CHAPTER TEN
THE EXPERIMENT

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10.01 **INTRODUCTION**

Exploration part of study habits and skills and related aspects have been covered in the earlier chapters. As pointed out in 'Review of Related Literature', chapter second, this investigation was to throw light on the programme which would help modify the study habits in the desired direction and also modify the achievement of students in the positive direction. For this particular aspect of study, experimentation was carried out and this chapter would describe all the aspects of experimentation. This description is presented into following sections for the sake of clarification.

**Section I:** It contains details of decisions regarding experimental design and the necessary steps involved in the conduct of the experiment.

**Section II:** It contains interpretation and conclusions of the data collected through experimental observations.

**Section III:** It contains discussion of the results of the experiment and restatement of the hypotheses and the problem.
DECISIONS REGARDING THE EXPERIMENTAL DESIGN

As mentioned in Chapter three on 'Procedures', all the decisions regarding the choice of the experimental design and its corresponding aspects are given below:

The basic objective as indicated in Chapter second of this experimental study was to find out the efficacy of the programme for changing the existing study habits of students in the desired direction and in the change of their achievement positively. So naturally the decisions regarding the experimental design centered around following:

1) Programme to be prepared
2) The class of students on which the programme was to be conducted
3) Control of alternative hypotheses other than that of the programme as a cause of change in the study habits and then to locate (verify) the corresponding change in achievement.

The programme for modifying the existing study habits was an independent variable.

The dependent variables were:

1) The study habits
2) The achievement
As the efficiency of the programme was to be judged, it was essential to decide about the nature of the programme that would be prepared and used as the treatment. It was also essential to decide the tools to be used for measuring study habits and their achievement.

For increasing the generalizability of the experiment, the testing of I.Q. of all the subjects was an additional consideration.

**DECISIONS TAKEN**

In order to overcome the difficulties regarding various alternative hypotheses to the independent variable, different arrangements of dependent and independent variables i.e. designs were compared. Out of all these arrangements, it was decided to select the 'Solomon Four Group Experimental Design' for considerations of the internal validity and the external validity of the experimental results.

(A) **STRUCTURE OF THE DESIGN (SOLOMON FOUR)**

\[
\begin{align*}
R & \quad O_1 & X & \quad O_2 \\
R & \quad O_3 & & \quad O_4 \\
R & \quad & X & \quad O_5 \\
R & \quad & & \quad O_6 \\
R & \quad & & \quad & \\
X & \quad & \equiv \text{Randomization} \\
O_1, O_3 & \equiv \text{Pre-tested Groups} \\
O_2, O_4, O_5 \text{ and } O_6 & \equiv \text{Post-tested Groups}
\end{align*}
\]
This design is a combination of two true experimental designs.

1) Pre-test Post-test
   \[ \begin{array}{ccc}
   R & 0_1 & 0_2 \\
   R & 0_3 & 0_4 \\
   \end{array} \]

2) Post-test only
   \[ \begin{array}{ccc}
   R & 0_5 & 0_6 \\
   \end{array} \]

a) Subjects were randomly assigned to four groups.

b) Out of the four groups, two groups received experimental treatment through random selection.

c) Out of these two, one group received the pre-test and the other one received only the post-test.
   The selection was made again on random basis.

d) Two groups which did not receive treatment, were called controlled groups.

e) Out of these two, one group received the pre-test.
   The group was selected randomly.

f) The post-test was administered to four groups.
   This design is also strong enough to control the factors threatening the internal validity and external validity. Gage (63)\(^{(1)}\) has discussed the strength
In his words:

...... The Solomon (1949) Four Group Design deserves higher prestige and represents the first explicit consideration of external validity factors .... the main effects of testing and the interaction of testing and X are determinable. In this way not only is generalizability increased but in addition, the effect of X is replicable in four different fashions: \( 0_2 > 0_1, \ 0_2 > 0_4, \ 0_2 > 0_6 \) and \( 0_2 > 0_3 \). The actual instabilities of experimentation are such that if these comparisons are in agreement, the strength of the inference is greatly increased ......

C) i) SELECTING THE SCHOOL

The researcher is working as a secondary teacher in New English School, Pune. So for the administrative ease in the conduct of experiment, such as availability of the students, suitable place and timing for her experiment, she selected New English School, Tilak Road, Pune, for her experiment.

ii) SELECTING THE CLASS

The students of standard VIII were selected for the experiment because as compared to the students of other standards, they were free from the burden of other public/external examinations such as Hindi, Mathematics and Sanskrit of Tilak Maharashtra Vidyapeeth or of any other examining body etc. At the same time at least
theoretically, they were expected to be equipped with all the basic skills of learning as they had completed seven years of primary education. Some divisions of standard VII and IX were always given special coaching for the Middle School Scholarship examinations and the school final examination respectively, so these classes of VII/IX did not form a normal student population. Students of X were completely preoccupied with their school final examination.

D) DECISIONS REGARDING THE TOOLS

a) As mentioned in chapter three, 'Procedure,' Palsane's study habits inventory was administered for getting the scores on study habits of the students included in survey as well as in experiment. All the details about the inventory are given in chapter three.

b) Naphade's Non Verbal Test Of Intelligence

This test is used for obtaining the scores on I.Q. The validity and reliability was tested. (The details of this test are given in the Appendix No.15).

10.93 THE PROGRAMME AS A TREATMENT

A) Preparation of The Programme

As mentioned earlier in chapter two the researcher analysed various programmes of 'How to Study'.
These programmes were mainly written for students for getting guidance through reading of these programmes. However, the observation of the researcher as a teacher was that even the reading habits of the students were poor. It was supported by the researcher in the field of reading as referred to earlier in Chapter six. The written programmes were mainly in English. Change in study habits and skills, through reading English material could not be expected at the Secondary School level students of Marathi medium.

Thus the need to prepare a separate 'Programme' for developing study habits/skills was highlighted and a draft of a special course for the study habits/skills became a necessary.

Hence, the researcher decided to prepare a programme in Marathi and to teach it in Marathi through following usual teaching procedures in the regular class-room situation. The investigator (experimenter) taught them in the usual ways consisting of Question Answers, Explanation and discussion form and the educational aids used in the experiment were chalk and the black board. Due to this, the researcher could reduce the component of novelty in the experiment i.e. Hawthorne effect.
B) Content Of The Programme

The details of the programme are attached in Appendix No. 16. The programme contained the following aspects:

i) Purpose of Studying

ii) Organization Of Time

iii) Preparation of Time Plan For Studying

iv) Relation of Listening, Discussions, Reading, Writing, and Observation to Studying

v) Listening

vi) Discussion

vii) SQ3R - A Technique

viii) How to Take a Survey of a Book and Frame Questions

ix) How to Take a Survey of a lesson and Frame Questions

x) Reading - 1st R

xi) Recall - 2nd R

xii) Review - 3rd R

xiii) Note making - General informations - Summary type

xiv) Structure type Notes

xv) Long Answer Questions

xvi) Essay Writing

xvii) Revision of Content

xviii) How to Take Examinations.

C) Tryout Of The Programme

a) First Tryout

The programme was executed in Apte Vidyalaya Pune 4, for standard X students, in summer vacation in 1981, for a week, one hour every day. The method of communication was basically 'lecture'. The time
amount for the experiment was seven hours in total. By the above tryout the researcher understood from her discussion with students on the last day, that they did not want a lecture but were eager to take active part in the discussion. It was an important contribution of the first tryout. So the active part of the students in the programme was planned for the second tryout.

b) Second Tryout

This tryout of the programme was undertaken in New English School, and Vidyarthi Sahayak Samittee, Pune, for the students of standard X in the summer vacation 1982. (The students in Vidyarthi Sahayak Samittee had assembled from different village schools for a special enrichment programme intending to prepare them for Standard X examination). The treatment given to them was for fourteen hours in all spread over a month. The method of teaching was 'question and answer'; i.e. oral responses were accepted in this tryout and the sample units for this tryout were 40 in VSS and 60 in NEST students. At the end of the treatment, the teacher-made-questionnaire (Appendix No. 18) was given to the students. The researcher received the reactions about the programme from the students. The reactions did not add
to the content of the 'Programme' but suggested (1) to increase the time amount and (2) to give some practice exercises while discussing the study habits/skills. Their suggestions were used in further modifying the programme. By the above experience the researcher understood that more practice was needed for the formation of habits, i.e. additional inputs in terms of time, were required. So the researcher modified the programme and used it for the third tryout in New English School, Tilak Road, Pune. C) Third Tryout

The modified programme was carried out in NEST for the students, of standard VIII during the months from August to October 1982, for 40 minutes, on every alternate day. The time amount was 20 hours spread over the above period. Pre-test, post-test research design was selected for measuring the efficacy of the programme. The groups were selected randomly for control and experimental treatment. The treatment was given immediately after the first unit test. The terminal examination of the students started at the end of the programme. Therefore, the change in the academic performance of the students was gauged with
measuring the difference between the marks obtained in the unit test and in the terminal examination. The results of the experiment indicating the effectiveness of the programme are given in Appendix No. 19.

d) **Significance Of The Tryout**

The decisions about the methodology, time and content of the programme (treatment) were taken after the finishing of the tryouts. The students wanted to take part in the actual teaching. Hence the method was changed from 'lecture' to 'discussions'. Due to the inadequate time of treatment the students could not complete their practice lessons. Hence the span of time was increased from 14 to 30 hours.

D) **Description Of The Actual Conduct Of The Programme**

According to the requirement of the design, four experimental groups were selected. Each group contained 30 students. So 120 students from 320 of standard VIII were randomly selected and divided randomly into four groups. Out of these four, two groups were randomly selected for treatment by way of the prepared programme. Again one group from experimental groups and one from control
groups were randomly selected for pretesting. All the four groups received post-test immediately after the completion of the experiment. The reasons of selection of school and standard are mentioned earlier in this chapter. The details of the final programme are given in (Appendix No. 16).

The contents of the programme were given to the students for about 40 minutes on alternate days. The duration of this treatment was from 22nd June to 30th September 1983. (The time table is given in Appendix No. 20). The groups $O_1$ and $O_5$ were the treatment groups. They received the treatment for three days in a week. The treatment was given to them, from 5 to 5:40 p.m. from Monday to Friday and on Saturday from 11 to 11:40 a.m.

The alternate free day of the treatment was given for the practice of the study skills which were exposed to them.

E) **Difficulties In The administrations**

The headmaster of the School has kindly permitted the researcher to conduct the experiment in the school. Therefore there was no difficulty experienced during the execution of the programme with regard to time and place.
Secondly there was not any type of experimental mortality in the conduct of experiment.

The students who were not selected for the experiment were more anxious for joining the experiment and it was difficult for the experimenter to control their curiosity.

SECTION II

10.04. ONPAR RELATIONSHIP OF THE GROUPS

As stated earlier the four groups were selected for finding out the efficacy of the programme. It was essential, therefore to know, whether these groups were on the same level with regard to I.Q., scores on study habits and scores on achievement. Hence these relationships were studied with the help of 't.' (Appendix No. 21)

The data were collected through the study habit inventory and their achievement scores on school tests.

According to the requirement of the Design, the pre-test was administered to two groups. Before that, the I.Q. test was given to all, for finding out the on par relationship on I.Q. of four groups.

A) Results of I.Q. Testing

I.Q. is a major factor affecting every human activity. It was controlled through random selection. However,
whether all the groups were on par with respect to I.Q. is checked so that interpretation of results would have the proper perspective.

### TABLE No. 10.01

**COMPARISONS ON I.Q. SCORES**

<table>
<thead>
<tr>
<th>Gr.</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>'t' value</th>
<th>Groups compared</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0_1$</td>
<td>30</td>
<td>99.70</td>
<td>15.41</td>
<td>7.91</td>
<td></td>
<td>1</td>
<td>$0_1$ and $0_3$</td>
</tr>
<tr>
<td>$0_3$</td>
<td>30</td>
<td>99.23</td>
<td>17.63</td>
<td>10.36</td>
<td>4.28</td>
<td>0.1</td>
<td>$0_1$ and $0_3$</td>
</tr>
<tr>
<td>$0_5$</td>
<td>30</td>
<td>102.13</td>
<td>16.60</td>
<td>9.18</td>
<td>4.13</td>
<td>0.5</td>
<td>$0_1$ and $0_5$</td>
</tr>
<tr>
<td>$0_6$</td>
<td>30</td>
<td>97.03</td>
<td>18.43</td>
<td>11.32</td>
<td>4.38</td>
<td>0.6</td>
<td>$0_1$ and $0_6$</td>
</tr>
</tbody>
</table>

(From Garrette (66)\(^2\) Page No. 224 Formula No. 57,58). (Appendix No. 22).

From the table given above, it is seen that, the respective values of 't' point out that the four groups were homogeneous on I.Q. and the random samples selected for this experiment were on par on I.Q. level. Hence, the
effect of I.O. would be the same on these four groups.

B)  Study Habits Scores Obtained On Study Habits Inventory On Pre-Test

The prime interest of the researcher was to know whether initially all the groups were on equal level of the study habits. The table compares pre-tested groups on scores of study habits.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁</td>
<td>30</td>
<td>65.76</td>
<td>8.65</td>
<td>2.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₃</td>
<td>30</td>
<td>60.06</td>
<td>9.60</td>
<td>3.07</td>
<td>2.36</td>
<td>2.42*</td>
</tr>
</tbody>
</table>

* Significant on .05 level.

(Appendix No. 23).

From the above table, it is seen that the groups O₁ and O₃ were not on par on study habits scores. O₁ is significantly greater than O₃ group.

C)  Achievement Scores Obtained From School Record

The percentages obtained from school record are taken as the indicators of general achievement in the academic subjects. The table below shows the mean
difference significance on achievement scores of the pre-tested groups.

**TABLE No.10.03**

**COMPARISON OF GROUPS ON ACHIEVEMENT SCORES**

(Appendix No. 24)

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁</td>
<td>30</td>
<td>47.93</td>
<td>8.78</td>
<td>2.57</td>
<td>2.37</td>
<td>.49</td>
</tr>
<tr>
<td>O₃</td>
<td>30</td>
<td>46.77</td>
<td>9.60</td>
<td>3.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the above table, it is seen that the mean difference between O₁ and O₃ groups was non-significant on 't' test. Hence, these two groups were on par on achievement scores.

**10.05 RESULTS OF THE EXPERIMENT**

The two hypotheses for testing the efficacy of the programme are stated earlier. They are:

i) The programme modifies the students' study habits in the desired direction

ii) And modifies the academic performance in the positive direction.

The Solomon Four Group Experiemntal Design selected for the purpose does not allow the single statistical procedure for all the six groups simultanesouly.
Gage (63) (2) has mentioned the statistical procedure as follows:

Disregarding the pre-tests, except as another treatment coordinate with X, one can treat the post-test scores with a simple 2 X 2 analysis of variance:

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tested</td>
<td>0₄</td>
<td>0₂</td>
</tr>
<tr>
<td>Unpre-tested</td>
<td>0₆</td>
<td>0₅</td>
</tr>
</tbody>
</table>

From the column means, one estimates the main effect of X, from row means, the main effect of pre-testing and from cell means, the interaction of testing with X. If the main and interactive effects of pre-testing are negligible, it may be desirable to perform an analysis of covariance of 0₄ versus 0₂, pre-test scores being the covariate ....
Testing The Hypothesis No. 1

For finding out the effectiveness of the programme on study habits the 'Null Hypothesis' was stated as below:

There will be no significant difference between the mean scores of experimental group and control groups obtained on study habit inventory.

For finding out the effect of the treatment, the analysis of variance is made.

**TABLE No. 10.04**

ANALYSIS OF VARIANCE OF STUDY HABITS

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Sums of Squares</th>
<th>Mean Square (Variance)</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Correction</td>
<td></td>
<td>516140.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Total sum of Squares</td>
<td></td>
<td>8875.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Between group sum of Square</td>
<td></td>
<td>1428.31</td>
<td>1428.31</td>
<td></td>
</tr>
<tr>
<td>4) Among means sum of Square</td>
<td></td>
<td>448.54</td>
<td>448.54</td>
<td></td>
</tr>
<tr>
<td>5) Interaction sum of Square</td>
<td></td>
<td>6908.21</td>
<td>59.55</td>
<td>7.72</td>
</tr>
</tbody>
</table>

**B) Analysis of Variance**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>df</th>
<th>Sums of Squares</th>
<th>Mean Square (Variance)</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>1</td>
<td>1428.31</td>
<td>1428.31</td>
<td></td>
</tr>
<tr>
<td>Among means</td>
<td>1</td>
<td>448.54</td>
<td>448.54</td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>90.11</td>
<td>90.11</td>
<td></td>
</tr>
<tr>
<td>Within cells</td>
<td>116</td>
<td>6908.21</td>
<td>59.55</td>
<td>7.72</td>
</tr>
</tbody>
</table>

F between groups = \( \frac{1428.31}{59.55} = 23.98^* \)

F Among means = \( \frac{448.54}{59.55} = 7.53^* \)

F Interaction = \( \frac{90.11}{59.55} = 1.51 \)

(Appendix No. 25).
From the above table it is found that:

1) F test is significant on .05 level for columns. It indicates that the treatment through programme is effective.

2) F test is significant on .05 level for rows. It indicates that the testing is also effective.

3) F test is non-significant on .05 level for interaction; that means there is no interaction effect of treatment through programme and testing.

According to Garatte (66)

...... F furnishes a comprehensive or overall test of the significance of the differences among means. A significant F does not tell us which means differ significantly, but that at least one is reliably different from some others. ..... But if F is significant, we may proceed to test the separate differences by the t test ..... 

In the present study, F is significant. Hence it was essential to compute 't' statistics. As such comparisons of $O_2$ vs $O_4$, $O_2$ vs $O_5$, $O_2$ vs $O_6$, and $O_5$ vs $O_6$ and $O_5$ vs $O_3$ were made.

1) The Comparison of the Means Of $O_2$ and $O_4$

Shows The Effect Of Treatment Through Programme

As given in the Solomon Four Design, $O_2$ is a post-tested group with the treatment of testing and programme
where as the $O_4$ is a post-tested group with the pre-test only. Hence the comparison of these groups show the effect of programme.

Null Hypothesis was stated as under:

There will be no significant difference between two means obtained by $O_2$ and $O_4$ groups.

**TABLE No. 10.05**

**THE EFFECT OF TREATMENT**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>$O_2$</td>
<td>30</td>
<td>71.83</td>
<td>7.30</td>
<td>1.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$O_4$</td>
<td>30</td>
<td>63.20</td>
<td>10.38</td>
<td>3.59</td>
<td>2.32</td>
<td>3.72*</td>
</tr>
</tbody>
</table>

* Significant on .05 level.  

(Appendix No. 26)  

\[ 6_D = \sqrt{\frac{(S.D_1)^2}{N_1} + \frac{(S.D_2)^2}{N_2}} \]  

Garatte (66), Page No. 224  

Formula 57, 58.

From the table 't' value shows the significant results on .05 level. So, it can be concluded that the Null hypothesis is rejected and the alternative hypothesis is accepted.
ii) The Comparison Of The Means of $O_2$ and $O_5$ Shows

The Effect of Testing

$O_5$ is another experimental group without pre-testing. The comparison of these two groups show the effect of pretesting. Null Hypothesis stated for this comparison is as under.

There will be no significant difference between scores obtained on inventory by pretested and unpretested groups.

**TABLE No. 10.06**

**THE EFFECT OF TESTING**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>$O_2$</td>
<td>30</td>
<td>71.83</td>
<td>7.3</td>
<td>1.78</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>$O_5$</td>
<td>30</td>
<td>66.23</td>
<td>8.17</td>
<td>2.22</td>
<td>2.70*</td>
<td></td>
</tr>
</tbody>
</table>

* Significant on .05 level. (Appendix No. 27).

(Formula for comparison of 't' is used as in the table No. 10.05).

From the table above 't' value showed significant result on .05 level of significance. From this value, it is seen that there was an effect of testing on $O_2$ group.
Hence Null hypothesis is rejected and the alternative hypothesis is accepted. There is a significant difference of testing on the study habit scores of the students. In other term there is an effect of the testing on the scores on study habits.

iii) THE COMPARISONS OF \( O_2 \) vs \( O_6 \) AND \( O_5 \) vs \( O_6 \)

SHOW THE EFFECT OF PROGRAMME

\( O_6 \) is the only post-tested group. The comparisons between \( O_6 \) vs \( O_2 \) and \( O_5 \) shows the effect of programme. Null Hypothesis stated for these comparisons was as under:

There will be no significant difference between scores obtained on study habit Inventory of \( O_2 \) vs \( O_6 \) and \( O_5 \) vs \( O_6 \) groups.

<table>
<thead>
<tr>
<th>TABLE NO. 10.07</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFFECT OF PROGRAMME</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t</th>
<th>Groups compared</th>
</tr>
</thead>
<tbody>
<tr>
<td>( O_2 )</td>
<td>30</td>
<td>71.83</td>
<td>7.30</td>
<td>1.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( O_6 )</td>
<td>30</td>
<td>60.73</td>
<td>7.91</td>
<td>2.09</td>
<td>1.96</td>
<td>5.58*</td>
<td>( O_2 ) vs ( O_6 )</td>
</tr>
<tr>
<td>( O_5 )</td>
<td>30</td>
<td>66.23</td>
<td>8.17</td>
<td>2.22</td>
<td>2.07</td>
<td>2.65*</td>
<td>( O_5 ) vs ( O_6 )</td>
</tr>
</tbody>
</table>

* Significant on .05 level. (Appendix No. 28).

From the table given above, it is seen that both
the 't's show the significant results. Hence the Null Hypothesis is rejected and Alternative Hypothesis is accepted. There is a significant difference between scores obtained on study habit Inventory of experimental group and control group.


The effect of treatment is replicated in four different fashions. According to Gage (63) $O_5$ vs $O_3$ is one of the comparisons for finding out the effect of treatment through programme on testing. Thus the Null Hypothesis is stated as under.

There will be no significant difference between the scores obtained on study habit inventory of pre-tested group and unpretested experimental group.

**TABLE No. 10.08**

**INTERACTION EFFECT OF TESTING ON TREATMENT**

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>SEM</th>
<th>SED</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>$O_3$</td>
<td>30</td>
<td>60.06</td>
<td>9.60</td>
<td>3.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$O_5$</td>
<td>30</td>
<td>66.23</td>
<td>8.17</td>
<td>2.22</td>
<td>2.30</td>
<td>2.68*</td>
</tr>
</tbody>
</table>

* Significant on 0.05 level. *(Appendix No. 29)*

From the above table it is seen that $O_5$, the
experimental group shows significant result over the presented group. Hence the treatment through programme was effective in the comparisons of pretested and unpretested groups. Thus the Null Hypothesis is rejected and the Alternative Hypothesis is accepted i.e. the treatment through programme was effective.

From all the above comparisons, it is concluded that the Null Hypothesis is rejected and the Alternative Hypothesis No. 1 is accepted. So it is accepted that there is a positive change in the study habits of the students due to the treatment through programme.

III) Testing The Hypothesis No. 2

For finding out the effect of the programme on achievement, the 'analysis of Covariance' was undertaken because all the four groups received a pretest in the form of school examination. Hence they had a testing effect. Hence the analysis of covariance was undertaken.
A) Analysis Of Covariance

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>df</th>
<th>SSx</th>
<th>SSy</th>
<th>SSxy</th>
<th>Ss y . x</th>
<th>S . S x y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among Means</td>
<td>3</td>
<td>1329.89</td>
<td>917.29</td>
<td>707.49</td>
<td>566.80</td>
<td>217.25</td>
</tr>
<tr>
<td>Within groups</td>
<td>115</td>
<td>14398.90</td>
<td>13480.50</td>
<td>9768.80</td>
<td>6852.95</td>
<td>59.59</td>
</tr>
</tbody>
</table>

B) Calculations Of Adjusted Means

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mx</th>
<th>My</th>
<th>M y.x (adjusted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2</td>
<td>30</td>
<td>47.90</td>
<td>51.03</td>
<td>52.26</td>
</tr>
<tr>
<td>O4</td>
<td>30</td>
<td>46.77</td>
<td>44.60</td>
<td>46.60</td>
</tr>
<tr>
<td>O5</td>
<td>30</td>
<td>48.83</td>
<td>49.57</td>
<td>50.17</td>
</tr>
<tr>
<td>O6</td>
<td>30</td>
<td>55.33</td>
<td>51.63</td>
<td>47.47</td>
</tr>
</tbody>
</table>

General means = 49.71, 49.21

\[ M_{y-x} = My - b (M_x - GMx) \]

(1) For O2 = My-bx = 51.03 - .68 (47.90 - 49.71) = 52.26
(2) For O4 = My-bx = 44.60 - .68 (46.77 - 49.71) = 46.60
(3) For O5 = My-bx = 49.57 - .68 (48.83 - 49.71) = 50.17
(4) For O6 = My-bx = 51.63 - .68 (55.33 - 49.71) = 47.47
C) **Significance Of Difference Among Adjusted Y Means**

S.D. y.x. = \sqrt{59.59} = 7.72

SED between any two adjusted means

\[
\text{SED} = \frac{\text{S.D. yx} \times \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}{\sqrt{\text{df}}}
\]

\[
= 7.72 \times \sqrt{\frac{1}{30} + \frac{1}{30}}
\]

\[
= 7.72 \times 0.26 = 2.01
\]

For df. = 116, t .05 level = 1.66 (One tailed)

1) \( t \) for \( O_2 \) and \( O_4 \) = 2.82*
2) \( t \) for \( O_2 \) and \( O_5 \) = 1.00
3) \( t \) for \( O_2 \) and \( O_6 \) = 2.38*

* Significant at 0.05 level.

From the above results it is seen that the two experimental groups are on par on achievement scores. While \( O_2 \) is significantly superior than \( O_4 \) and \( O_6 \), the control groups.

Hence the treatment through programme is effective.

From above, the Null Hypothesis Formulated for Achievement is rejected and the Alternative Hypothesis i.e. 'The treatment through programme is effective for the change in the achievement scores in the positive direction is accepted.

10.06 **WHO PROFITED MORE?**

The further interest of the researcher was to find out the effect of the programme (on scores of study habits) on I.O. level. To serve this purpose the researcher arranged the scores of students according to three I.O. levels.
Below average
Average
Above average

The table below shows the statistics of inventory scores on study habits in tabulated form according to I.Q. levels.

**TABLE NO. 10.10**

<table>
<thead>
<tr>
<th>Groups</th>
<th>I.Q. Level</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>SEM</th>
<th>SED</th>
<th>r</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>0₁</td>
<td>Below</td>
<td>09</td>
<td>66.67</td>
<td>7.5</td>
<td>2.50</td>
<td>2.01</td>
<td>.63</td>
<td>1.6</td>
</tr>
<tr>
<td>0₂</td>
<td>Average</td>
<td>09</td>
<td>69.89</td>
<td>5.06</td>
<td>1.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0₁</td>
<td>Average</td>
<td>15</td>
<td>65.53</td>
<td>9.93</td>
<td>2.56</td>
<td>2.59</td>
<td>.40</td>
<td>291*</td>
</tr>
<tr>
<td>0₂</td>
<td></td>
<td>15</td>
<td>73.07</td>
<td>8.15</td>
<td>2.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0₁</td>
<td>Above</td>
<td>06</td>
<td>65.00</td>
<td>8.07</td>
<td>3.29</td>
<td>1.98</td>
<td>.83</td>
<td>3.37</td>
</tr>
<tr>
<td>0₂</td>
<td>Average</td>
<td>06</td>
<td>71.67</td>
<td>8.41</td>
<td>3.43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant on .05 level (Appendix No. 31)

**FORMULA:**

i) \[ \sigma_D = \sqrt{\frac{(S.D_1)^2}{N_1} + \frac{(S.D_2)^2}{N_2}} \]

ii) \[ r = \frac{\Sigma xy - NMxMy}{\sqrt{(\Sigma x^2 - NM^2x)(\Sigma y^2 - NM^2y)}} \]

iii) \[ t = \frac{\text{Actual Mean Difference}}{\sigma_D} \]

From the table given above, it is seen that average and above average groups of I.Q. level show the significant results on 't.' It means that these groups were benefited more with
this treatment. But the treatment is not so much effective to below average students.

**Implication of the Results**

The Review of Related Literature has revealed that study habits are directly related to the academic achievement. The present study has explored the same relationship between these two variables. Hence if one wants to increase the achievement of the students and minimize the wastage due to failures; the study habits should be improved.

From the above results and discussions, it is seen that the programme is effective for change in scores on study habits and achievement in the desired direction.

Hence this subject should be introduced in the curriculum at different school levels so as to increase the study habits/skills and achievement of the students.

**10.07 CONCLUSIONS**

(1) For finding out the efficacy of the programme the Solomon Four Group Experimental Design was selected as it controls all the aspects of the internal validity.

(2) The programme was prepared in the light of previous work and the books. It was finalized after taking three tryouts.
(3) The four groups were selected randomly according to the requirement of the Experimental Design.

(4) The four groups selected for experiment were on par on I.Q. and achievement scores but significantly differ with the scores on study habits.

(5) Analysis of Variance was made for testing hypothesis No.1 for study habits scores. The hypothesis was not rejected. Hence the programme was effective on study habits scores.

(6) Analysis of Covariance was made for testing the hypothesis No.2 for achievement. The hypothesis was not rejected. Hence the programme was also effective for change in achievement scores in positive direction.

(7) The programme was effective for such students whose I.Q. levels are average and above average.
CHAPTER TEN
Experiment

References To The Chapter

1. N.L. Gage  Hand Book Of Research On Teaching,
(Chicago, Rand McNally and Co. 1963) page. 194-195

2. H.E. Garatte and R.S. Woodwarth, 'Statistics In
Psychology and Education.' (Bombay, Vikas, Feffer and
CHAPTER ELEVEN
SUMMARY AND CONCLUSIONS

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   B) School Atmosphere
   C) Negligence of Parents
   D) Lack of Guidance of 'How To Study'
11.03 NEED OF THE STUDY
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