In this chapter, the main effects and interaction effects have been analysed by applying 'F' test, and interaction effects have also been analysed by using 't' test.

ANALYSIS OF VARIANCE

In this experiment three factors - methods of instruction, intelligence levels and socio-economic levels - regard to methods of instruction, intelligence levels and socio-economic levels, were organized in such a way that three way analysis of variance technique could be applied.

The data were collected by scoring pre and post achievement test, intelligence test and socio-economic status scale in both the methods - Audio-lingual and Cognitive-code. The gain scores of individuals for three factors were organized into eighteen cells. In each cell there are 10 students. Details of gain scores for the eighteen cells have been given in Table 20.
Table 20 indicates that there are 3651 scores in Audio-lingual (A₁) group and the total number of scores in Cognitive-code method (A₂) was found to be 4509. The table also shows that the total numbers of scores obtained by the students belonging to high, average and low levels of intelligence in both treatment groups, were found to be 3930, 2748 and 1432 respectively. The total numbers of obtained scores by students for the three levels of socio-economic status.
FREQUENCY POLYGON FOR THE DISTRIBUTION OF GAIN SCORES IN AUDIO-LINGUAL AND COGNITIVE-CODE

SCORES

SCALE
OX-AXIS 1 cm = 1 CLASS INTERVAL
OY-AXIS 2 cm = 5 FREQUENCIES

--- AUDIO-LINGUAL
--- COGNITIVE-CODE

SOURCE: APPENDIX B4 AND B5

FIGURE No. 4
FREQUENCY POLYGON FOR THE DISTRIBUTION OF GAIN SCORES AT DIFFERENT LEVELS OF INTELLIGENCE FOR AUDIO-LINGUAL GROUP

SOURCE: APENDIX B6

FIGURE No. 5
FREQUENCY POLYGON FOR THE DISTRIBUTION OF GAIN SCORES AT DIFFERENT LEVELS OF INTELLIGENCE FOR COGNITIVE-CODE GROUP

SCALE
OX- AXIS 1Cm = 1CLASS INTERVAL
OY- AXIS 1Cm = 1FREQUENCY

HIGH
AVERAGE
LOW

FIGURE No. 6
FREQUENCY POLYGON FOR THE DISTRIBUTION OF GAIN SCORES AT DIFFERENT LEVELS OF SOCIO-ECONOMIC STATUS FOR AUDIO-LINGUAL GROUP

SCALE
OX - AXIS 1 cm = 1 CLASS INTERVAL
OY - AXIS 1 cm = 1 FREQUENCY

SOURCE: APPENDIX B8
FIGURE No. 7
Frequency polygon for the distribution of gain scores at different levels of socio-economic status for cognitive codegroup.

Source: Appendix B3

Figure No. 8
in both the treatment groups, were found to be 3062, 2712 and 2386 respectively.

The distribution of scores for the three factors indicates that there is a difference between methods of instruction. Attainment seems high for students belonging to high intelligence as compared to average and low level of intelligence for both the methods and the attainment appears to be varied for different levels of socio-economic status in both the methods. Further analysis of these scores for all the three levels has been attempted in this very chapter.

The distribution of gain achievement test scores in $A_1$ and $A_2$ along with the scores for intelligence levels and socio-economic status levels in each method has also been graphically represented in figures 4, 5, 6, 7 and 8.

The total sum of squares, the sum of between subjects and the sum of within subjects are as follows:

Total Sum of Squares - ($SS_T$)

$SS_T = (67)^2 + (59)^2 + \ldots + (8)^2 + (11)^2 - \frac{(8160)^2}{150}$

$= 441468 - 369920$

$= 71548$
The total sum of squares (SS_T) was calculated by adding the squares of all 180 observations and subtracting it from the correction factor. Thus, the total sum of squares (SS_T) was found to be 71543.

Sum of Squares Between-Subjects - (SS_b)

\[ SS_b = \frac{(609)^2}{10} + \frac{(431)^2}{10} + \ldots + \frac{(150)^2}{10} - \frac{(3160)^2}{180} \]

\[ = 43351.40 - 369920.20 \]

\[ = 63931.4 \]

The sum of squares between subjects was calculated by adding the squares of the total number of scores obtained by each individual and dividing it by ten and then subtracting it from the correction factor. The sum of squares between subjects was found to be 63931.4

Sum of Squares Within-Subject - (SS_w)

\[ SS_w = SS_T - SS_b = 71543.0 - 63931.4 \]

\[ = 7616.60 \]

The sum of squares within subjects was calculated by subtracting the value of SS_b from the value of SS_T. The sum of squares of within subjects (SS_w) was found to be 7616.60.
The details of tables for A x B, A x C, B x C and A x B x C have been given in the following pages.

**TABLE 21**

**SCORES FOR A x B**

*Methods x Intelligence Levels*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>A₁</th>
<th>A₂</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>B₁</td>
<td>1723</td>
<td>2207</td>
<td></td>
<td>3930</td>
</tr>
<tr>
<td>B₂</td>
<td>1092</td>
<td>1656</td>
<td></td>
<td>2748</td>
</tr>
<tr>
<td>B₃</td>
<td>836</td>
<td>486</td>
<td></td>
<td>1422</td>
</tr>
<tr>
<td>Total</td>
<td>3651</td>
<td>4509</td>
<td></td>
<td>8160</td>
</tr>
</tbody>
</table>

Table 21 shows the total number of scores in A₁ and A₂ along with the total number of scores for each level of intelligence in both the treatments.

The total number of scores in A₁ treatment was found to be 3651 and in A₂ treatment, it was 4509. The analysis of A x B is as follows:

\[
SS_a = \frac{(3651)^2}{90} + \frac{(4509)^2}{90} - \frac{(8160)^2}{180}
\]

\[
= 374009.8 - 369920
\]

\[
= 4089.8
\]
SSa was calculated by adding the squares of the total number of scores of $A_1$ and $A_2$ treatments and dividing it by the number of subjects and then subtracting it from the correction factor. The $SS_a$ was found to be 4089.8.

\[
\text{Cells } A \times B = \frac{(1723)^2}{30} + \frac{(2207)^2}{30} + \ldots + \frac{(646)^2}{30} - \frac{(8160)^2}{120}
\]

\[
= 429636.33 - 36930.00
\]

\[
= 59766.33
\]

The value of cells $A \times B$ was calculated by adding the squares of scores in each cell and dividing it by the total number of subjects and then subtracting it from the correction factor. The value of cells $A \times B$ was found to be 59766.33.

\[
SS_b = \frac{(3930)^2}{60} + \frac{(2748)^2}{60} + \frac{(1422)^2}{60} - \frac{(8160)^2}{120}
\]

\[
= 419878.8 - 369920
\]

\[
= 49958.8
\]

The value of $SS_b$ was calculated by adding the squares of total scores for high, average and low levels in both the treatments and dividing it by the total number of subjects in each level of intelligence and then subtracting it from the correction factor. The value of $SS_b$ was found to be 49958.8.
The interaction value of A x B (Methods x Intelligence) was calculated by subtracting $SS_a$ and $SS_b$ from cells A x B. The value of interaction of A x B was found to be 5717.73.

Table 22 gives the total numbers of scores in $A_1$ treatment for high, average and low socio-economic levels which were found to be 1370, 1251 and 1030 respectively. In $A_2$
treatment, the total numbers of scores for high, average and low socio-economic levels were found to be 1692, 1461 and 1356 respectively.

The analysis of A \times C is as follows:

\[ SS_c = \frac{(3062)^2}{60} + \frac{(2712)^2}{60} + \frac{(2386)^2}{60} - \frac{(8160)^2}{180} \]
\[ = 373729.733 - 369920 \]
\[ = 3809.733 \]

The \( SS_c \) was calculated by adding the squares of total scores for high, average and low socio-economic levels in both the treatments and dividing it by the number of subjects in each level and subtracting it from the correction factor. The value of \( SS_c \) was found to be 3809.733.

Cells \( A \times C = \frac{(1370)^2}{30} + \frac{(1251)^2}{30} + \frac{(1030)^2}{30} + \frac{(1461)^2}{30} + \frac{(1692)^2}{30} + \frac{(1356)^2}{30} + \frac{(8160)^2}{30} \]
\[ = 377964.06 - 369920 \]
\[ = 8044.06 \]

The value of cells \( A \times C \) was calculated by adding the squares of total scores in each cell of \( A \times C \) table and dividing it by the total number of observations in each cell and then subtracting it from the correction factor. The value of cells \( A \times C \) was found to be 8044.06.
The interaction value of $A \times C$ or $SS_{ac}$ was calculated by subtracting $SS_a$ and $SS_c$ from cells $A \times C$. The obtained value of $A \times C$ interaction was found to be $144.527$.

**Table 23**

**Scores for $B \times C$**

(Intelligence x Socio-economic Status)

<table>
<thead>
<tr>
<th>$C$</th>
<th>$B_1$</th>
<th>$B_2$</th>
<th>$B_3$</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_1$</td>
<td>1392</td>
<td>1050</td>
<td>620</td>
<td>3062</td>
</tr>
<tr>
<td>$C_2$</td>
<td>1314</td>
<td>902</td>
<td>496</td>
<td>2712</td>
</tr>
<tr>
<td>$C_3$</td>
<td>1224</td>
<td>796</td>
<td>366</td>
<td>2386</td>
</tr>
<tr>
<td>Total</td>
<td>3930</td>
<td>2743</td>
<td>1482</td>
<td>8160</td>
</tr>
</tbody>
</table>

Table 23 indicates that the total numbers of scores in high ($B_1$), average ($B_2$) and low ($B_3$) levels of intelligence were found to be 3930, 2743 and 1482 respectively. The total numbers of scores for high ($C_1$), average ($C_2$) and low ($C_3$)
socio-economic levels were found to be 3062, 2712 and 2386 respectively.

The analysis of B x C is as follows:

\[
SS_b = 49958.8 \\
SS_c = 3309.733 \\
Cells B x C = \frac{(1392)^2}{20} + \frac{(1394)^2}{20} + \ldots + \frac{(366)^2}{20} - \frac{(3160)^2}{180} \\
= 53906.4
\]

The value of cells for B x C was calculated by adding the squares of scores of each cell of B x C table and dividing it by the total number of observations in each cell and then subtracting it from the correction factor. The obtained value of cells for B x C was found to be 53906.4.

\[
SS_{bc} = Cells B x C - SS_b - SS_c \\
= 53906.4 - 49958.8 - 3309.733 \\
= 137.867
\]

The interaction value of B x C (Intelligence levels and socio-economic status levels) was calculated by subtracting \(SS_b\) and \(SS_c\) from cells B x C. The obtained interaction value of B x C was found to be 137.867.

A perusal of Table 20 reveals that the total numbers of scores in \(A_1\) and \(A_2\) treatments were found to be 3651 and
4509 respectively. It may also be noted that total numbers of scores for different intelligence levels - B₁, B₂ and B₃ were found to be 3930, 2748 and 1432 respectively. The total numbers of scores for different socio-economic levels i.e. C₁, C₂ and C₃ were found to be 3062, 2712 and 2336 respectively.

It may be observed from Table 20 that the total numbers of scores in A₁ and A₂ treatments were found to be 3651 and 4509 respectively. It is also obvious that the total number of scores for different intelligence levels - B₁, B₂ and B₃ was found to be 3930.

The analysis of A x B x C is as follows:

\[
\begin{align*}
SS_a &= 4089.8 \\
SS_b &= 49958.8 \\
SS_c &= 3309.733 \\
SS_{ab} &= 5717.73 \\
SS_{ac} &= 144.527 \\
SS_{bc} &= 137.367
\end{align*}
\]

Cells A x B x C = \(\frac{(609)^2}{10} + \frac{(585)^2}{10} + \ldots + \frac{(150)^2}{10} - \frac{(8160)^2}{120}\)

= 433851.4 - 369920.00

= 63931.4

The value of A x B x C cells was calculated by adding the squares of scores of each cell and dividing it by the number
of total observations in each cell and then subtracting it from the correction factor. The obtained value of cells $A \times B \times C$ was found to be 63931.4.

$$SS_{abc} = \text{Cells } A \times B \times C - SS_a - SS_b - SS_c - SS_{ab} - SS_{ac} - SS_{bc}$$

$$= 63931.4 - 4089.4 - 40958.8 - 3809.733 - 5717.731 - 144.527 - 137.867$$

$$= 72.943$$

The interaction value of $A \times B \times C$ was calculated by subtracting $SS_a$, $SS_b$, $SS_c$, $SS_{ab}$, $SS_{ac}$ and $SS_{bc}$ from cells $A \times B \times C$. The obtained value of $A \times B \times C$ interaction was found to be 72.943.

**TABLE 24**

**TABLE OF ANALYSIS OF VARIANCE**

<table>
<thead>
<tr>
<th>Sources of Variation</th>
<th>Sum of Squares</th>
<th>d.f.</th>
<th>Mean sum of Squares</th>
<th>'F'</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4089.8</td>
<td>1</td>
<td>4089.8</td>
<td>36.987*</td>
</tr>
<tr>
<td>B</td>
<td>49958.8</td>
<td>2</td>
<td>24979.4</td>
<td>531.296*</td>
</tr>
<tr>
<td>C</td>
<td>3809.733</td>
<td>2</td>
<td>1904.8665</td>
<td>40.515*</td>
</tr>
<tr>
<td>A x B</td>
<td>5717.73</td>
<td>2</td>
<td>2858.865</td>
<td>60.806*</td>
</tr>
<tr>
<td>A x C</td>
<td>114.527</td>
<td>2</td>
<td>72.2635</td>
<td>1.536</td>
</tr>
<tr>
<td>B x C</td>
<td>137.867</td>
<td>4</td>
<td>34.466</td>
<td>.733</td>
</tr>
<tr>
<td>A x B x C</td>
<td>72.943</td>
<td>4</td>
<td>18.235</td>
<td>.733</td>
</tr>
<tr>
<td>Error within</td>
<td>7616.6</td>
<td>162</td>
<td>47.016</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>71543.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at .01 level
ANALYSIS OF SINGLE EFFECTS

Table 24 shows that the 'F' value for single effects of A, B and C is significant. The 'F' value for methods of instruction (A) was found to be 86.887 with the degree of freedom 1 and 162. The obtained 'F' value was found significant even at .01 level of confidence. It has been found by the size of the 'F' ratio that the two methods of teaching Hindi sentence-patterns subjected to experimental examination in this research produce singly differential results for the learner. The 'A' mean square corresponds to a comparison between the means for one and two presentations averaged over the three levels of 'B' and the three levels of 'C'. The mean achievement for the second level of 'A' is 89.73. The fact that 'A' mean square is significant leads to conclude that these two means differ significantly. It may, thus, be observed that the Cognitive-code method in an over all view is definitely superior to the Audio-lingual method.

Similarly, the single effect of 'B' represents a comparison among mean achievements for \( B_1 \) (High intelligence), \( B_2 \) (Average intelligence) and \( B_3 \) (Low intelligence) averaged over the two levels of 'A' and three levels of 'C'. Table 24 indicates that 'F' value for intelligence levels (B) was found to be 531.296 with the degrees of freedom 2 and 162. The obtained 'F' value was significant even at .01 level of confidence.
The mean achievement for high intelligence in Audio-lingual method is 57.433, for average group it is 36.40 and for low intelligence group it comes to 24.53. The mean achievement for high intelligence in Cognitive-code method is 73.56, for average intelligence, it is 55.2 and for low intelligence, it is 21.533.

Thus, the single effect of intelligence expectedly shows different results for different levels leading to the familiar conclusion that the intelligent children learn better than the less intelligent ones. This effect is highly significant. It may be asserted that the achievement of students belonging to high level of intelligence is superior to that of average and low levels of intelligence for both the methods pertaining to Audio-lingual and Cognitive-code. Further, it is also evident that the achievement of students belonging to average level of intelligence is superior to that of low level with respect to both methods.

The 'F' ratio for socio-economic status (C) was found to be 40.515 with the degree of freedom 2 and 162. The obtained 'F' value was significant at .01 level of confidence. It may, therefore, be inferred that the differences in the socio-economic strata are also reflected in the degree of achievement in learning.

The mean socio-economic status achievement in Audio-lingual
GRAPHICAL REPRESENTATION OF
A x B INTERACTION

SCALE: 2 cm = 20

SOURCE: TABLE 21

FIGURE NO. 9
for high level is 45.66, for average level it is 41.70 and for low level it is 34.33. In Cognitive-code method the mean achievement for high socio-economic status is 56.40, for average it is 48.70 and for low it is 45.2.

Thus, it may be stated that the achievement of students belonging to high socio-economic status is superior to that of average and low levels for both the methods. It is also obvious that the achievement of students belonging to average socio-economic status is superior to that of low socio-economic status under both the methods - Audio-lingual and Cognitive-code. The children drawn from higher socio-economic strata of society and income group learn better than those taken from the lower socio-economic strata of society.

TWO FACTOR INTERACTION EFFECTS

The 'F' ratio for interaction effects of A x B (Methods x Intelligence) was found to be 43.039 with the degrees of freedom 2 and 162. The 'F' value was significant at .01 level of confidence. Of the three possible two factor interaction effects, only one viz. A x B, where intelligence interacts with methods has come out to be significant which is graphically represented in Fig. 9. This makes explicit that the difference between \( A_1 \) and \( A_2 \) is not independent of the levels of intelligence \( (B) \) or equivalently that the difference among \( B_1 \) and \( B_2 \) and \( B_3 \) is not independent of the
GRAPHICAL REPRESENTATION OF A x C AND B x C INTERACTIONS

SCALE: 2 cm = 20

SOURCE: TABLE 22, 23

FIGURE NO. 10
levels of A. The other two viz. A x C (Methods x Socio-economic status) and B x C (Intelligence x Socio-economic status) are well within the limits of chance as to the size of 'F'. The interaction effects of A x C and B x C have been graphically represented in Fig. 10.

This leads to an interesting finding that intelligence and socio-economic status are not at least in this sample correlated. This is surprising since normally the two would be expected to correlate. The reason of this unexpected result is that there has been a restriction of range in the sample which is drawn from the white collar classes mainly with differences only in size of income. The intelligence levels and methods are correlated (since 'F' for their interaction is significant) and this would obviously imply that a particular method may better answer the need of learner for a finer level of intelligence. It is here observed that the more intelligent learn better by the Cognitive code method. The lower level of intelligence on the other hand requires the other method i.e. the Audio-lingual method.

This finding has important implications for methodology of instruction because no one method can be regarded as superior to the other in an absolute sense. For choosing the most suitable method for a given group of learner, the level of their intelligence must be considered.
GRAPHICAL REPRESENTATION OF A × B × C INTERACTIONS

A\(_1\)

\begin{align*}
Y & = 40 \\
30 & \quad \quad 20 \\
10 & \quad \quad 0
\end{align*}

\begin{align*}
B_1 & \quad \quad B_2 \quad \quad B_3
\end{align*}

\begin{align*}
C_1 & \quad \quad C_2 \quad \quad C_3
\end{align*}

A\(_2\)

\begin{align*}
Y & = 40 \\
30 & \quad \quad 20 \\
10 & \quad \quad 0
\end{align*}

\begin{align*}
B_1 & \quad \quad B_2 \quad \quad B_3
\end{align*}

\begin{align*}
C_1 & \quad \quad C_2 \quad \quad C_3
\end{align*}

A = A\(_1\) + A\(_2\)

\begin{align*}
Y & = 80 \\
60 & \quad \quad 40 \\
20 & \quad \quad 0
\end{align*}

\begin{align*}
B_1 & \quad \quad B_2 \quad \quad B_3
\end{align*}

\begin{align*}
C_1 & \quad \quad C_2 \quad \quad C_3
\end{align*}

SCALE: \(1\text{ cm} = 20\)

SOURCE: TABLE 20 FIGURE No. 11
TRIPLE INTERACTION EFFECTS

The three way interaction of methods (A), levels of intelligence (B) and socio-economic status (C) does not occur to the extent of a significant 'F'. It may, thus, be interpreted that the arrangements in the form of A x B x C do not interact significantly. All the three variables are independent of one another. The triple interaction effect of A x B x C has been represented in Fig. 11.

We are then left with the significant conclusion that while each of the three factors viz. methods, intelligence and socio-economic status produce differential results by themselves, the only significant inter-action occurs between intelligence level and methods suggesting a selective use of methodology for each type of learner in respect of intelligence. This would mean that difference in learning would be found among those random groups treated separately by the two methods, also when either method is used, differences among persons of different levels of intelligence and socio-economic status will be found. But results will improve if method and intelligence of the learner are judiciously combined in the instructional process.

ANALYSIS OF INTERACTION EFFECTS BY APPLYING 't' TEST

From the results obtained from the table of analysis of variance (Table 24) it is obvious that the main effects of
A (Methods), B (Intelligence) and C (Socio-economic Status) are having significant 'F' values and there is an interaction between A x B only. The factors which show significant 'F' values, owing to significant level-wise difference are of Methods (A), Intelligence (B) and Socio-economic Status (C).

STUDY OF SIGNIFICANT MAIN EFFECTS

As explained earlier, all the three variables - Methods (A), Intelligence (B) and Socio-economic Status (C) came out to be significant factors in the analysis of variance table. A detailed further analysis is given below -

(A) Methods

The 'F' value for methods was 86.987. This obtained value is significant. The significance of 'F' shows the difference between two types of presentations. The mean achievement is high in Cognitive-code method. It may, therefore, be concluded that Cognitive-code method is more effective in comparison to Audio-lingual method.

(B) Intelligence

Pair-wise Comparison of Levels

It may be further observed from analysis of variance table that the main effect of intelligence (B) is significant. To know where the actual difference lies, the pair-wise
comparison of mean achievements at different levels of B has been made in the following table:

**TABLE 25**

PAIR-WISE COMPARISON OF MEANS AT DIFFERENT LEVELS OF (B)

<table>
<thead>
<tr>
<th>Level</th>
<th>Mean</th>
<th>Pair</th>
<th>'Difference'</th>
<th>SE&lt;sub&gt;dm&lt;/sub&gt;</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&lt;sub&gt;1&lt;/sub&gt;</td>
<td>65.5</td>
<td>B&lt;sub&gt;1&lt;/sub&gt;, B&lt;sub&gt;2&lt;/sub&gt;</td>
<td>19.7</td>
<td>1.251</td>
<td>15.747*</td>
</tr>
<tr>
<td>B&lt;sub&gt;2&lt;/sub&gt;</td>
<td>45.8</td>
<td>B&lt;sub&gt;1&lt;/sub&gt;, B&lt;sub&gt;3&lt;/sub&gt;</td>
<td>40.8</td>
<td>1.251</td>
<td>32.613*</td>
</tr>
<tr>
<td>B&lt;sub&gt;3&lt;/sub&gt;</td>
<td>24.7</td>
<td>B&lt;sub&gt;2&lt;/sub&gt;, B&lt;sub&gt;3&lt;/sub&gt;</td>
<td>21.1</td>
<td>1.251</td>
<td>16.866*</td>
</tr>
</tbody>
</table>

\( N = 60 \)

* Significant at .01 level

It is obvious from Table 25 that 't' value is much more significant for average level of intelligence as compared to the other 't' value for high and low levels of intelligence. Thus, the highest mean achievement is at average level of intelligence (B<sub>2</sub>) and it is significantly greater than the mean achievement at the high and low levels of intelligence.

Next to B<sub>2</sub>, the 't' value is significant for low level of intelligence (B<sub>3</sub>) and next to it, the mean achievement is also significant at high level of intelligence. Thus, it may be
interpreted that the difference among all the levels of B is significant.

(C) Socio-economic Status

Pair-wise Comparison of Levels

The Analysis of Variance Table (24) shows that the main effect of socio-economic status is significant. The pair-wise comparison of mean achievements at different levels of socio-economic status has been given in Table 26.

TABLE 26

PAIR-WISE COMPARISON OF MEANS AT DIFFERENT LEVELS OF (C)

<table>
<thead>
<tr>
<th>Level</th>
<th>Mean</th>
<th>Pair</th>
<th>Difference</th>
<th>SE_{dm}</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_1</td>
<td>51.033</td>
<td>C_1, C_2</td>
<td>5.333</td>
<td>1.251</td>
<td>4.662*</td>
</tr>
<tr>
<td>C_2</td>
<td>45.2</td>
<td>C_1, C_3</td>
<td>11.267</td>
<td>1.251</td>
<td>9.006*</td>
</tr>
<tr>
<td>C_3</td>
<td>39.766</td>
<td>C_2, C_3</td>
<td>5.434</td>
<td>1.251</td>
<td>4.344*</td>
</tr>
</tbody>
</table>

N = 60

* Significant at .01 level

It is evident from the above table that the 't' value is much more significant for average level of socio-economic status (C_2). The highest mean achievement is for the group
belonging to middle level of socio-economic status. It may be further observed that it is significantly greater than the mean achievements at high and lower levels of C. It may, thus, be interpreted that the difference among all the levels of C is significant.

INTERACTION EFFECTS

As it is apparent from Table 24 that only the interaction between A (Methods) and B (Intelligence) has come out to be significant. To explore the exact sources of significance of interaction, the 't' test has been applied to find out how the difference in the means of achievement at both levels of methods differed with different levels of intelligence.

A x B Interaction Effects

The interaction effects of A x B (Methods x Intelligence levels) were further analysed by applying the 't' test. The means of the scores in the different cells of A and B are given in Table 27.

<table>
<thead>
<tr>
<th>B Intelligece</th>
<th>A Cell</th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>57.433</td>
<td>73.566</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>36.4</td>
<td>55.2</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>27.533</td>
<td>21.533</td>
<td></td>
</tr>
</tbody>
</table>

\[ N = 30 \]
The significance of difference of the difference in the means of the pairs of levels of 'A' at different levels of 'B' were tested and results have been given in Table 28.

**TABLE 28**

't' RATIOS FOR DIFFERENCE OF MEANS BETWEEN DIFFERENT LEVELS OF A and B

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Pair of the Difference</th>
<th>'Difference'</th>
<th>SE_{dm}</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>((A_1B_1 - A_2B_1) - (A_1B_2 - A_2B_2))</td>
<td>2.667</td>
<td>2.503</td>
<td>1.065</td>
</tr>
<tr>
<td>2</td>
<td>((A_1B_1 - A_2B_1) - (A_1B_2 - A_2B_2))</td>
<td>10.133</td>
<td>2.503</td>
<td>4.048*</td>
</tr>
<tr>
<td>3</td>
<td>((A_1B_2 - A_2B_2) - (A_1B_3 - A_2B_3))</td>
<td>12.8</td>
<td>2.503</td>
<td>5.113*</td>
</tr>
</tbody>
</table>

* Significant at .01 level

Table 28 brings out that 't' value for interaction effects of \(AB_1\) and \(AB_2\) was found to be 1.065. The obtained 't' value was not significant even at .05 level of confidence. It may, therefore, be viewed that \(AB_1\) and \(AB_2\) do not interact significantly. Thus, it may be observed that for within treatments both the Audio-lingual and Cognitive-code methods are equally effective at high and average levels of intelligence but for between treatments Cognitive-code method is more
effective at high and average level of intelligence as compared to audio-lingual method. Audio-lingual is more effective at low level of intelligence.

Table 28 also indicates that 't' value (4.048) for interaction effect $AB_1$ and $AB_3$ was found to be significant at .01 level of confidence. It may be asserted that $AB_1$ and $AB_3$ appear to have interacted significantly. It may, thus, be construed that Cognitive-code method is more effective at high level of intelligence as compared to audio-lingual method. The audio-lingual method on the other hand is more effective at low level of intelligence as compared to Cognitive-code method.

Table 28 also reveals that 't' value for interaction effects of $AB_2$ and $AB_3$ interact significantly. It may, thus, be argued that Cognitive-code method is more effective at average level of intelligence as compared to audio-lingual method. The audio-lingual method, therefore, is more effective at low level of intelligence.