillingham and Stillman, 1968).

According to Cruickshank (1976) these approaches help in accomplishing more effective eye-hand coordination and enhance the ability to differentiate figure from background. Furthermore, an organised multisensory approach results in better understanding and successful teaching to the children, which enables them to achieve both academically and socially.

While multisensory instructional approach involves giving some instructions related to the spelling activities, playway approaches makes use of some activities in which child can play as well as learn. Another reason for taking up multisensory playway approaches to remediate spellings of the learning disabled children is that they are based on the principle of ‘learning by doing’ and hence prove useful for the children, at the same time help in attaining educational objectives.

After the identification of experimental treatments different experimental group were assigned different treatments. There were four section in class VI and out of the four sections, experimental and control groups were selected randomly and thereafter the experimental
treatments were also assigned randomly to the experimental groups. As a result, section A (experimental group I) got both multisensory instructional and multisensory playway approaches to see whether a combination of two approaches is more effective. Section C (experimental group II) got only multisensory instructional approach, section D (experimental group III) got multisensory playway approach and the fourth group was treated as the control group and it was not given any treatment.

The multisensory Instructional approach included 5 activities namely:
- Word building
- Arrangement of jumble words
- Adding missing letters in the words
- Crosswords
- Identification of correct spellings.

The multisensory playway approach also included five activities namely:
- Free hand drawing
- Figure matching
- Picture discrimination
- Letter cancellation
- Finger painting

The lay out of the experimental design is presented vide table 2.2.
Table 2.2  
Layout Of The Experimental Design

<table>
<thead>
<tr>
<th>Experimental group I</th>
<th>Control Group</th>
<th>Experimental Gp.II</th>
<th>Experimental gp.III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two treatment groups</td>
<td>no treatment</td>
<td>single treatment group</td>
<td>single treatment group</td>
</tr>
<tr>
<td>(Section A, N=13)</td>
<td>(Section B, N=11)</td>
<td>(Section C, N=13)</td>
<td>(Section D, N=14)</td>
</tr>
</tbody>
</table>

| m.s.i. approach (x1 to x5) | m.s.p.w. approach (x6 to x10) | m.s.i. approach (x1 to x5) | m.s.p.w. approach (x6 to x10) |

**NOTE**: X1 to X10 activities are detailed below:

- x1 - Word building
- x2 - Arrangement of jumble words
- x3 - Adding missing letters in the words
- x4 - Cross words
- x5 - Identification of correct spellings
- x6 - Free hand drawing
- x7 - Figure matching
- x8 - Picture discrimination
- x9 - Letter cancellation
- x10 - Finger painting

At the next step the experiment was conducted. The experimental treatment started from 23rd Oct. and continued till 30th Dec. '96. (Section A received two treatments i.e. multisensory instructional and multisensory playway approaches of teaching. Which completed in ten sessions. Section C received multisensory instructional approach and section D got multisensory playway approach which was completed in five sessions each. The detailed schedule of the experimental treatment given in various groups is presented vide table 2.3
### TABLE 2.3
Detailed Schedule Of The Experimental Treatment

<table>
<thead>
<tr>
<th>Stage</th>
<th>treatment</th>
<th>section A (Exp. gp. I)</th>
<th>section B (Control gp. I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identification of LD</td>
<td>7th Apr.-30 Aug.96</td>
<td>7th April-30 Aug 96</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Pretest</td>
<td>1st Sept-22nd Sept 96</td>
<td>1st Sept-22nd Sept 96</td>
</tr>
<tr>
<td>3.</td>
<td>Treatment</td>
<td>23rd Oct.-30th Dec 96</td>
<td>No Treatment</td>
</tr>
<tr>
<td>4.</td>
<td>Post Test</td>
<td>1st Jan.-15th Jan 97</td>
<td>1st Jan.-15th Jan 97</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>treatment</th>
<th>Section C (Exp. gp II)</th>
<th>Section D (Exp. gp III)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identification of LD</td>
<td>7th Apr.-30 Aug 96</td>
<td>7th Apr.-30 Aug 95</td>
</tr>
<tr>
<td></td>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Pretest</td>
<td>1st Sept-22nd Sept 96</td>
<td>1st Sept-22nd Sept 96</td>
</tr>
<tr>
<td>3.</td>
<td>Treatment</td>
<td>23rd Oct.-30th Dec 96</td>
<td>23rd Oct.-30th Dec 96</td>
</tr>
<tr>
<td>4.</td>
<td>Post Test</td>
<td>1st Jan.-15th Jan 97</td>
<td>1st Jan.-15th Jan 97</td>
</tr>
</tbody>
</table>

The investigator being a science teacher in the same school was already teaching to all these groups in class VI. The academic session starts in the first week of April, so, the investigator got several months to build rapport with the students. For ensuring the maximum possible attendance and involvement of the students, they were told not to be absent because otherwise they will miss some new and interesting activities. This enabled the investigator to arrest the sample death.

Everytime, during the session, the attendance was taken first and then the students were given instructions about a particular activity. It was ensured that the students possessed necessary materials like pen, pencil, and paper to do the activities. Students were asked to work individually, however, they were told that they could talk to each other when they were given a break. The students could ask for an extra sheet if they required. After the task they had been performed, the next step was to do the...
overall analysis of the task. Finally, the evaluation of the activity was done by scoring the spelling tests etc. The procedure followed for the treatment has been detailed vide Appendix C.

Stage 4: Posttests

Spelling test in science subjects at the end of the treatment and the achievement scores in science subjects at the end of the session, i.e. 1997-98.

Spelling Tests: After the treatments were given to all the four sections, the spellings in science subjects which were taught with the help of various activities in different approaches were tested again. The spelling tests were given to the students in all the experimental and control groups. The post tests were given to see whether or not these activities were beneficial in remediating the spelling problems of the learning disabled children.

Achievement Scores: The achievement scores in science subjects at the end of the session 1997-98 were also taken at this stage. This was done to see whether there was an overall improvement in achievement in the subject of science as a result of experimental treatment. The posttest stage continued for about 15 days i.e. from 1st Jan-15th Jan’97.

Stage 5: Delayed Posttests

Delayed posttest on the variables of anxiety, self concept, locus of control, intelligence and achievement in science subjects score after a gap of one session (i.e. in 1998).
Delayed posttest on the variables of anxiety, self concept, locus of control and Intelligence were administered after a gap of one academic session as a delayed post test. The delayed post tests on these variables were given to see whether the experimental treatments (i.e. multisensory instructional & multisensory playway approaches) contributed positively towards the improvement of these variables and whether there were long term effects.

**Delayed Achievement Scores**

Examination result of the science subjects in the session 1998-99 was taken as a delayed posttest to see the efficiency of the treatments given to the experimental groups with respect to retention and use of multisensory approaches in learning of spellings.

**Field Of Investigation**

The present study was conducted on class VI students of St.Stephen’s School, Chandigarh which is an English medium school. The class VI in this school had four sections A, B, C & D and all the four sections were included in the study.

**Sample Of The Study**

The total sample of the study comprised 51 learning disabled students selected from four sections of class VI. The sections of a particular class in this school are formed on the basis of enrollment and not on the basis of merit or other criteria. There were a total number of 230 students in all the 4 sections. The break up of the sample of learning disabled students is detailed vide Figure 2.1.

**Distribution & Allocation Of Subjects To Experimental & Control Groups**

In this study a total of 51 learning disabled students were identified in all the four sections of class VI, out of a total of 230 students. In each section there were about 10-15 learning disabled students. In accordance with the nature of the experiment, there were two types of remedial
approaches which were given to the students viz. multisensory instructional and multisensory playway approach. The investigator required three experimental and one control group for the study. Out of the three experimental groups, one group was given multisensory instructional approach, another was given multisensory playway approach, third group was given a combination of the two approaches i.e. multisensory instructional and multisensory playway approaches and the fourth group was the control group.

In order to avoid the administrative difficulties, instead of allocating the subjects randomly to each of the treatments selecting from the class, the experimental treatments were randomly assigned to the groups with the help of lots. As such the entire group was exposed to the treatment given to them. This helped to reduced the element of bias.

As a result of randomization of treatment, section A got both multisensory instructional and multisensory playway treatment, section B was the control group and got no treatment, section C got multisensory instructional treatment and section D got multisensory playway treatment.

**Experimental Controls**

In an experimental study, it is necessary to exercise controls to reduce the effect of errors. According to Lindquist (1953), the observed differences among the treatment means in any experiment are due only partly to actual differences in the effectiveness of the treatment. They are partly due to either errors of various kinds i.e. due to the effects of extraneous variables or factors. Thus three types of errors may be classified as errors due to subjects, treatment group and replication viz. type 'S' error, type 'G' error and type 'R' error (Lindquist, 1953).

Type S errors are those which characterize simple random sampling. These errors are caused simply due to random assigning of the subjects into the experimental (treatment) group and control group. Type 'S' error was minimized by allocating the entire group of learning disabled
students in one section to experimental treatment with the help of random method by the draw of lots.

Type 'G' errors may be defined as those due to operation of extraneous factors which tend to have same effect on all members of any given treatment but different effects on different treatment groups in any single replication. Type 'G' errors are usually associated with the administration of the experiment which may be due to the teachers or different treatments given to the different groups in the experiment.

In the present study type 'G' errors were reduced to the minimum by the fact that each experimental group got the experimental treatment by the same teacher for the same period of time in each classroom. Thus it minimized the effect of individual differences associated with the administration of experiments.

Another kind of type 'G' error which is caused by 'natural leaders' in the group who exert a beneficial influence on the members of his group - a problem of group dynamics. This was controlled by the fact that the entire group was exposed to the experimental treatment and secondly the smarter ones were given extra work to help the teacher and in teacher's activities.

Type 'R' errors result from difference in treatments (A being better than B) having varying effect from school to school, curriculum administrative organisation of the school, school plant, equipment or due to any other condition genuinely characteristic of the individual replications or sub populations.

This type of error was minimized by taking only one class i.e. class VI and only from one school, similar class room setting, one subject (Science) and one subject teacher. It reduced varying effect of difference in school curriculum, administrative organisations, school plant and equipment. Variation in treatment effects from replication to replication.
which is characteristic of individual replications was thus controlled as explained above.

In addition to controlling the 'G' 'S' and 'R' errors (vide Lindquist, 1953, p.8-10), the other necessary controls useful from the point of view of the experiment were also exercised. This was done because inspite of the precautions taken, factors other than those involved in study, may also affect the experiment, which may cause variation in results in a particular direction. In order to control all these factors following controls were exercised:

♦ The test used at the pre and post testing stage to measure achievement in spelling were same and were prepared by the investigator herself in accordance with the objectives of and nature of the study experimental treatment.

♦ The time duration for each treatment was the same i.e. thirty minutes per day,

♦ The treatment given to the students followed the similar procedure.

♦ The variable of intelligence was used as a control to equate the experimental and control groups of not only learning disabled population but the entire class as a whole, in all the four sections to eliminate the effect of intelligence if any. The details of this analysis are given vide Table - 2.4 to 2.7

♦ The artificiality in the experiment was minimized by performing the experiment on the intact class VI and without the subject's awareness of participation in the experiment.

**Intelligence : A Control Variable To Equate The Groups**

Intelligence was taken as one of the variables to equate the groups in this study. For this, the scores on Intelligence were taken before the commencement of the experiment i.e. pre test scores. The purpose of carrying out this analysis was to find out whether any differences on Intelligence existed at pretest stage or not. To measure intelligence,
Raven's coloured Progressive Matrices were used which were administered to all the four sections of class VI.

The null hypothesis was that no differences exist on intelligence scores in any of the four groups taken for the study.

The results of this analysis are reported vide table 2.4 to 2.7.

### Table 2.4

**Intergroup Comparison Of Intelligence Scores Taking The Intact Class**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Comparisons between groups</th>
<th>t cal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exptl. gp.I (Section A)</td>
<td>57</td>
<td>24.7</td>
<td>9.1</td>
<td>A - B</td>
<td>1.88</td>
<td>N.S.</td>
</tr>
<tr>
<td>Control gp. (Section B)</td>
<td>59</td>
<td>27.6</td>
<td>7.4</td>
<td>A - C</td>
<td>1.27</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp.II (Section C)</td>
<td>58</td>
<td>26.7</td>
<td>7.5</td>
<td>A - D</td>
<td>0.95</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp.III (Section D)</td>
<td>56</td>
<td>26.1</td>
<td>6.3</td>
<td>B - C</td>
<td>0.68</td>
<td>*</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>26.3</td>
<td>7.4</td>
<td>C - D</td>
<td>1.71</td>
<td>*</td>
</tr>
</tbody>
</table>

### Table 2.5

**Comparison of Individual Groups With The Entire Class (N=230)**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Comparisons between groups</th>
<th>t cal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exptl. gp.I (Section A)</td>
<td>57</td>
<td>24.7</td>
<td>9.1</td>
<td>Exptl. gp.I vs entire class</td>
<td>1.68</td>
<td>N.S.</td>
</tr>
<tr>
<td>Control gp. (Section B)</td>
<td>59</td>
<td>27.6</td>
<td>7.4</td>
<td>Control gp. vs entire class</td>
<td>1.27</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp.II (Section C)</td>
<td>58</td>
<td>26.7</td>
<td>7.5</td>
<td>Exptl. gp.II vs entire class</td>
<td>0.95</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp.III (Section D)</td>
<td>56</td>
<td>26.1</td>
<td>6.3</td>
<td>Exptl. gp.III vs entire class</td>
<td>0.68</td>
<td>*</td>
</tr>
<tr>
<td>Total</td>
<td>230</td>
<td>26.3</td>
<td>7.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2.6

**Inter-group Comparison Of Intelligence Scores Of Learning Disabled Students**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Comparisons</th>
<th>df</th>
<th>t cal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exptl. gp. I (Section A)</td>
<td>13</td>
<td>25.1</td>
<td>8.4</td>
<td>A ~ B</td>
<td>22</td>
<td>0.26</td>
<td>N.S.</td>
</tr>
<tr>
<td>Control gp. (Section B)</td>
<td>11</td>
<td>26.0</td>
<td>8.2</td>
<td>A ~ C</td>
<td>24</td>
<td>0.57</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp. II (Section C)</td>
<td>13</td>
<td>27.4</td>
<td>4.4</td>
<td>A ~ D</td>
<td>25</td>
<td>0.71</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp. III (Section D)</td>
<td>14</td>
<td>23.4</td>
<td>5.7</td>
<td>B ~ C</td>
<td>22</td>
<td>0.51</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>51</td>
<td>25.3</td>
<td>7.1</td>
<td>C ~ D</td>
<td>25</td>
<td>1.72</td>
<td>*</td>
</tr>
</tbody>
</table>

### Table 2.7

**Comparison Of Learning Disabled Students In Each Group With Total Number Of Learning Disabled Children (N=51) On Scores Of Intelligence.**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Comparisons</th>
<th>df</th>
<th>t cal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exptl. gp. I (Section A)</td>
<td>13</td>
<td>25.1</td>
<td>8.4</td>
<td>LD students in exptl. gp. I vs total LD's</td>
<td>62</td>
<td>0.09</td>
<td>N.S.</td>
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<tr>
<td>Control gp. (Section B)</td>
<td>11</td>
<td>26.0</td>
<td>8.2</td>
<td>LD students in exptl. gp. I vs total LD's</td>
<td>60</td>
<td>0.20</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp. II (Section C)</td>
<td>13</td>
<td>27.4</td>
<td>4.4</td>
<td>LD students in exptl. gp. II vs total LD's</td>
<td>62</td>
<td>1.03</td>
<td>*</td>
</tr>
<tr>
<td>Exptl. gp. III (Section D)</td>
<td>14</td>
<td>23.4</td>
<td>5.7</td>
<td>LD students in exptl. gp. III vs total LD's</td>
<td>63</td>
<td>1.04</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>51</td>
<td>25.3</td>
<td>7.1</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Discussion Based On Table 2.4

On observation of the table, it is revealed that none of the groups showed significant differences on t-test when compared with each other. Thus it can be concluded that all the four groups were at par on Intelligence.

The range of scores varied from 24.7 to 27.6 which indicates that they fall in average group (level III) as per the manual of CPM.

These results strengthen the approach followed by the school to form the sections on the basis of enrollment, and not on the basis of merit. This further supported the assumption of the investigator that all the groups were equal on intelligence and that they could be randomly placed in the experimental and control groups.

Discussion Based On Table 2.5

On the comparison of individual groups with the entire class on scores of Intelligence, it was observed that the t-ratios were not found significant in any of the groups. These results further support the fact that all the groups are at par on Intelligence before the onset of the experiment.

Discussion Based On Table 2.6

After having identified the students as learning disabled in each section/group, all the various groups of learning disabled children were then inter compared. On the observation of the table, it is revealed that none of the groups of learning disabled students showed significant differences on t-test when compared with each other. Thus it can be concluded that all the groups of learning disabled in each of the groups were at par on intelligence at pre experimental stage. The range of scores from 23.4 to 27.4 indicates their average intelligence (level III) as per norms of CPM.

This facilitated the investigator to allot the remedial treatment randomly to various groups.
Discussion Based On Table 2.7

Comparison of learning disabled students in each group with the total number of learning disabled students on scores of intelligence was made to know whether any differences existed on intelligence among them.

It is revealed from the table given above that none of the groups of learning disabled students show significant differences on intelligence when compared with total number of learning disabled students.

Thus it may be concluded that all the groups of learning disabled students initially were at par on intelligence i.e. at the pre experimental stage.

Overall Conclusions

Overall Group Wise Comparisons Of Students Taking Intact Classes.

♦ At the onset of the experiment, all the four groups were at par on intelligence when the intact classes were compared with each other.

Comparison Of Individual Groups With Entire Class.

♦ When the individual groups were compared with the entire class, no significant differences on intelligence were found.

Group Wise Comparison Of Students Taking Only Learning Disabled Students

♦ None of the groups of learning disabled students showed significant differences on intelligence.

Comparison Of Individual Groups Of Learning Disabled Students With Total Number Of Learning Disabled Students.

♦ When the individual groups of learning disabled students were compared with total number of learning disabled students, no significant differences on intelligence were found.

Thus the null hypothesis of no significant differences on intelligence scores was retained. This enabled the investigator to equate
the various groups on intelligence. Hence intelligence was used as a control variable in the present study.

**Tools Employed To Collect Data For The Study**

The study was completed with the help of a number of tests for measuring all the variables included in the study. These measures are described below:

**Coloured Progressive Matrices (J.C.Raven, J.H. Court & J.Raven, 1995) As a Measure Of Intelligence**

The Coloured Progressive Matrices are designed for use with young children and old people for anthropological studies, and for clinical work. It can be used satisfactorily with people who for any reason, cannot understand or speak the English language, with people suffering from physical disabilities, aphasias, cerebral palsy or deafness, as well as people who are intellectually subnormal or who have deteriorated. The CPM is well known for assessing the degree to which people can think clearly, or the level to which their intellectual functions have deteriorated. It has a reliability varying with age from .50 to .80. It correlates .50 with both the crichton vocabulary scale and Terman Merrill scale. Over the entire range of operational utility, the test retest reliability of the CPM was in the neighbourhood of .90.

The split half reliability of CPM worked out to be was .90 and Test retest reliability by Shanghai, Rao and Reddy was reported to be .86.

Using the WISC-R Performance scale with 84 hearing impaired children, James found a very high relationship with the CPM ($r = .87$).

The above mentioned test was used to equate the experimental and control groups as well as a measure to identify learning disabled children.

**Spelling Tests**

These tests were used to assess the learning difficulties in spellings. A number of spelling tests were given as Pre-test and post
tests from the commonly identified misspelt words. These tests were also helpful in identification of the children as learning disabled.

The tests were constructed by the investigator to assess the spelling difficulties in the subjects of science only. These tests were designed to be used in a particular situation where the focus was on spellings only in science subjects. These tests are in the form of dictation of words related to science.

Personality Word List By Deo (1971) As A Measure Of Self-concept

For the present study Deo’s PWL (1971) was used to obtain the self concept score of learning disabled students and to know its relationship with their achievement. The test measures the ideal self, social self and the perceived self. But for the present study it measure how the students perceive themselves.

Originally the test consisted of 210 adjectives in all. It was first prepared in 1963 and revised in 1971. The present list has 90 words in the form of adjectives. The test has both English and Hindi version but in the present study only English version has been used. The test is a 5 point scale ranging from “very much like this” & ending at “not at all like this” The respondents are asked to tick mark against the column out of the 5 columns.

The list contains both kinds of words. Words which have positive meaning and words which can note negative measuring. Both positive and negative scores are taken separately and their differences give the total self concept.

The test retest reliability of PWL was established and the reliability coefficient obtained for these were in the range of .62 to .86.

The convergent validity ranged from .40 to .65. The overall validity coeff. of PWL was found to be in the range of .12 to .80.
State Trait Anxiety Test (STAT by Psy. Com Services 1991, rev. ed.) As A Measure Of Anxiety

The STAT was developed as a means of getting clinical anxiety information in rapid, objective, and standard manner. It is a brief and non-stressful test, applicable to all but the lowest educational settings. The scale gives an accurate appraisal of anxiety level, supplementing clinical diagnosis, and facilitating all kinds of research screening operations where very little diagnostic or assessment time can be spent with each examinee.

The test is easily administered individually or to large groups at one time. It can even be used as self-administering test. The split half reliability of "State" (page 1) is .91 and that of "Trait" (page ?) is .92. The Test retest reliability of "State" (page 1) is .80 and that of "Trait" (page 2) is .82.

The STAT has an average correlation of .70 with some well known measures of anxiety. The Coeff. of Correlation with Sinha's Comprehensive Anxiety Test (SCAT) was found to be .76, where as with Taylor's Manifest Anxiety scale was .70.

In the present study, this test was used to measure anxiety level of learning disabled children and to find out, how it affects their academic achievement.

Internal-External Scale For Adolescents by (Km. Roma Pal, 1978) As A Measure Of Locus of Control

Locus of Control scale is related to the measurement of the extent to which an individual is self motivated, directed or controlled (internal frame of reference) and the extent to which the environment (luck or chance) influences his behaviour (external frame of reference). Locus of Control is helpful in understanding a child's view of placement of responsibility for events in his life and in evaluating the maturity of his conception of success and failure. Simply stated locus of control has to do
with the placement of responsibility for the outcome of events or behaviours. The outcome of events are sometimes pleasant or unpleasant, encouraging or discouraging, gratifying or distressing and can generally be referred to as reinforcers and different people perceive them differently which is characterized as either internal or external control. In the present study, locus of control scale was used to assess how it affects the academic achievement of learning disabled students.

The reliability coeff. was found to be .78 for undergraduate, .82 for the post graduate and for entire sample .80. The validity coeff. was found to be .77 for English version of present Rotler's I-E scale. For Hindi version, validity coeff. was found to be .76.

**Academic Achievements**

The achievement of the students was measured by the result of their average marks of science subjects (Physics, chemistry & Biology). For this purpose average science marks of both the semesters were considered.

**Teacher's Referral Form**

There are three main areas in which learning disabled children face problems viz. reading, writing and behaviour. An assessment of these helps to identify learning disabled children. For this purpose Teacher's Referral form was used which helps to identify the learning disabled children and their reading, writing and behavioural problems. This was used to know teacher's ratings about learning disabled pupils. There were a total of 30 items carefully chosen in the Teacher's Referral form, 10 each in areas of reading, writing and behaviour. This was constructed by the investigator in consultation with her guide.

**Multisensory & Playway Approaches**

These approaches were used as remedial treatments. They are based on Gillingham & Stillman's V-A-K-T techniques as they help to involve many senses like visual, auditory, kinesthetic & tactual. Each of
these approaches included 5 activities which were used to remediate spellings of learning disabled children.

Following activities were included in multisensory instructional approach:
❖ Word building
❖ Arrangement of jumble words
❖ Adding missing letters in the words
❖ Crosswords
❖ Identification of correct spellings.

The multisensory playway activities included are as follows:
❖ Free hand drawing
❖ Figure Matching
❖ Picture discrimination
❖ Letter cancellation
❖ Finger painting.

The spellings which were taught through these activities were selected from the list of commonly identified misspelt words.

Scoring Of The Data:

After conducting the pretest and posttest of spellings, using Multisensory Instructional and Playway approaches as remedial measures, the spelling tests were scored out of 10. Each right spelling was given one mark and other tests such as test for measuring Intelligence, selfconcept, locus of control and anxiety were also scored following the directions given in the manual of the respective tests.

The ratings of teachers in the areas of reading, writing and behaviour were used in identifying learning disabled children through a teacher’s referral form. In addition to this student’s note books, medical examination classroom observation, Intelligence tests, spelling tests also served as a basis to identify learning disabled children.
The spellings were tested using a multisensory instructional and multisensory playway approach based on Gillingham’s V-A-K-T technique which were the major tests in the present study.

Statistical Techniques Employed To Analyse The Data

In the present study different statistical techniques were employed to analyse the data keeping in view the objectives and the hypotheses.

Analysis Of Variance & Covariance

In order to study the effect of multisensory instructional and playway approaches in the pretest and posttest experimental & control group design, the analysis of variance and covariance were employed. As such the pretest scores were used as a covariate to eliminate the effect of initial scores abruptly on the final scores of spellings by adjusting the initial differences on the tests.

T-test

T-test was employed to find out the significance of difference between means of different groups and different variables.

Product-Moment Coefficient Of Correlations

Coefficient of correlations were employed to see the extent of relationship between the variables of anxiety, self concept, locus of control and Intelligence with the achievement of learning disabled children.

Multiple Linear Regression

Multiple linear regression analysis was carried out to regress the achievements of learning disabled students on the variables of anxiety, self-concept, and locus of control for various groups as well as for the entire sample both at pre & post test stages.