CHAPTER - VIII

INTERPRETATION AND DISCUSSION OF THE DATA

Intelligence-Treatment Interaction
Creativity-Treatment Interaction
Anxiety-Treatment Interaction
Extraversion-Treatment Interaction

References
Three groups of students were separately taught by the three treatment modes namely, linear and branching style of programming and expository method. Students of each of these three groups were then divided into high and low ability groups on the basis of the different personality and mental ability variables under investigation. Only such students were included in these groups as would make the high as well as low groups on any personality variable comparable for the three treatment modes. Means of post test achievement scores for the high and low groups taught by different treatment modes were computed. These means were then adjusted for the two control variables namely previous achievement and intelligence by employing analysis of covariance. This analysis has been presented in the preceding chapter.

The interaction between a personality variable and different treatment modes was studied by comparing the post test achievement scores obtained by students high and low on each personality variable for different treatment modes. The 'F' value obtained in the analysis of covariance were employed for comparing these high and low groups. It was considered that if these values are significant even for one of the treatment modes under investigation, the inter-

*The post test means for high and low intelligence groups were adjusted for previous achievement only. Other variables were adjusted for intelligence as well as previous achievement.
action could be disordinal and significant. If the difference between the high and low groups on any personological variable for two treatment modes was insignificant, the treatment lines could cross but the angle between them would be so small as not to warrant any significant interaction.

Adjusted post achievement scores obtained by students high as well as low on any personological variable for different pairs of treatment modes were then compared to secure evidence for assigning treatment modes for optimal achievement. The interaction between different personological variables and treatment modes has been presented in the following pages.

INTELLIGENCE-TREATMENT INTERACTION:

Table XCIII presents the adjusted, post test means and 'F' values for differences between post test scores of high and low intelligence groups taught through the three treatment modes.

**TABLE-XCIII**

ADJUSTED ACHIEVEMENT Means OF HIGH AND LOW INTELLIGENCE GROUPS AND THEIR F VALUES FOR DIFFERENT TREATMENT MODES.

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>Linear Style</th>
<th>Branching Style</th>
<th>Expository Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>F Value</td>
<td>Mean</td>
</tr>
<tr>
<td>High</td>
<td>48.34</td>
<td>24.51°</td>
<td>55.92</td>
</tr>
<tr>
<td>Low</td>
<td>43.51</td>
<td></td>
<td>33.52</td>
</tr>
</tbody>
</table>

* Significant at .01 level
The 'F' values for the linear style of programming is 24.51 which shows that there is significant interaction between intelligence and achievement through linear style of programming. The high intelligence group achieved higher as compared to the low intelligence group. This finds support in the studies by Bhushan (1973), Sasanwal (1978), O'Meilly (1969), Kapadia (1972), Agarwal (1978), Davis and Leith (1967), Evans (1965), Hatch and Flint (1962), Limbert and others (1962) and Shay (1961), but contradicts with those of Toluow (1964), Glaser and Reynolds (1962) and Porter (1961) who did not obtained any significant interaction.

The 'F' value for branching style of programming is 124.3, which is also highly significant. The high intelligence group achieved significantly higher through branching style than the low intelligence group, which shows significant interaction between intelligence and achievement through branching style of programming. This finding is supported by the studies of Agarwal (1978), Kapadia (1972), Hartley (1965) and Silverman (1961).

The expository method has yielded a 'F' value of 0.25 only which is highly insignificant showing that the achievement of high and low intelligence groups when taught through expository method is not statistically different. This finding seems to be a little unbecoming, for it has long been considered rather axiomatic that high intelligence students
should achieve higher than their lesser endowed counterparts when taught by any method let alone by conventional method of teaching. The expository method employed in the present study can well be considered as conventional one. This could have been due to the nature of the subject matter and subjects under study. However, high intelligence group achieved slightly higher by this method in comparison to low intelligence ones.

The above analyses do not provide any evidence for assignment of treatment modes to the two groups of the students. Evidence for this purpose was obtained by comparing the achievement through any of the two treatment modes for either of the intelligence groups. For this purpose, graph of adjusted post test means of students high and low on intelligence for different pairs of treatment modes were drawn and 't' values for difference in post test means were computed for each pair. The interaction between these different pairs were studied according to suggestions of Lubin (1967), racht and Glass (1968) with some modifications by the present investigator. The rationale of these modifications have been presented in Chapter III.

5. Comparison between Linear and Branching Styles of Programming

Table XCIV and Fig. 3(a) presents the comparison of post test means for high and low intelligence groups of students taught through linear and branching style of programming.
TABLE-XCIV

't' VALUES FOR DIFFERENCE BETWEEN POST TEST MEANS OF HIGH AND LOW INTELLIGENCE GROUPS TAUGHT THROUGH LINEAR AND BRANCHING STYLES OF PROGRAMMING.

<table>
<thead>
<tr>
<th>Treatment modes</th>
<th>Low Intelligence 't' Value</th>
<th>High Intelligence 't' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>Adjusted mean</td>
</tr>
<tr>
<td>Linear</td>
<td>43.51</td>
<td>48.38</td>
</tr>
<tr>
<td>Branching</td>
<td>33.53</td>
<td>55.92</td>
</tr>
</tbody>
</table>

*Significant at 0.1 level.

It will be seen from the Fig. 9(a) that the two treatment lines cross which shows that while the linear style of programming is better for the low intelligence students, the branching style has proved to be more effective for the high intelligence group. The interaction is disordinal according to the standard suggested by Lubin (1967). It will also be seen from the table that the 't' values between the post test means of high intelligence students taught by the two modes is 1.50, which is insignificant at 0.05 level for 28 degree of freedom.

The 't' values between the post test means for the low intelligence group taught through the two treatment modes is 1.91, which is also insignificant at 0.05 level. Thus the interaction though disordinal according to Lubin (1967) is not so according to Bracht and Glass (1968) and the present investigator. The low intelligence students may be taught
more profitably by the linear style of programming and the high intelligence students by the branching style of programming but the evidence is not very trustworthy as the 't' values for both the groups are insignificant at 0.05 level. However, since 't' value for the low intelligence students is significant at 0.1 level, such students may be taught more profitably by the linear style of programming. These results find sufficient support in previous researches. The review of previous researches presented in Chapter IV shows that more than forty five research workers attempted to study the interaction between intelligence and different treatment modes. Of these only two (Singh, 1977; and Hartley, 1965) attempted to study the interaction between linear and branching style of programming and intelligence of the linear learner. The results of these investigations corroborate the findings of the present study to a fair extent.

B. Comparison between Branching Style of Programming and Expository Method:

Table XCV and Fig.9(b) presents the comparison of post test means for high and low intelligence groups of students taught through the branching style of programming and expository method of teaching.

It will be seen from the Fig.9(b) that the two treatment lines cross each other. The interaction is disordinal according to the standard suggested by Lubin (1967). The expository method has come out to be only slightly better for
TABLE-XCV

't' VALUES FOR THE DIFFERENCE BETWEEN POST TEST MEANS OF HIGH AND LOW INTELLIGENCE STUDENTS TAUGHT THROUGH BRANCHING AND EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Low Intelligence</th>
<th>High Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted means</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Branching</td>
<td>33.53</td>
<td>1.08</td>
</tr>
<tr>
<td>Expository</td>
<td>38.06</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.01 level

Low intelligence students. The 't' value being 1.08, which is significant at 0.01 level for 28 degree of freedom. Thus the interaction which is ordinal according to Lubin (1967) is not so according to Fracht and Glass (1968) because the difference at both the levels of intelligence are not significant. However, according to the present investigator, the interaction is ordinal since the 't' values at one of the levels (high intelligence level) is significant beyond 0.05 level. The high group may be assigned the branching style of programming for better achievement but the evidence is not equally sound for low intelligence students because the 't' value of this group is not significant, each at 0.1 level. Sinha (1977) also found that branching programme is superior than conventional for high intelligence students.
C. **Comparison between Linear Style of Programming and Expository Method:**

*Table XCVI* and Fig. 9(c) presents the comparison of post test means of high and low intelligence students taught through linear and expository treatment modes.

**TABLE XCVI**

'T' VALUE FOR THE DIFFERENCE BETWEEN POST TEST MEANS OF HIGH AND LOW INTELLIGENCE STUDENTS TAUGHT THROUGH LINEAR STYLE OF PROGRAMMING AND EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment modes</th>
<th>Low Intelligence</th>
<th>High Intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjustment</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Linear</td>
<td>43.51</td>
<td>-</td>
</tr>
<tr>
<td>Expository</td>
<td>38.06</td>
<td>41.18</td>
</tr>
</tbody>
</table>

It will be seen from the Fig. 9(c) that the two treatment lines do not cross which shows that the interaction is ordinal according to Lubin (1967), Bracht and Glass (1968) and the present investigator. Both high as well as low intelligence students have secured better through linear style of programming as compared to expository method. Thus, there is no evidence of interaction i.e. alternative treatments can not be assigned on the basis of this evidence. Thus there was hardly any need to calculate 't' values for the difference between post test means. Sheehan and Hambleton
(1977), Jodhi (1977), Govinda (1976), Bhushan and Sharma (1975), Patel (1975), Chandaya (1974), Nagar (1971), Ripple and others (1969), Jamieson and others (1969), Besai (1966), and Shah (1964) also could not obtain any significant interaction between intelligence and linear style of programming and expository method. Reed and Hayman (1962) however, obtain significant interaction between these variables which revealed that high intelligence students did better on linear style of programming while the low intelligence students did better by conventional or expository method. The subject matter of their study was 'English-2600' text. Callmadge and Shearer (1969) have shown that subject matter also interacts with treatment modes and personological variables. Therefore, the disparity between the findings of Reed and Hayman (1962) and the present investigator could possibly be due to the difference in the subject matter employed in these investigations.

CREATIVITY-TREATMENT INTERACTION:

Table XCVII presents the adjusted, means and 'F' values for the difference between post test means of high and low creativity groups taught through linear and branching styles of programming and expository method.

The table XCVII shows that the 'F' value for linear style of programming is 5.8 which shows the significant interaction between creativity and achievement through linear style of programming. The low creative students achieved
### TABLE X VII

**ADJUSTED POST ACHIEVEMENT MEANS OF HIGH AND LOW CREATIVITY GROUPS AND THEIR 'F' VALUES FOR DIFFERENT TREATMENT MODES.**

<table>
<thead>
<tr>
<th>Creativity</th>
<th>Linear Style Mean 'F' Value</th>
<th>Branching Style Mean 'F' Value</th>
<th>Expository Method Mean 'F' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>37.80</td>
<td>44.11</td>
<td>17.33</td>
</tr>
<tr>
<td></td>
<td>5.86*</td>
<td>0.35</td>
<td>4.34*</td>
</tr>
<tr>
<td>Low</td>
<td>50.17</td>
<td>33.38</td>
<td>66.38</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.

Significantly higher in comparison to high creative ones. This finds support in the studies of Doty and Doty (1964), Gotkin and Massa (1963), and Stolourow (1962). Welcomer (1973) also obtained a significant interaction between creativity and achievement through linear style of programming, but high creative students achieved higher as compared to the low creativity students in his study. O'Deilly (1969), Ripple and others (1969) and Agarwal (1978) did not find any significant difference between low and high creativity groups.

The 'F' value for branching style of programming is 0.35, which is insignificant showing that the post achievement scores of high and low creatives taught through branching style do not differ significantly. Agarwal (1978) corroborates the findings of the present study.

The expository method has yielded a 'F' value of 4.34 which is significant at 0.05 level for 28 degree of freedom. This shows that a significant interaction exists between creativity and achievement through expository method.
FIG. 10 CREATIVITY - TREATMENT INTERACTION FOR DIFFERENT PAIRS OF TREATMENT MODES
The achievement of low creatives is also higher than that of high creatives when taught through this treatment mode. This is probably due to the fact that expository method has an authoritarian approach, which is known to dampen creativity.

As in the case of intelligence, the above analyses do not provide any evidence for assignment of alternative treatment modes to student of differing levels of creativity. Evidence for this purpose was obtained by comparing the achievement through any of two treatment modes for either of the creativity groups. For this purpose, the graph of adjusted post test means of student high and low on creativity for different pairs of treatment modes were drawn and 't' values for difference in post test means were computed for each pair. The interaction between the different pairs were studied according to the established criteria.

4. Comparison between Linear and Branching Styles of Programming:

Table XVIII and Fig. 10(A) presents the comparison of post achievement test means for high and low creative groups of students taught through linear and branching styles of programming.

It will be seen from the Fig. 10(A) that the two treatment lines cross each other which shows that while the linear styles is better for low creative students, the branching style has proved to be better for high creative...
TABLE-XVIII
't' VALUE FOR DIFFERENCE IN POST TEST MEANS OF HIGH AND LOW CREATIVITY GROUPS TAUGHT THROUGH LINEAR AND BRANCHING STYLE OF PROGRAMMING.

<table>
<thead>
<tr>
<th>Treatment modes</th>
<th>Low Creative</th>
<th>High Creative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Linear</td>
<td>50.17</td>
<td>1.64*</td>
</tr>
<tr>
<td>Branching</td>
<td>39.38</td>
<td>44.11</td>
</tr>
</tbody>
</table>

*Significant at 0.1 level

students. The interaction is, thus, disordinal according to the standard of Lubin (1967). It will also be seen from the above table that the branching style is superior for high creative students and linear style is superior for low creative students. The 't' value between the post test means of high creative students taught through the two modes i.e. linear and branching style is 0.94, which is insignificant. The 't' value between the post test means of low creative students taught through the two modes is 1.64 which is also insignificant at 0.5 level for 26 degree of freedom. Thus the interaction through disordinal according to standard suggested by Lubin (1967) is not so according to that suggested by Brecht and Glass (1968) and the present investigator. The low creative may be taught by linear style of programming. But the evidence is not very sound as the 't'
value is not significant at 0.05 level in both the cases. However, since the 't' value of low creative taught by two modes is significant at 0.1 level, such students may more profitably be taught by linear style of programming. This is in agreement with Agarwal (1978), who obtained a very low coefficient of correlation between creativity and linear and branching styles of programming i.e. +0.116 and +0.24 respectively.

(B) **Comparison between Branching Style of Programming and Expository Method:**

Table I and Fig. 10(b) presents the comparison of post achievement means for high and low creatives taught through branching expository method.

**Table-IC**

<table>
<thead>
<tr>
<th>Treatment Modes</th>
<th>Low Creative</th>
<th>High Creative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Branching</td>
<td>39.38</td>
<td>3.63*</td>
</tr>
<tr>
<td>Expository</td>
<td>66.08</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .01 level.
It will be seen from the Fig.10(b) that the two treatment lines cross each other which shows that while the expository method is better for the low creatives, the branching style has proved to be better for the high creatives. The interaction is, thus, disordinal according to the criteria of Lubin (1967). Table I also shows that the expository method is better in term of post achievement for low creatives and the branching style is better for high creatives. The 't' value between the post achievement means of high and low creatives taught through the two modes are 40.5 and 3.63 respectively, which are very significant beyond 0.05 level for 28 degree of freedom. Thus the interaction which is disordinal according to the criteria of Lubin (1967) is also disordinal according to Bracht and Glass (1968) and the present investigator. The low creatives may be assigned expository method and the high creatives may be assigned branching style for maximal achievement.

(c) Comparison between linear style of Programming and Expository Method:

Table C and Fig.10(c) presents the comparison of post achievement means for high and low creative students taught through linear style of programming and expository method.

It will be seen from the Fig.10(c) that the two treatment lines cross each other which reveals that while the expository method is better than the linear style of programming for low creatives, the linear style has proved
<table>
<thead>
<tr>
<th>Treatment Modes</th>
<th>Low Creatives</th>
<th>High Creatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>linear</td>
<td>50.17</td>
<td>1.95*</td>
</tr>
<tr>
<td>Expository</td>
<td>66.08</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.1 level
**Significant at 0.01 level.

to be more effective in comparison to expository method for the high creative students. The interaction is thus disordinal according to standard put forth by Lubin (1967). It will also be seen from the table that the 't' value between the post test means of low creative students taught by the two modes is 1.95 which is insignificant at 0.05 level for 28 degree of freedom. The 't' value for high creative students is 3.74 which is significant at 0.01 level for 28 degree of freedom. Thus the interaction which is disordinal as per Lubin (1967) is not so according to that suggested by Brecht and Glass (1968). According to present investigator the interaction is disordinal since the 't' value is significant beyond .05 level at least at one of the end i.e. at high creativity end.
The low creatives may be taught more profitably by the expository method and high creatives may be assigned linear style of programming be better achievement. But the evidence is not very sound for low creatives as the 't' value is not significant at 0.05 level for 28 degree of freedom. However, since the 't' value for low creatives is significant at 0.1 level, such students may be taught through expository method for better achievement. The above findings are supported by Alcombe (1973) who reported that high creative students achieved well under individualized learning situation which the linear style of programming provides. But the study contradicts with that of Ripple et al. (1969) and Crocker et al. (1976) who did not obtained any significant interaction between creativity and the two treatment modes employed.

ANXIETY-TREATMENT INTERACTIO.

Table 1 presents an adjusted means and 'F' values for the difference between post test means of high and low anxiety groups taught through the three treatment modes.

TABLE- I

<table>
<thead>
<tr>
<th>TREATMENT MODES</th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>39.60</td>
<td>53.31</td>
<td>36.09</td>
<td>84.87</td>
<td>0.83</td>
</tr>
<tr>
<td>Linear tyle mean 'F' value</td>
<td>41.53</td>
<td>5.90*</td>
<td>0.83</td>
<td>-4.97</td>
<td>3.68*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.
The table 6I shows that the 'F' value for the linear style of programming is 5.30 which shows that there is significant interaction between anxiety and achievement through linear style of programming. The high anxiety group achieved higher in comparison to low anxiety group. This finds support in the study by Right and Wassereth (1966), Gangopadhyay (1971) and Davis and Leith (1967), however, did not obtained any significant interaction. Kpadi (1972) and O’Heilly and Ripple (1966) also obtained a significant interaction between anxiety and achievement through linear style of programming, but low anxiety group achieved higher as compared to the high anxiety group in their studies. However, the conclusions of the present study i.e. the high anxiety students achieve better as compared to low anxiety students through linear style of programming find support in Lobins (1973) who writes:

The reduced difficulty of programme, their tighter organisation, and reduction of students uncertainty while studying a programme would suggest that these instructional modes ought to be especially beneficial for the performance of high anxiety individuals.

The 'F' value for branching style of programming is 0.83 which is insignificant showing that the achievement of high and low anxiety students when taught through branching style of programming is not statistically different. The finding of this study is supported by the studies of Flynn and Morgan (1966) and Kpadi (1972).
The expository method has yielded a 'F' value of 9.68, which is highly significant beyond 0.05 level for 28 degree of freedom. The high anxiety students achieved higher than the low anxiety students when taught through expository method. This finding is in agreement with most of the related studies (Carnes, 1957; Spielberger, 1962; Salzig, 1964).

As in the case of mental ability variables the above analyses do not provide any evidence for assignment of treatment modes to the two groups of the students. Evidence for this purpose was obtained by comparing the achievement through any of the two treatment modes for either of the anxiety groups. For this purpose, graph of adjusted post test means of students high and low on anxiety, for different pairs of treatment modes were drawn and 't' values for difference in post test means were computed for each pair.

The interaction between these different pairs were studied according to suggestions of Lubin (1967), Brecht and Glass (1968) with some modifications by the present investigator. The rationale of these modifications have been presented in chapter III.

(A) Comparison between Linear and Branching Styles of Programming:

Table 11 and fig.11(a) presents the comparison of post test means for high and low anxiety groups of students taught through linear and branching styles of programming.
TABLE-CII
't' VALUES FOR DIFFERENCE IN POST TEST MEANS OF HIGH AND LOW ANXIETY GROUPS TAUGHT THROUGH LINEAR AND BRANCHING STYLES OF PROGRAMMING.

<table>
<thead>
<tr>
<th>Treatment Modes</th>
<th>Low Anxiety</th>
<th></th>
<th></th>
<th>High Anxiety</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted</td>
<td>'t' Value</td>
<td>Adjusted</td>
<td>'t' Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td></td>
<td>mean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear</td>
<td>34.60</td>
<td>0.27</td>
<td>53.3</td>
<td>2.532*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branching</td>
<td>41.53</td>
<td></td>
<td>36.09</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

It will be seen from the Fig.11(a) that the two treatment lines cross which shows that while the linear style of programming is better for high anxiety group, the branching style has proved to be more effective for the low anxiety group. The interaction is disordinal according to the standard suggested by Lubin (1967). It will be seen from the table that the 't' value between the post test means of high anxiety students taught by the two modes is 2.53, which is significant at 0.5 level for 28 degree of freedom. The 't' value between the post test means for the low anxiety students taught by the two modes is 0.27, which is insignificant. Thus the interaction though disordinal according to Lubin (1967) is not so according to Bracht and Glass (1968) as the difference at both the levels of anxiety are not significant. However, according to the present investigator, the interaction is
disordinal since the 't' value at one of the anxiety levels is significant at 0.05 level. The high anxiety group may be assigned the linear style for better achievement but the evidence is not equally sound for low anxiety group, because the 't' value of this group is not significant even at 0.1 level. His find support from Leith (1366) who writes, "...anxious pupil will do well with linear programmes... the less persistent (less anxious) might fair better with branching programme".

(b) Comparison between Branching Style of Programming and Expository Method.

Table CIII and Fig.11(b) presents the comparison of post achievement means for high and low anxiety students taught through branching style of programming and expository method.

**Table CIII**

"t" V FOR DIFFERENCE IN POST TEST MEANS OF HIGH AND LOW ANXIETY GROUPS TAUGHT THROUGH BRANCHING STYLE OF PROGRAMMING AND EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment mode</th>
<th>Low Anxiety</th>
<th>High Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Braching</td>
<td>41.53</td>
<td>6.5*</td>
</tr>
<tr>
<td>Expository</td>
<td>-4.97</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.01 level.
It will be seen from the Fig.11(b) that the two treatment lines cross each other. The interaction is disordinal according to the standard suggested by Lubin (1967). The expository method is better in terms of post achievement for high anxiety students and the branching style of programming is better for low anxiety students. The 't' values between the post achievement means of high and low anxiety groups taught by the two modes are 6.5 and 6.3 respectively, which are both very significant beyond 0.05 level for 28 degree of freedom. Thus the interaction which is disordinal according to Lubin (1967) is also disordinal according to Bracht and Glass (1968) and the present investigator. The low anxiety group may be assigned branching style of programming while the high anxiety group may be assigned expository method for maximal achievement. Keith (1966) also concluded that low anxiety students achieve high with branching style of programming.

(1) **Comparison between Linear Style of Programming and Expository Method:**

Table IV and Fig.11(c) presents the comparison of post achievement means for high and low anxiety students taught through linear style of programming and expository method.

It will be seen from the Fig.11(c) that the two treatment lines cross each other. The figure reveals that the linear style of programming is better for low anxiety students,
TABLE XIV
't' VALUES FOR THE DIFFERENCE BETWEEN POST TEST MEAN OF HIGH AND LOW ANXIETY STUDENTS TAUGHT THROUGH LINEAR STYLE IN GROGRA IN AN EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment style</th>
<th>Low Anxiety</th>
<th>'t' Value</th>
<th>High Anxiety</th>
<th>'t' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>39.6</td>
<td>8.2*</td>
<td>53.3</td>
<td>7.3*</td>
</tr>
<tr>
<td>Expository</td>
<td>-4.97</td>
<td></td>
<td>84.89</td>
<td></td>
</tr>
</tbody>
</table>

*significant at 0.01 level.

It will be seen from the Fig.11(c) that the two treatment mlines cross each other. The figure reveals that the linear style of programming is better for low anxiety students, the expository method is superior for high anxiety students. The interaction is ordinal according to the standard suggested by Libin (1967). The 't' values between the post achievement means of high and low anxiety students taught by two modes are 7.3 and 8.2 respectively, which are both very significant beyond 0.05 level for 28 degrees of freedom. Thus the interaction is also ordinal according to Bracht and Glass (1968) and the present investigator. The low anxiety students may be assigned linear style of programming while the high anxiety students may be assigned expository method for optimal achievement. This finds support in the studies of Sheehan and Rambleton (1977), Papey and others
(1975), Brown and Leith (1975) and Cowley (1977), Patel (1978), Ripple and others (1969) and Locke (1967) however, did not obtain any interaction between anxiety and these treatment modes. Grime and Illingworth (1961) and Brase (1964) also obtained a disordinal interaction but in his study high anxiety students profit more from linear style of programming and low anxiety students by expository method. The subject matters of the programmes employed by Grime and Illingworth (1961) and Brase (1964) are quite different from that employed in the present study. Ames (1969) has shown that interaction is not only a function of the treatment modes but also of the subject matter employed. He studied interaction between response modes and programme constructed on different types of subject matter i.e. technical and familiar and concluded that constructed responses led to superior achievement for technical subject matter with which students had little prior familiarity, whereas on subject matter with which students were previously acquainted, there was little difference between constructed responses made or reading. Carason and Palkola (1960) also indicated that anxiety had differential effects depending upon the difficulty of the subject matter. Therefore, the difference in achievement by high and low anxiety students may be attributed to the difference in the subject matter employed by them.
EXTROVERSION-TREATMENT INTERACTION:

Table CV presents the adjusted means and 'F' values for the difference between post test scores of high and low extroversion groups taught through the three treatment modes.

**Table CV**

<table>
<thead>
<tr>
<th>Extroversion</th>
<th>Linear Style Mean 'F' Value</th>
<th>Branching Style Mean 'F' Value</th>
<th>Expository Method Mean 'F' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>43.79</td>
<td>29.79</td>
<td>36.23</td>
</tr>
<tr>
<td></td>
<td>1.24</td>
<td>10.76*</td>
<td>0.28</td>
</tr>
<tr>
<td>Low</td>
<td>44.34</td>
<td>52.91</td>
<td>41.33</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.

The table shows that the 'F' value for the linear style of programming is 1.24, which is insignificant showing that the achievement of high and low extroversion groups when taught through linear style of programming is not statistically different. This finds support in the studies by Greer (1978), Rawn and Leith (1975) and Kapadia (1972) but contradicts with Savis and Leith (1967) who obtained negative and significant interaction between extroversion and achievement through linear style of programming.

The 'F' value for branching style of programming is
10.76 which is highly significant. The low extroversion students' achievement significantly higher through branching style than the high extroversion students which shows significant interaction between extroversion and achievement through branching style of programming. This contradicts with the study of Kapadia (1972) who did not obtained any significant interaction between extroversion and achievement through branching style of programming. Kapadia (1972) employed branching programmes in Geography while in the present study a branching programme on mathematics (statistics) has been employed. The contradictory findings of the above two studies may be due to this difference of subject matter employed by them.

The expository method has yielded a 'F' value of 0.28 only which is highly insignificant showing that the achievement of high and low extroversion groups when taught through expository method is not statistically different.

As in the case of anxiety, the above analyses do not provide any evidence for assignment of treatment modes to the two groups of the students. Evidence for this purpose was obtained by comparing the achievement through any of the two treatment modes for either of the extroversion groups. For this purpose, graph of adjusted means of students high and low extroversion for different pairs of treatment modes were drawn and 't' values for difference in post test means were
FIG. 12. EXTROVERSION-TREATMENT INTERACTION FOR DIFFERENT PAIRS OF TREATMENT MODES
computed for each pair. The interaction between these different pairs were studied according to the established criteria.

(A) **Comparison between Linear and Branching styles of programming:**

Table VI and Fig. 12(a) presents the comparison of post achievement means for high and low extroversion students taught through linear and branching style of programming.

<table>
<thead>
<tr>
<th>Treatment modes</th>
<th>Low Extroversion</th>
<th>High Extroversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' value</td>
</tr>
<tr>
<td>Linear</td>
<td>44.34</td>
<td>1.04</td>
</tr>
<tr>
<td>Branching</td>
<td>52.79</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.01 level.

It will be seen from the Fig. 12(a) that the achievement lines cross which shows that while the branching style of programming is better for low extroversion students, the linear style of programming is proved to be more effective for the high extroversion students. The interaction is
disordinal according to the standard suggested by Lubin (1967). It will also be seen from the table that the 't' value between the post test means of high extroversion students taught by the two modes is 2.48, which is significant at 0.05 level for 28 degrees of freedom. The 't' value between the post test means for the low extroversion students taught through the two modes is 1.04, which is insignificant. Thus the interaction through disordinal according to Lubin (1967), is not so according to Bracht and Glass (1968) as the difference at both the levels of extroversion are not significant.

However, according to the present investigator, the interaction is disordinal since the 't' value at one end of the extroversion levels is significant at 0.05 level. The high extroversion students may be assigned the style of programming and extroversion students may be assigned branching style of programming but the evidence is not equally sound for low extroversion students because the 't' value of this group is not significant even at 0.1 level. This conclusion does not fall in line with Leith (1966) hypothesis, who writes "... introverted... pupil will do well with linear programmes. The... extrovert pupil might fare better with branching programmes".

(a) **Comparison between Branching Style of Programming and Expository Method:**

Table VII and Fig. 12(b) presents the comparison of post achievement means of low and high extroversion students
taught through branching style of programming and expository method.

**TABLE-CVII**

't' VALUES FOR THE DIFFERENCE IN POST TEST RANK OF HIGH AND LOW EXTROVERSION STUDENTS TAUGHT THROUGH BRANCHING STYLE OF PROGRAMMING AND EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment Modes</th>
<th>Low Extroversion</th>
<th>High Extroversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Branching</td>
<td>52.79</td>
<td>1.77*</td>
</tr>
<tr>
<td>Expository</td>
<td>41.33</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.1 level.

It will be seen from the Fig.12(b) that the two treatment lines cross each other which shows that while the branching style of programming is better for the low extroversion students, the expository method has proved to be more effective for the high extroversion students. The interaction is disordinal according to the standard suggested by Lubin (1967). It will be seen from the above table that the 't' values between the post test means for high and low extroversion students taught by the two treatment modes are 1.14 and 1.77 respectively, which are not significant at 0.05 level. Thus the interaction which is disordinal according to the standard of Lubin (1967) is not so according to the Bracht and
Glass (1968) and the present investigator. The low extroversion students may be taught more profitably by the branching style of programming and the high extroversion students by the expository method but the evidence is not very trustworthy as the 't' value for both the groups are insignificant at 0.5 level. However, since 't' value for the low extroversion students taught through branching style and expository method is significant at 0.1 level for 28 degree of freedom, such students may be taught more profitably by the branching style of programming.

( ) Comparison between linear style of Programming and expository Method.

Table CVIII and Fig.12(c) presents the comparison of post test means for high and low extroversion students taught through linear style of programming and expository method.

TABLE-CVIII
't' VALUE FOR THE DIFFERENCE IN POST TEST MEANS FOR HIGH AND LOW EXTROVERSION STUDENTS TAUGHT BY LINEAR STYLE OF PROGRAMMING AND EXPOSITORY METHOD.

<table>
<thead>
<tr>
<th>Treatment modes</th>
<th>Low Extroversion</th>
<th>High Extroversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted mean</td>
<td>'t' Value</td>
</tr>
<tr>
<td>Linear</td>
<td>44.34</td>
<td></td>
</tr>
<tr>
<td>Expository</td>
<td>41.33</td>
<td></td>
</tr>
</tbody>
</table>
It will be seen from the Fig. 12(a) that the two treatment lines do not cross, which shows that the interaction is ordinal according to Lubin (1967), Bracht and Glass (1968) and the present investigator. Both high as well as low extroversion students have secured better through linear style of programming as compared to expository method. Thus there is no evidence of interaction i.e. alternative treatments cannot be assigned on the basis of this evidence. Thus, there was hardly any need to calculate 't' values for the difference between post test means. Greer (1978) and Trawn and Leith (1975) also could not obtain any significant disordinal interaction between extroversion and linear style of programming and expository method. The ordinal interaction in the studies may be due to the interaction of extroversion and some other personality characteristics within the individual. Davis and Leith (1967) suggested, "it is not one aspect of individual's personality that leads to success, but rather the interaction of personality characteristics within the individual". They found that it was the neuro-introverts who succeeded best on programmed learning task.
REFERENCES:


46. Spelberger, C. G. The Effect of Manifest Anxiety on the Academic Achievement of College Students, Mental Hygiene, 1962, 46, 420-426.


