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CHAPTER III
METHODOLOGY

3.1. INTRODUCTION

The chapter II provides review of related literature. Their some previous reviews are quoted and discussed. The chapter III related to the research method that was used in present study.

The success of any research study depends on the selection and application of appropriate research methods. Research method is of utmost importance for the research process. It describes the various steps and plans to be adopted in solving a research problem, such as the choice of subject for investigation, the validation of data gathering tool, the collection and analysis of data and interpretation of results and the process of inferences and discussion of results. The success of any research study depends on the selection of a research method and the specific design within that method which holds appropriate in investigating research problem.

The present study is an experimental study which aims to study the effect of memory Training Package on 9th Standard Students. On the other hand the methodology of present study consists of design of the study, sampling, validation of achievement tool, development and validation of Memory Training Package, tools and techniques, procedure of data collection i.e., that clears the path of the study.

3.2. STATEMENT OF THE PROBLEM

A Study on the Effectiveness of a Specially Designed Memory Training Package (MTP) on Enhancement of Memory of Secondary School Students”
3.3. OBJECTIVES OF THE STUDY

The main aims of the study are to Develop and Validate the Memory Training Package ensuring the effectiveness of Memory Training Package on the enhancement of Memory of Secondary School Students. The specific objectives are as follows...

1. To Study the Effectiveness of Memory Training Package for the enhancement of memory of Secondary School Students.
2. To study the difference in the level of the enhancement of memory of boys and girls of secondary school students taught by Memory Training Package.
3. To study the extent of retention of Secondary School Students taught by the Memory Training Package.
4. To study the difference in the level of retention of boys and girls of Secondary School students taught by Memory Training Package.
5. To Study the relationship between Memory and Intelligence of secondary school students.

3.4. VARIABLES

Independent Variable - 1. Memory Training Programme.
2. Conventional Method

Dependent Variable - Enhancement of memory.

Secondary Independent Variable - Intelligence

Moderate Variables - Gender
3.5. HYPOTHESES

To study the objective 1, the hypotheses 1 and 2 were framed, for objective 2 the hypotheses 3, 4, 5, 6, 7, 8, 9, 10 were framed, for the objective 3 the hypothesis 11 was framed, for the objective 4 the hypotheses 12, 13, 14, 15 were framed for the objective 5 the hypothesis 16 was framed. In these hypotheses the hypothesis 2nd was a directional hypothesis and others were null hypotheses.

Objective 1: To Study the Effectiveness of Memory Training Package for the enhancement of memory among Secondary School Students.

1. There exists no significant difference between the mean gain scores on enhancement of memory of experimental and control group before teaching of Memory Training Package (MTP).
2. There exists significant difference between the mean gain scores on enhancement of memory of experimental and control group after teaching of Memory Training Package (MTP).

Objective 2: To study the difference in the level of the enhancement of memory of boys and girls of secondary school students taught by Memory Training Package.

3. There exists no significant difference between the mean gain scores on the enhancement of memory of boys and girls of experimental group before teaching of Memory Training Package (MTP).
4. There exists no significant difference between the mean gain scores on the enhancement of memory of boys and girls of experimental group in their immediate post test after teaching Memory Training Package (MTP).
5. There exists no significant difference between the mean gain scores on the enhancement of memory of boys and girls of control group before teaching of Memory Training Package (MTP).
6. There exists no significant difference between the mean gain scores on the enhancement of memory of boys and girls of control group in their immediate post test after teaching of Memory Training Package (MTP).

7. There exists no significant difference between the mean gain scores on the enhancement of memory of boys of experimental and control group before teaching of Memory Training Package (MTP).

8. There exists no significant difference between the mean gain scores on the enhancement of memory of boys of experimental and control group in their immediate post test after teaching of Memory Training Package (MTP).

9. There exists no significant difference between the mean gain scores on the enhancement of memory of girls of experimental and control group before teaching of Memory Training Package (MTP).

10. There exists no significant difference between the mean gain scores on the enhancement of memory of girls of experimental and control group in their immediate post-test after teaching of Memory Training Package (MTP).

**Objective 3:** To study the retention of Secondary School Students taught by Memory Training Package.

11. There exists no significant difference between the mean gain scores of experimental group in immediate post test and delayed post test after teaching of Memory Training Package (MTP).

**Objective 4:** To study the difference in the level of retention of boys and girls of secondary school students taught by Memory Training Package.

12. There exists no significant difference between the mean gain scores of boys and girls of experimental group in their immediate post-test.
13. There exists no significant difference between the mean gain scores of boys and girls of experimental group in their delayed post-test.

14. There exists no significant difference between the mean gain scores of boys in their immediate post test and delayed post-test.

15. There exists no significant difference between the mean gain scores of girls in their immediate post test and delayed post-test.

**Objective 5:** To Study the relationship between Memory and Intelligence of secondary school students.

16. There exists no significant relationship between memory and intelligence of secondary school students.

### 3.6. DESIGN OF THE STUDY

The present study is a pre-test, post-test parallel group design. In this design the effects of the teaching Memory Training Package was judged by analyzing the difference between the before teaching of MTP (pre-test) and after teaching of MTP (post-test). This was compared with the control group.

The main steps included in the experimentation are as follows:

i) Experimental and control group were pre tested on achievement test which helps to assess the enhancement of memory;

ii) Experimental group was taught by the Memory Training Package and the control group was taught by the conventional method;

iii) Both the groups were immediately post tested on their achievement;

iv) The Experimental group was again tested after the gap of one month on achievement test to test whether they retain the improvements.
The procedure followed in the conduction of the experiment is represented in the Table 1

**Table 1: Experimental Design for the Study**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Stages</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-test</td>
<td>The Achievement Test was administered to find out whether they equal before teaching Memory Training Package.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Treatments</td>
<td>Memory Training Package was used for the period of five months.</td>
<td>Conventional Method of Teaching was used for teaching.</td>
</tr>
<tr>
<td>3</td>
<td>Post-test</td>
<td>The Achievement test was administered to see the difference in the memory enhancement of students in the both the group after teaching Memory Training Package and Conventional Method.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Delayed Post-test</td>
<td>To test the longer retention Of the group the Achievement test was administered again after one month.</td>
<td></td>
</tr>
</tbody>
</table>

3.7. **SAMPLING**

At the outset the sample of 100 students was selected, among them the 50 students were from the Government High School, Durgigudi and 50 from Government High School, B.H. Road. They were tested by ‘Meaningful Connected Words Recall Test’. This test contained 20 words, students having similar average range of marks in consequent memory test were divided equally
and randomly to both experimental and control groups consisting of 60 sample. The Random Sampling Technique was used for the study.

The present investigation comprises following sampling Phases:

**Phase-1:** To give ‘Meaningful Connected Words Recall Test’ on 100 9th Standard students. (As Prescribed in Manual of Experiments in Psychology). The term described in 3.9.)

**Phase-2:** Categorizing 60 average Memory Level Students out of 100 samples. The selection procedure of sampling is shown in the Table 2.

**Table 2: The Details of the Sample Used in Present Study.**

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Names of The schools</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Government High School, Durgigudi, Shimoga (Experimental Group)</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Government High School, B.H. Road, Shimoga (Control Group)</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>

**Procedure in Framing the Equivalent Groups:**

60 students of 9th standard students was selected from two government high school of Shimoga city and sample was divided into two groups namely experimental (Government High School, Durgigudi) and control group (Government High School, B.H Road). The experimental group consisted of 30 sample of 15 male and 15 female students who were taught using “Memory Training Package” by investigator and the control group comprising 30 of 15 male and 15 female students were taught by the conventional method of teaching.
by subject teacher. Two equivalent groups was formed (two groups were matched) using t-test. For the present study independent variable memory forms an important variable in the context of the study and hence is treated as the main independent variable for matching. To find out whether two groups were equivalent or not. The ‘t’ test was used to find out the significant difference between the two groups. Mean, SD and t test was calculated for the scores obtained on ‘Meaningful Connected Words Recall Test’. The obtained mean, SD, and t-value represented in Table 3.

Table 3: Mean, SD and t-test of Experimental and Control Group in the ‘Meaningful Connected Words Recall Test’

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>Level of Significance at 0.05 level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>30</td>
<td>12.83</td>
<td>1.74</td>
<td>1.68</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Control</td>
<td>30</td>
<td>12.56</td>
<td>1.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table reveals that obtained t-value was 1.68 which found insignificant at 0.05 level of significance. The mean of the both the groups was 12.83 and 12.56 than SD was 1.74 and 1.67 respectively. Hence the mean were almost same. Consequently it was assured that both the groups were equivalent to each other before beginning of the experiment.

3.8. CONSTRUCTION OF ACHIEVEMENT TEST

In the present study, valid, reliable and comprehensive achievement test was constructed to measure the enhancement of Memory of the students. For that the objective type questions was framed from the lessons of ‘Delhi Sultans’ and
'Mahmud Ghazni and Mohammad Ghori', from the Social Science, 'The Little Martyr', and 'The Black Tuesday' from English of 9th standard state syllabus. The preliminary achievement test contained 79 items. With the views of experts and subject teachers, some were deleted and some were modified. Finally 60 items were retained for pilot study. While constructing the tests the following aspects were considered.

1. The test should adequately cover all the contents selected.
2. The test should be objective type.
3. Language of the items and instruction to respond to the items should be clear and appropriate to the level of students.
4. Items should be specific and unambiguous.

PILOT STUDY

To test the validity and reliability of the achievement test, the preliminary form of the achievement test consisting of about 79 items was administered personally by the investigator to a group of 36 students of 10th standard on 9th standard achievement test who were not included in the sample of the study. The 10th standard students were chosen for the pilot study because when investigator started the pilot study the students of 9th standard were new to the subjects because of the new academic year. Hence, 10th standard students were considered for the pilot study because they had just completed 9th standard. As the students had no difficulty in following instructions given in the test paper for each type of questions, oral instructions was not necessary. However, the students were given clarifications wherever they expressed doubts and such points were noted, to modify the instructions and test items for the final form of the test. The test was administered in one session for 1 hour. The complete process of Development and Standardization of Tool described below in detail.
Development and Standardisation of Test

The main aim of the study is to construct and standardize the tool for pre-test and post-test to measure the achievement of 9th standard students in the lessons included in the experiment. The same tool was used for pre and post-test. The steps followed for its construction and standardization are as follows:

1. Planning
2. Preparation of the items
3. Item tryout
4. Item Analysis
5. Establishing validity and reliability

1. Planning

During planning, items were collected from the lessons included in experiment and the 79 objective type items were framed by preparing blue print. Equal importance has been given to all the segments of lessons and objectives and types of item. Appropriate directions and instructions were framed to answer the items.

2. Preparation of the Items

Draft items were scrutinized by the investigator in consideration with a few subject experts, teacher educators, and experienced teachers at the primary level and guiding to check that curricular validity is ensured, all the basic competencies are being tested to select good and appropriate items for developing achievement test. They were modified according to the suggestions and comments. During the Preparation of items care was taken to include all the segments of lessons. In the beginning 79 items were constructed. The Types of the items are:
1. Match the Following
2. Fill in the Blanks
3. Answer in one Sentence each
4. Multiple Choice Items
5. Complete the Word
6. True or False

Proper instructions were also prepared for the students to respond to all the items of the test then these items were given to 8 experts from the field of education and 9 secondary school subject teachers. They were asked to correct ambiguous wordings, sentences and appropriateness of content and strengthen the weak alternatives. During the incorporation of comments and suggestions of experts, some of the items were deleted and some of the items were modified. Only 60 items were made ready for tryout.

Scoring

A scoring key was prepared with correct responses for each item. One mark was assigned for each correct response and zero for each wrong response and omissions.

3. Item Try Out

A try out was made for a pilot study of the tool. The try out helps to refine the items as clearly as possible. Not only for refining the items but also for the following:

1. To identify the weak items and the needed improvements.
2. To refine the instruction and procedures.
3. To know how to organize the items
4. To streamline the format of the tool.
The test consisting 60 items was tried out on 36 students (18 boys and 18 girls) of 10th standard students who were the fresh output from 9th standard, from Government high school, B.H. Road, Shimoga.

4. Item Analysis

One of the important steps for the standardization of any tool is the item analysis. For this purpose, the investigator selected 36 samples and they were arranged it from the highest to the lowest score to analyse the items for knowing the difficulty level and discriminative index for each item. Investigator took top 27% of the sample—the high scores and the bottom 27% of the sample—low scores and 46% of the sample—average scores were grouped.

Item Selection

➢ Difficulty level or difficulty Index of an Item

The difficulty index of an item is represented by the percentage of students who responded to it correctly. It was calculated by using the formula.

\[ D.I = \frac{U+L}{2N} \]

Where

- \( U \) = Number of correct responses in the upper group (high scored group)
- \( L \) = Number of correct responses in the lower group (low scored group)
- \( N \) = Number of Students either in the lower group of higher group

➢ Discriminative power or discriminative Index of an Item

The Discriminative index of an item indicates the measure of the extent to which an item discriminates or differentiates between subjects who do well on the
overall test and those who do not do well on the overall test. The discriminating power of each item was calculated by the formula

\[ D.P = \frac{U-L}{N} \]

Where

- \( U \)= Number of correct responses in the upper group
- \( L \)= Number of correct responses in the lower group
- \( N \)= Number of sample in the both the groups

**Selection of Items**

Any item whose discriminating power stood above 0.30 should be considered as a reasonably good item. In the present investigation, only such of those items whose difficulty index ranged from 0.33 to 0.76 and whose discriminating power falls between 0.30 and 0.68 were selected and shown in Table 4.

*Table 4: Table showing the Difficulty Index and Discriminative Power of the Test Items*

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Difficulty Index</th>
<th>Discriminative Index</th>
<th>Item selected and not selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.49</td>
<td>0.48</td>
<td>Selected</td>
</tr>
<tr>
<td>2</td>
<td>0.29</td>
<td>0.23</td>
<td>not selected</td>
</tr>
<tr>
<td>3</td>
<td>0.50</td>
<td>0.40</td>
<td>selected</td>
</tr>
<tr>
<td>4</td>
<td>0.54</td>
<td>0.41</td>
<td>selected</td>
</tr>
<tr>
<td>5</td>
<td>0.66</td>
<td>0.45</td>
<td>selected</td>
</tr>
<tr>
<td>6</td>
<td>0.56</td>
<td>0.39</td>
<td>selected</td>
</tr>
<tr>
<td>7</td>
<td>0.24</td>
<td>0.13</td>
<td>not selected</td>
</tr>
<tr>
<td>8</td>
<td>0.76</td>
<td>0.49</td>
<td>selected</td>
</tr>
<tr>
<td>9</td>
<td>0.58</td>
<td>0.50</td>
<td>selected</td>
</tr>
<tr>
<td>10</td>
<td>0.61</td>
<td>0.56</td>
<td>selected</td>
</tr>
<tr>
<td>11</td>
<td>0.67</td>
<td>0.39</td>
<td>selected</td>
</tr>
<tr>
<td>12</td>
<td>0.70</td>
<td>0.41</td>
<td>selected</td>
</tr>
<tr>
<td>13</td>
<td>0.55</td>
<td>0.37</td>
<td>selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
<td>-----</td>
<td>------------------</td>
</tr>
<tr>
<td>14</td>
<td>0.59</td>
<td>0.42</td>
<td>selected</td>
</tr>
<tr>
<td>15</td>
<td>0.22</td>
<td>0.19</td>
<td>not selected</td>
</tr>
<tr>
<td>16</td>
<td>0.73</td>
<td>0.51</td>
<td>selected</td>
</tr>
<tr>
<td>17</td>
<td>0.69</td>
<td>0.49</td>
<td>selected</td>
</tr>
<tr>
<td>18</td>
<td>0.64</td>
<td>0.51</td>
<td>selected</td>
</tr>
<tr>
<td>19</td>
<td>0.73</td>
<td>0.63</td>
<td>selected</td>
</tr>
<tr>
<td>20</td>
<td>0.61</td>
<td>0.44</td>
<td>selected</td>
</tr>
<tr>
<td>21</td>
<td>0.54</td>
<td>0.39</td>
<td>selected</td>
</tr>
<tr>
<td>22</td>
<td>0.45</td>
<td>0.36</td>
<td>selected</td>
</tr>
<tr>
<td>23</td>
<td>0.53</td>
<td>0.44</td>
<td>selected</td>
</tr>
<tr>
<td>24</td>
<td>0.92</td>
<td>0.16</td>
<td>not selected</td>
</tr>
<tr>
<td>25</td>
<td>0.61</td>
<td>0.62</td>
<td>selected</td>
</tr>
<tr>
<td>26</td>
<td>0.59</td>
<td>0.55</td>
<td>selected</td>
</tr>
<tr>
<td>27</td>
<td>0.66</td>
<td>0.53</td>
<td>selected</td>
</tr>
<tr>
<td>28</td>
<td>0.76</td>
<td>0.66</td>
<td>selected</td>
</tr>
<tr>
<td>29</td>
<td>0.88</td>
<td>0.17</td>
<td>not selected</td>
</tr>
<tr>
<td>30</td>
<td>0.94</td>
<td>0.12</td>
<td>not selected</td>
</tr>
<tr>
<td>31</td>
<td>0.44</td>
<td>0.36</td>
<td>selected</td>
</tr>
<tr>
<td>32</td>
<td>0.50</td>
<td>0.33</td>
<td>selected</td>
</tr>
<tr>
<td>33</td>
<td>0.71</td>
<td>0.44</td>
<td>selected</td>
</tr>
<tr>
<td>34</td>
<td>0.54</td>
<td>0.43</td>
<td>selected</td>
</tr>
<tr>
<td>35</td>
<td>0.84</td>
<td>0.16</td>
<td>not selected</td>
</tr>
<tr>
<td>36</td>
<td>0.45</td>
<td>0.43</td>
<td>selected</td>
</tr>
<tr>
<td>37</td>
<td>0.53</td>
<td>0.55</td>
<td>selected</td>
</tr>
<tr>
<td>38</td>
<td>0.55</td>
<td>0.43</td>
<td>selected</td>
</tr>
<tr>
<td>39</td>
<td>0.63</td>
<td>0.66</td>
<td>selected</td>
</tr>
<tr>
<td>40</td>
<td>0.58</td>
<td>0.44</td>
<td>selected</td>
</tr>
<tr>
<td>41</td>
<td>0.61</td>
<td>0.56</td>
<td>selected</td>
</tr>
<tr>
<td>42</td>
<td>0.30</td>
<td>0.05</td>
<td>not selected</td>
</tr>
<tr>
<td>43</td>
<td>0.54</td>
<td>0.40</td>
<td>selected</td>
</tr>
<tr>
<td>44</td>
<td>0.62</td>
<td>0.52</td>
<td>selected</td>
</tr>
<tr>
<td>45</td>
<td>0.56</td>
<td>0.52</td>
<td>selected</td>
</tr>
<tr>
<td>46</td>
<td>0.75</td>
<td>0.45</td>
<td>selected</td>
</tr>
<tr>
<td>47</td>
<td>0.71</td>
<td>0.51</td>
<td>selected</td>
</tr>
<tr>
<td>48</td>
<td>0.38</td>
<td>0.03</td>
<td>not selected</td>
</tr>
<tr>
<td>49</td>
<td>0.44</td>
<td>0.43</td>
<td>selected</td>
</tr>
<tr>
<td>50</td>
<td>0.53</td>
<td>0.39</td>
<td>selected</td>
</tr>
<tr>
<td>51</td>
<td>0.58</td>
<td>0.47</td>
<td>selected</td>
</tr>
<tr>
<td>52</td>
<td>0.31</td>
<td>0.07</td>
<td>not selected</td>
</tr>
<tr>
<td>53</td>
<td>0.61</td>
<td>0.46</td>
<td>selected</td>
</tr>
<tr>
<td>54</td>
<td>0.57</td>
<td>0.58</td>
<td>selected</td>
</tr>
<tr>
<td>55</td>
<td>0.45</td>
<td>0.46</td>
<td>not selected</td>
</tr>
</tbody>
</table>
5. Establishing Validity and Reliability of Test

Validity of the Test

Content validity was established for the Achievement Test by attaching questionnaire by giving 20 experts, which included Teachers teaching social science and the English language in schools and colleges and teacher educators to decide the content validity of the test. The experts agreed that the items in the achievement test are relevant and worthwhile for collecting the Data and considering the suggestions of the experts, some of the items and responses were modified and rewritten.

Concurrent validity (usefulness of the test) was established by the ratings of the 4 teachers among them 2 of them were teaching social science and 2 were teaching English. Ratings was taken regarding result of students in Achievement Test. They were requested to rate the students on two point scale as good scorer and poor scorer. Only those stood in agreement with each other were retained the validity. The teachers’ ratings and achievement scores were taken and tetrachoric correlation coefficient was computed between them. For this obtained data were presented in 2×2 table. The computation of tetrachoric correlation coefficient with 2×2 table is shown in Table 5.
Table 5: Worksheet for Computation of Tetrachoric Correlation ($r_t$)

<table>
<thead>
<tr>
<th>Teacher’s Ratings</th>
<th>Good Scorer</th>
<th>Poor Scorer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Achievment Test Mean</td>
<td>Above Mean</td>
<td>7 (B)</td>
</tr>
<tr>
<td>Achievement Test Mean</td>
<td></td>
<td>23 (D)</td>
<td>2 (C)</td>
</tr>
<tr>
<td>Total</td>
<td>30 (A+C)</td>
<td>18 (B+D)</td>
<td>48 (A+B+C+D)</td>
</tr>
</tbody>
</table>

**Step 1**

Compute $AD$ and $BC$

$AD = A \times D = 7 \times 16 = 112$

$BC = B \times C = 23 \times 2 = 46$

Here $AD > BC$ thus the following formula can be used:

**Step 2**

$r_t = \cos \left( \frac{180 \sqrt{BC}}{\sqrt{AD} + \sqrt{BC}} \right)$

$r_t = \frac{180 \sqrt{7}(2)}{\sqrt{16}(23) + \sqrt{7}(2)}$

$r_t = \cos \left( \frac{180 \times 374}{19.18 + 3.74} \right)$

$r_t = \cos \left( \frac{673}{22.92} \right)$

**Step 3**

Compute $\cos 29.36$ (It can be done directly with the help of Table H which presented in Educational Statistics books)

$r_t = 0.87$
There was a high correlation between teachers' ratings and achievement test mean. Thus it can be concluded that the test has concurrent validity.

**Item Validity**

The item to item correlation for that the Phi-Coefficient technique was employed. The item validity was computed to 50 items selected based on difficulty index and discriminatory power. For finding the item validity the 50 items of the Achievement Test were taken for consideration as following manner the item 1 and item 2, than item 2 and item 3, than item 3 and item 4......i.e., a example of computation of the item to item correlation to find out the item validity is shown in Table 6.

**Table 6: Worksheet for Computation of Item to Item Correlation**

<table>
<thead>
<tr>
<th>Item 2</th>
<th>Item I</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Wrong</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>8</td>
<td>2</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A)</td>
<td>(B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrong</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(C)</td>
<td>(D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Formula:**

\[ \phi_{Coefficient} = \frac{AD - BC}{\sqrt{(A + B)(C + D)(B + D)(A + C)}} \]

\[ \phi_{Coefficient} = \frac{8 \times 8 - 2 \times 2}{\sqrt{(8 + 2)(2 + 8)(2 + 8)(8 + 2)}} \]

\[ \phi_{Coefficient} = \frac{64 - 4}{\sqrt{(10)(10)(10)(10)}} \]
\[ \phi \text{Coefficient} = \frac{60}{\sqrt{10000}} \]

\[ \phi \text{Coefficient} = \frac{60}{100} \]

\[ \phi \text{Coefficient} = 0.6 \]

Computed correlation indicated that there prevailed moderate correlations between two items. Similarly, remaining the items was computed using the above procedure. The obtained validity coefficients of all the items was positive, highly or moderately significant, hence the 50 items retained in the test.

**RELIABILITY OF THE TEST**

**Split Half Reliability**

Reliability refers to the accuracy or internal consistency or internal stability of measurements by a test. In this study the co-efficient of internal consistency has been found by the split half method. The test administered only once. The group of the individuals and scores divided equally half like the score on odd items and score on even items and scores co-related with the ‘Carl-Pearson’s Product Moment Co-relation’. For this scores of 50 items were divided equally into 25 each, as odd items like 1,3,5,7,9,11,13 and even items like 2, 4, 6,8,10 i.e. Co-efficient correlation was calculated. Obtained Co-efficient Correlation from SPSS analysis was shown in Table 7.
Table 7: Shows the Correlation Coefficient of Split Half Method

N=25 (number of questions in each type of items)

<table>
<thead>
<tr>
<th></th>
<th>Odd Items</th>
<th>Even Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odd Items</td>
<td>1.00</td>
<td>0.907</td>
</tr>
<tr>
<td>Even Items</td>
<td>0.907</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Correlation is significant at the 0.01 level (2-tailed).

The reliability co-efficient was found to be 0.90, that depicted the high reliability of the tool. The final form of the scale holding 50 items was used as an Achievement Test of 45 minutes. The test was used as pre-test. The same test was used in post test.

The scatter diagram plotted on scores of odd and even items shown in diagram 3.

Diagram 3. Shows Scatter Plot of Split Half Reliability

VAR00001 = Odd items, VAR00002 = Even Items
**Test- Retest Reliability**

To find the test- retest reliability, a retest was conducted on students after a gap of 20 days from the first administration. Test-retest reliability was computed using Pearson’s Product Moment Correlation Coefficient found to be 0.86, which is highly significant. Obtained result of test-retest reliability done through SPSS analysis is shown in Table 8.

*Table 8: Shows r value of Test-Retest Reliability.*

<table>
<thead>
<tr>
<th></th>
<th>TEST</th>
<th>RETEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST</td>
<td>Pearson</td>
<td>.869</td>
</tr>
<tr>
<td></td>
<td>Correlation</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig (two tailed)</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

| RETEST | Pearson  | 1.000 |
|        | Correlation | .869 |
|        | Sig (two tailed) | .000 |
| N     | 50         | 50         |

Correlation is significant at the 0.01 level (2-tailed).

The test-retest reliability co-efficient was found to be 0.86, which depicted the high reliability of the tool.

The scores test and retest plotted on scatter diagram 4.
Diagram 4: Scatter Diagram to show the $r$ of Test and Retest Reliability

Final Form of the Test

After the process of item analysis, 50 items were selected as final items for the achievement test for administering pre and post-test. The final tool of the study consisted of 50 items with different types of questions were shown in the table 9.
Table 9: Details of the Final Form of the Test in Social Science and English

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the Unit</th>
<th>Multiple Choice</th>
<th>Fill in the blanks</th>
<th>matching</th>
<th>One Sentence</th>
<th>True/false</th>
<th>Complete the word</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Little Martyr</td>
<td>2 (1,5)</td>
<td>3(25,26, 27)</td>
<td>2 (13,14)</td>
<td>3 (35,36,37)</td>
<td>2 (21,22)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>2.</td>
<td>The Black Tuesday</td>
<td>3 (2,3,4)</td>
<td>2 (28,29)</td>
<td>3 (11,12,15)</td>
<td>2 (38,39)</td>
<td>2 (23,24)</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>'Mahmud Ghazni and Mohammad Ghori'</td>
<td>2 (6,7)</td>
<td>3 (32,33,34)</td>
<td>2 (18,19)</td>
<td>1 (43)</td>
<td>3 (48,49,50)</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Delhi Sultans</td>
<td>3 (8,9,10)</td>
<td>2 (31,32)</td>
<td>3 (16,17,20)</td>
<td>4 (40,41,42,44)</td>
<td>3 (45,46,47)</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>
3.9. TOOLS USED FOR STUDY

The present study involved following tools

1. **Meaningful Connected Words Recall Test**: Learning does not take place without memory. In the sense, the organism has to start from the scratch in each trial. It is because of retention the organism shows progressive change as training proceeds, and responds with less energy in each successive trial. This is possible because of memory traces, which are technically known as neurogram of engrams. Anatomical and physiological details of these traces are not yet known. Recalling is also known as reproduction. The amount of material reproduced correctly of what has been learned is known as recalling or recall memory. There are several ways of recalling like method of retained members, memory span, method of anticipation and method of paired associations...etc., in the present study the subject has to identify or recognize the items shown to him. (The 20 Meaningful Connected Words shown in Appendix 3)

**Materials:** 1. A list of 20 connected words  2. A stop watch  3. Writing materials.

**Plan:** The list containing 20 connected words presented orally to the Students thrice. Having the number of words reproduced from list.

**Procedure:** Seat the students comfortably and instruct them thus: I will read out a list of words, listen carefully so that you may have to reproduce the list sometime later. With this instruction say ready, start the stop watch, and read out the list at the rate of two seconds a word and an even tone. Thus present the list three times with an interval of 5 seconds, in between, each presentation of the list. Then made them to reproduce the list.

95
Precautions: The rate of presentation and the tone must be constant, throughout.
Analysis of the Results: Find out how many words are correctly reproduced from list. Calculate mean, SD and t for the group results.

2. **Raven’s Progressive Matrices:** Standard Progressive Matrices is a test of person’s capacity at the time of test, to apprehend meaningless figures presented for observation. The test consisted of 60 problems divided into 5 sets of 12 each. The problems become progressively more difficult. In order to sustain interest and to be free from fatigue, the figures are boldly presented, accurately drawn and pleasing to look at. The scale is intended to cover the whole range of intellectual development from childhood to early old age. The total scores of a person provide an index of intellectual capacity whatever be his/her nationality of education. In the sense, it is culture fair test to a great extent. Individuals’ intelligence can be assessed and compared, irrespective of caste, creed, culture, nationality, education and sex. Time taken is considered for the purposes of comparison it is mainly a work limit test. 1) Though the deviation in the consistency score is more than 2 and it not considered as consistency in the strict sense, for general purposes the total score can be taken as valid. 2) It is said that the people who obtain low scores have a proportionately greater number of success by pure chance. To this extent low total scores are always less consistent and reliable than high scores, 3) If The test is administered individually, it appears to introduce emotional factors which are less operative, when he is allowed to work quietly at his own speed. Group test provides more reliable sample of a person’s output of intellectual activity during the test. 4) (a) one in 20 may be expected to obtain a score at or above 95th percentile point. Similarly one in 20 can be expected to obtain a score at or below 5th percentile point. (b) one in 10 may be expected to obtain a score at or above 90th pp. and one in 10 may obtain score at or below 10th pp. (c) one in 4 may obtain a score at or above 75th pp and one in 4 may obtain score at or below 25th
pp. (d) one in every two may be expected to fall between 25th and 75th pp. 5) RPM does not very clearly differentiate between young children or between adults of superior intellectual capacity 6) Test normally takes 45 minutes to complete.

Materials: 1) RPM 2) Key to check up the answers 3) Norms 4) Data Sheet to write answers 5) Stop-Watch 6) Writing Materials.

Procedure: Subjects should be seated in a good ventilated room. Place the RPM booklet before them, and give instructions. Give set A first, then after completion of set A give B set, then C then D and then E. Note down the total time taken by individuals to answer all the problems.

Precautions: 1. Before allowing the Subjects to start answering the problems, make sure that they understood what exactly they have to do. 2. Check up the answers of Subjects, only after all the problems solved. 3. No problem should be left unanswered. 4. Though there is no time limit, the Subjects have to answer the problems as fast as possible.

Analysis of the Result: 1. Check up the answers with reference to the key. 2. While checking the answers, if the subjects have written more than one answer to a problem, take the last answer into account, whether it is right or wrong.

RPM can be used individually and for group, for the present study it was used on a group of 9th standard students who were included in the experiment to see the relationship of their Intelligence with their Memory.

3.10. Development of Memory Training Package

The four lessons were taken from the 9th standard Social Science and English (State Syllabus). The lessons were ‘Delhi Sultans’, ‘Mahmud Ghazni and Mohammad Ghori’ from Social Science, ‘The Little Martyr’, and ‘The Black
Tuesday' from English. The lessons were divided into different tasks and the package was developed based on these lessons.

Development of the Memory Training Package considered following factors.

ii. Flexibility for teachers to recognize the content and activities wherever necessary to suit the situation.

iii. Sustenance of motivation and interest among students throughout the programme.

iv. Provision to continuous and inbuilt evaluation throughout the programme.

v. Students would be able to perform the activities on their own according to the instructions by the investigator.

vi. Readily available materials within the local environment, preferably low cost materials to be used.

vii. Active use of process skills of observation, classification and inference was facilitated.

viii. Provisions for self learning and self experiments.

ix. The clarity should be maintained to use the package by any other teachers.

Phases of Development of Memory Training Package

Descriptions of the steps involved in the development of the Memory Training Package are presented below.

1. Analyzing Phase

The content analysis of the texts of Social Science and English was done to check for the adequacy and relevance for developing effective Memory Training
Package, written the instructional objectives and the contents, the materials were analysed and memory techniques were chosen.

2. **Designing Phase**

The memory Techniques appropriate to particular contents were chosen. The draft of the package was prepared. Activities and questions were to be posed and feedback material was designed at the end of the each task. Lesson plans were designed based on contents for particular period of teaching. Materials required for these activities also were listed out, submitted to the respective subject teachers and eminent experts from the field of education for scrutiny. It was based on their suggestions and the content was modified aptly.

3. **Development Phase and Try out of Package**

This phase included the development of the Memory Training Programme. The Package validated on comprehensibility of the content and activities, difficulty level, time factor, suitability for the given age group and ability level, extent of facilitation for achieving specified instructional objectives. The problems faced by small group of sample were observed by the investigator holding had discussion with them, subsequently and on the basis of the feedback, the Memory Training Package was finalized with suitable modifications.

4. **Evaluation Phase**

Preliminary administration was made on small groups of 4 students, which were not included in the sample. The problems faced by small group of sample were observed by the investigator, holding discussion with them subsequently and on the basis of the feedback, the Memory Training Package was refined with suitable modifications.
Validating the Memory Training Package

Again Eight eminent experts’ opinions were taken on simplicity, clarity, relevance, appropriateness for content validity and administration of the package. Based on their suggestions, suitable refinement was made in the package.

The package was validated by the experts by evaluating the questionnaire. The evaluation questionnaire assessed the suitability of Format, content, organization, and vocabulary and language structure of the Memory Training Package and suitability of techniques for enhancing memory used in MTP. The Evaluation questionnaire held 4 sections with 12 questions and 1 open-ended question. (The Evaluation Proforma presented in Appendix 5). The each item of the evaluation questionnaire was rated on 5-point Scale consisting of the following points

1. To a very high degree - Score 5
2. To a high degree - Score 4
3. To a moderate degree - Score 3
4. To a low degree - Score 2
5. To a very low degree - Score 1

Interpretation of Evaluation Questionnaire

To interpret the use of package, the norm was fixed by taking suggestion of experts and guide. Hence, the total possible score fixed the range from -80 to +80. The questionnaire judged on the basis of following norms.

100
Score | Interpretation
---|---
61-80 | use the package with full confidence
41-60 | use the package with less confidence
20-40 | make necessary modification in the package\n20 and | reject the package below

The Percentage of Agreement of Judges to MTP is given in the table 10.

*Table 10: Shows the Percentage of Agreement given by Judges*

<table>
<thead>
<tr>
<th>Nature of agreement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>To a very high degree</td>
<td>19.09</td>
</tr>
<tr>
<td>To a high degree</td>
<td>50.58</td>
</tr>
<tr>
<td>To a moderate degree</td>
<td>30.33</td>
</tr>
<tr>
<td>To a low degree</td>
<td>---</td>
</tr>
<tr>
<td>To a very low degree</td>
<td>---</td>
</tr>
<tr>
<td><strong>Total agreement</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The Eighty percentages of positive reports of judges made use of the package with full confidence. Thus, the MTP was taken for consideration for the final try out.

5. Implementation

Based on the experience and discussions with the subject experts, some modifications were made in the package to meet the criteria and package finalized for its execution. The final form the package was implemented on intended sample
with suitable memory techniques, practice, activity, materials, and questions and with feedback.

The Memory Training Package implemented over a span of 5 months in about 120 periods of 45 minutes each from Monday to Friday of the week.

Methods of Teaching used During Memory Training Programme

The methods of Lecturing, Discussion, Activity, Role play, group study method was used during Memory Training Programme.

Materials used during Memory Training Programme

Activity Sheet, Flash cards, chits, charts, books, photographs, observation sheets, pencils, erasers.

3.11. DATA COLLECTION

The data was collected by controlling the extraneous variables like age, interest, intelligence, memory level, kind of schools. The objectivity was ensured during the data collection. The experiment was conducted for the period of 120 working days. The investigator did the experiment and collected data in person by visiting two Government Secondary Schools in Shimoga city by dividing 45 minutes of time for each class for experimental and control group. There was the heed given for simultaneous class by investigator to experimental group and by subject teacher to control group.

The students of experimental group of 9\textsuperscript{th} standards were subjected to experimental treatment i.e., they were taught with the specially designed Memory Training Package, where as the students of control group were taught the prescribed units with the conventional method by subject teacher. The package was implemented by the investigator carefully following all the relevant
principles, guidelines over a span of 5 months, from June 2010 to October 2010 in about 120 periods of 45 minutes each from Monday to Friday of the week. While implementing the package, the following factors were duly considered.

1. Even though the package was developed by the investigator herself, a thorough mastery over each topic of the planned syllabus in respect of objectives specified, and insight into the subject itself, the method of introduction of each topic, interaction with the students during the activity and finally, evaluation of each student’s performance in each class were considered essential for its implementation. These factors were satisfied by the investigator.

2. As the intellectual and motivational appeal of the activity based package might vary from child to child, and also their reception and reaction capabilities and forms, the principle of flexibility was adopted to make adaptations within the classroom sessions: usage of varied language forms to enable every student to understand the presentation and questions involved, elongation or reduction of session length in keeping with motivational level of the group in a particular class, above rules were followed throughout the implementation stage. It was to make each class an enjoyable learning experience for each student.

The following observations were made during the course of teaching package;

1. All learners showed a keen interest in all the activities by the investigator.
2. Students who were not good at speaking English also showed a great interest in preparing themselves for the activities. Their verbal ability was eliminated as the attention is paid on the spot to the performance in the activity.
3. For some classes, the investigator had to literally pull the bright achievers out of their hideouts for activity class.
4. The students seemed to be not exposed to any sort of academic freedom in the classroom, so, the activity classes became a bit chaotic.

    Based on above factors, investigator conducted the experiment by taking pre-test achievement of students. After the completion of experiment the immediate post test was administered to the Experimental and Control Group and compared the achievement of both the group. After the gap of one month, the surprise delayed post test was administered to experimental group to test their long term retention. The immediate post test achievement and delayed post test achievement was compared.

    The collected data were subjected to statistical analysis.

3.12. STATISTICAL TECHNIQUES USED

1. **t-test**: t-test is the test of the significance of the difference between two means. It involves the computation of the ratio between observed difference between two sample means and the sampling error factor.

   The formula of t- test is

   \[
   t = \frac{\sum d}{\sqrt{\frac{n\sum d^2 - (\sum d)^2}{n-1}}}
   \]

   with df (n-1)

   Where,  
   \(d\) = difference of the scores of group1 and group 2
   \(D^2\) = square of \(d\)
   \(n\) = Number of subjects
2. **Carl Pearson’s Product Moment Correlation:** this type of Correlation used to find the relationship of two variables, for the present study Carl Pearson’s Product Moment Correlation was used to see the relationship to two variables namely Memory and Intelligence.

*Formula of Correlation is*

\[
r = \frac{\sum XY (\Sigma X)(\Sigma Y)}{N} \sqrt{\frac{\left\{\sum X^2 \frac{(\Sigma X)^2}{N}\right\}\left\{\Sigma Y^2 - \frac{(\Sigma Y)^2}{N}\right\}}}
\]

Where, \( r \) = Correlation

\( X \) = first variable (Memory)

\( Y \) = second variable (Intelligence)

\( N \) = Number of sample