Analysis of data and Interpretation of Results
CHAPTER - VI

ANALYSIS OF DATA AND INTERPRETATION OF RESULTS

In the preceding chapters the problem of the study, hypotheses, the sample, tools used, design and procedure of the study were discussed. The present chapter deals with the analysis of the data, interpretation and discussion of the results.

The data obtained from the experiment have been analyzed under the following sub-heads.

6.1 Analysis of criterion scores.
6.2 Analysis of Achievement Scores
6.3 Analysis of Retention Scores
6.4 Analysis of self-concept Scores

6.1 ANALYSIS OF CRITERION SCORES

In general, information provided by test results can be used to evaluate various aspects of instructional process and its outcome. It can help in determining the extent to which instructional objectives were realistic, whether the methods and materials of instruction were appropriate, and how well the learning experiences were organized. Test results reveal not only the weakness of instruction; they can also reveal learning weaknesses of individual students.

The students responses to the test and the discussion of the results would provide clues to the instructional difficulty and the corrective steps that can thereby be taken. The obtained scores on the post test are used for analysis of criterion scores.
6.1.1 Performance Criterion

The post test scores of the two experimental groups and one control group were depicted through cumulative percentage curves viz. field independent and field dependent with respect to the total scores obtained by the entire treatment groups.

Each graph was plotted for the exact lower limits of class intervals on the axis of 'X' and the corresponding percentage of their cumulative frequencies were computed from the highest class to the lowest class on the axis of 'Y'. The scores obtained by each of the above mentioned groups have been placed in Table 6.1.
TABLE 6.1
FREQUENCY DISTRIBUTION OF POST TEST SCORES OF THE
TWO TREATMENTS AND ONE CONTROL GROUP

<table>
<thead>
<tr>
<th>Class Interval</th>
<th>Lower Limit</th>
<th>Total</th>
<th>T1C1</th>
<th>T2C1</th>
<th>T3C1</th>
<th>T1C2</th>
<th>T2C2</th>
<th>T3C2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>f</td>
<td>c per f</td>
<td>f</td>
<td>c per f</td>
<td>f</td>
<td>c per f</td>
<td>f</td>
</tr>
<tr>
<td>111-120</td>
<td>110.5</td>
<td>15</td>
<td>13.88</td>
<td>6</td>
<td>33.33</td>
<td>8</td>
<td>44.44</td>
<td>1</td>
</tr>
<tr>
<td>101-110</td>
<td>100.5</td>
<td>29</td>
<td>40.74</td>
<td>8</td>
<td>77.77</td>
<td>7</td>
<td>83.33</td>
<td>7</td>
</tr>
<tr>
<td>91-100</td>
<td>90.5</td>
<td>22</td>
<td>61.11</td>
<td>3</td>
<td>94.44</td>
<td>3</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>81-90</td>
<td>80.5</td>
<td>24</td>
<td>83.33</td>
<td>1</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>71-80</td>
<td>70.5</td>
<td>12</td>
<td>94.44</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>61-70</td>
<td>60.5</td>
<td>4</td>
<td>98.14</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>51-60</td>
<td>50.5</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>108</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>
FIG. 6.1: CUMULATIVE FREQUENCY CURVE FOR FIELD INDEPENDENT (C1) TREATMENT GROUPS
FIG. 6.2: CUMULATIVE FREQUENCY CURVE FOR FIELD DEPENDENT(C2) TREATMENT GROUPS

COMMULATIVE % FREQUENCY

LOWER LIMIT OF CLASS INTERVALS

TOTAL - T1 - T2 - T3
It may be observed from Figures 6.1 and 6.2 that

♦ About 90 percent of the field independent students obtained 92 or more scores when taught through Inquiry Training Mode, 96 or more scores when taught through Mastery Learning Model and about 82 or more scores when taught by conventional method as against the equal number of the total group obtaining 74 or more scores.

♦ About 90 percent of field dependent group obtained 80 or more scores when taught through Inquiry Training Model, 72 or more scores when taught through Mastery Learning Model, 64 or more scores when taught through conventional method as against the equal number of the group obtaining 73 or more scores.

♦ About 80 percent of field independent group obtained 98 or more scores when taught by Inquiry Training Model, 101.5 or more scores when taught by Mastery Learning Model, 87 or more scores when taught by conventional method as against the total group obtaining 81.5 or more scores.

♦ About 80 percent of field dependent students obtained 83 or more scores when taught by Inquiry Training Model, 79 or more scores when taught by Mastery Learning Model, 71 or more scores when taught by conventional method as against the total group obtaining 82 or more scores.

♦ About 70 percent of field independent students obtained 102 or more scores when taught by Inquiry Training Model, 104 or more scores when taught by Mastery Learning Model, 91 or more scores when taught by conventional method as against the total group obtaining 86.5 or more scores.
About 70 percent of field dependent students obtained 85.5 or more scores when taught by Inquiry Training Model, 83 or more scores when taught by Mastery Learning Model, 73.5 or more scores when taught by conventional method as against the total group obtaining 86 or more scores.

6.2 ANALYSIS OF ACHIEVEMENT SCORES

Analysis of variance as the primary technique of statistical analysis in experimental design was first used by R.A. Fisher (1935), F.Yates, G.Ep. Box, R.C. Bose, O. Kempathorne and W.G. Cochran (Montgomery, 1984) advanced the technique as it can greatly increase the efficiency of an experiment and often strengthen the confusion so obtained. A carefully designed experiment will undoubtedly lead to relatively straight forward analysis.

Selection of the Statistical Technique- Its justification.

The present study employed a 3 x 2 x 2 factorial design. It evaluated the combined effect of two or three experimental variables used simultaneously. The information obtained from a factorial design of experiment is more complete than that obtained from a series of single factor experiments, in the sense that evaluation of interaction effects can be made. Apart from it, the estimates of the effect of the independent variable is also practically more as these estimates are obtained by averaging over a relatively broad range and other relevant experimental variables. In the case of factorial experiments the population to which inference can be made is more inclusive than the corresponding population for a single factor experiment (Winer, 1971). In addition to information about how the experimental variables operate in relative isolation, it can predict what will happen when two or more variables are used in combination.
Following the selection of the statistical technique appropriate for data analysis it was decided to employ analysis of variance with one repeated measure. The factorial experiments in which the same experimental unit (usually a subject) is observed under more than one treatment conditions. The primary purpose of repeated measures on the same element is the control that this kind of design provides over individual differences between experimental units. Another advantage is in terms of the economy of subjects. By having each subject serve as his own control, the experimenter attempts to work with smaller sample size (Winer, 1971).

**Preliminary Data Handling**

The scores were first processed. The gain as measured by the difference of post and pre-test scores were calculated for each student. The obtained gains were subjected to the analysis of variance. The present factorial design deviated from simple experimental design in its special provision for the variables of categories of objectives viz., knowledge and comprehension categories.

The variable of categories of objectives was a repeated variable. The deviation in the design was reflected in its special calculation for the error variance component.

**Three Way Analysis of Variance on Gain Scores of Achievement in Mathematics:**

Following set of null hypotheses were tested through this analysis:

H1 The three instructional treatments yield comparable mean gain on achievement scores in mathematics.

H2 The field independent and field dependent groups yield equal mean gain on achievement scores.
H3 Comparable mean gain on achievement scores are yielded by the students at knowledge and comprehension categories of objectives.

H4 There is no significant interaction between instructional treatments and types of cognitive style.

H5 There is no significant interaction between instructional at treatments and categories of objectives.

H6 There is no significant interaction between types of cognitive style and categories of objectives.

H7 The three instructional groups attain comparable mean gain on achievement scores with both the types of cognitive style at knowledge and comprehension categories of objectives.

The means and S.D.'s of different sub samples were calculated and have been presented in Table 6.2 and the summary of ANOVA for 3 x 2 x 2 design for gain scores in achievements in Table 6.3.

The data was treated according to the specifications of Winer (1971).
### Table 6.2
MEANS AND S.D.'s OF SUB SAMPLES OF 3X2X2 DESIGN FOR GAIN SCORES IN ACHIEVEMENT

<table>
<thead>
<tr>
<th>Cognitive Style ↓</th>
<th>Treatment Objectives ↓</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F.I. (C₁)</strong></td>
<td>O₁</td>
<td>M=31.22</td>
<td>M=32</td>
<td>M=28.5</td>
</tr>
<tr>
<td></td>
<td>n =18</td>
<td>n=18</td>
<td>n=18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D.=1.7812</td>
<td>S.D.=3.0731</td>
<td>S.D.=2.7131</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O₂</td>
<td>M=32.88</td>
<td>M=35.55</td>
<td>M=29.05</td>
</tr>
<tr>
<td></td>
<td>n =</td>
<td>n=18</td>
<td>n=18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D.=2.7866</td>
<td>S.D.=3.9334</td>
<td>S.D.=3.6128</td>
<td></td>
</tr>
<tr>
<td><strong>F.D. (C₂)</strong></td>
<td>O₁</td>
<td>M=29.27</td>
<td>M=31.72</td>
<td>M=28.16</td>
</tr>
<tr>
<td></td>
<td>n =18</td>
<td>n=18</td>
<td>n=18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O₂</td>
<td>M=28.83</td>
<td>M=28.94</td>
<td>M=20.05</td>
</tr>
<tr>
<td></td>
<td>n=18</td>
<td>n=18</td>
<td>n=18</td>
<td></td>
</tr>
</tbody>
</table>

### Table 6.3
SUMMARY OF 3X2X2 ANOVA FOR GAIN SCORES IN ACHIEVEMENT

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects</td>
<td>3825.59</td>
<td>107</td>
<td>35.75</td>
<td>1.979</td>
<td></td>
</tr>
<tr>
<td>T (Treatment)</td>
<td>1215.25</td>
<td>2</td>
<td>607.625</td>
<td>33.64</td>
<td>S**</td>
</tr>
<tr>
<td>C.S. (Cognitive Style)</td>
<td>740.73</td>
<td>1</td>
<td>740.73</td>
<td>41.01</td>
<td>S**</td>
</tr>
<tr>
<td>T x C.S. (Treatment X Cognitive Style)</td>
<td>26.807</td>
<td>2</td>
<td>13.4035</td>
<td>.742</td>
<td>NS</td>
</tr>
<tr>
<td>Error Term</td>
<td>1842.8</td>
<td>102</td>
<td>18.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Subjects</td>
<td>2539</td>
<td>108</td>
<td>23.50</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>O(Categories of objectives)</td>
<td>46.29</td>
<td>1</td>
<td>46.29</td>
<td>2.72</td>
<td>NS</td>
</tr>
<tr>
<td>T x O (Treatment X Objectives)</td>
<td>220.03</td>
<td>2</td>
<td>110.015</td>
<td>6.47</td>
<td>S**</td>
</tr>
<tr>
<td>C.S. x O (Cognitive Style X Objectives)</td>
<td>439.177</td>
<td>1</td>
<td>439.177</td>
<td>25.83</td>
<td>S**</td>
</tr>
<tr>
<td>T X C.S. x O (Treatment X Cognitive Style X Objectives)</td>
<td>99.35</td>
<td>2</td>
<td>49.675</td>
<td>2.922</td>
<td>NS</td>
</tr>
<tr>
<td>Error Term</td>
<td>1734.2</td>
<td>102</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level
MAIN EFFECTS

Treatment (T)

The F-ratio for the difference in the mean scores of the three treatment groups was found to be significant at 0.01 level of confidence leading to the inference that the three instructional treatments yielded different mean gains on achievement scores in Mathematics.

An examination of means indicates that there is a difference in the mean gain scores of the three groups. Thus H1 was rejected.

To investigate further the difference between different treatments, t-ratios were computed to test the following hypotheses.

H1.01 Inquiry Training Model and Mastery Learning Model yield comparable mean gain on achievement scores in Mathematics.

H1.02 Inquiry Training Model and Conventional Method yield comparable mean gain on achievement scores in Mathematics.

H1.03 Mastery Learning Model and Conventional Method yield comparable mean gain on achievement scores in Mathematics.

The t-ratios for the difference in the means of gain scores in achievement of the three treatment groups have been placed in Table 6.4.

TABLE 6.4

| t-RATIOS FOR MEANS OF ACHIEVEMENT GAIN SCORES BETWEEN DIFFERENT TREATMENTS |
|-------------------|----------------|----------------|
| Group             | T1     | T2     | T3     |
| Means             | 30.55  | 32.05  | 26.34  |
| T1 (30.55)        | -      | 1.5    | 4.11** |
| T2 (32.05)        | -      | -      | 5.61** |
| T3 (26.44)        | -      | -      | -      |

* Significant at 0.05 level
** Significant at 0.01 level
The above table 6.4 reveals that students taught through Inquiry Training Model and Mastery Learning Model yield comparable mean gain on achievement scores in Mathematics. Thus H1.01 was retained.

- Students taught by Inquiry Training Model exhibited better mean gains as compared to those taught by the conventional method as is evident from the value of 't' which is significant at 0.01 level of confidence. Thus, H1.02 was rejected.

- Students taught through Mastery Learning Model exhibited better mean gains as compared to the conventional method as is evident from the value of 't' which is significant at 0.01 level of confidence. Thus, H1.03 was rejected.

**Cognitive Style (C.S.)**

F-ratio for the difference in the mean gains of the two cognitive style groups was found to be highly significant at 0.01 level of confidence. Examination of means of the two groups tells us that the means of field independent group were superior to that of field dependent group. Thus H2 was rejected.

**Categories of Objectives (O)**

F-ratio for the difference in means of the different categories of objectives was found to be insignificant. Thus H3 was retained.

The gain means of the three main effects have been shown through bar diagrams in Fig. 6.3.
FIG. 6.3: BAR DIAGRAM SHOWING GAIN MEANS CORRESPONDING TO THE THREE MAIN EFFECTS OF ACHIEVEMENT SCORES
Two-Order Interaction

Treatment X Cognitive Style (T X C.S)

F-ratio for interaction between treatment and cognitive style was found to be insignificant. Thus H4 was retained.

Treatment and categories of objectives (T X O)

The F-ratio for the interaction between treatment and categories of objectives was found to be highly significant at 0.01 level of confidence leading to the inference that the two variables interact with each other. Thus H5 was rejected. The interaction has also been presented graphically in Fig 6.4.

The interaction was further investigated with the help of t-ratios to test the following hypotheses:

H5.01 Inquiry Training Model yields comparable mean gain on achievement scores at knowledge and comprehension category of objectives in Mathematics.

H5.02 Mastery Learning Model yields comparable mean gain on achievement scores at knowledge and comprehension category of objectives.

H5.03 Conventional Method yields comparable mean gain on achievement scores at knowledge and comprehension category of objectives.

H5.04 At knowledge category of objectives Inquiry Training Model and Mastery Learning Training Model yield comparable mean gain on achievement scores in Mathematics.
H5.05 At knowledge category of objectives Inquiry Training Model and conventional method yield comparable mean gain on achievement scores in Mathematics.

H5.06 At knowledge category of objectives Mastery Learning Model and conventional method yield comparable mean gain on achievement scores in Mathematics.

H5.07 At comprehension category of objectives Inquiry Training Model and Mastery Learning Model yield comparable mean gain on achievement scores in Mathematics.

H5.08 At comprehension category of objectives Inquiry Training Model and conventional method yield equal mean gain on achievement scores in Mathematics.

H5.09 At comprehension category of objectives Mastery Learning Model and conventional method yield equal mean gain on achievement scores in Mathematics.

TABLE 6.5

<table>
<thead>
<tr>
<th>Group</th>
<th>$T_1 O_1$</th>
<th>$T_1 O_2$</th>
<th>$T_2 O_1$</th>
<th>$T_2 O_2$</th>
<th>$T_3 O_1$</th>
<th>$T_3 O_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means</td>
<td>30.25</td>
<td>30.66</td>
<td>31.86</td>
<td>32.25</td>
<td>28.33</td>
<td>24.55</td>
</tr>
<tr>
<td>$T_1 O_1$</td>
<td>-</td>
<td>.628</td>
<td>1.65</td>
<td>2.05*</td>
<td>1.977</td>
<td>5.87**</td>
</tr>
<tr>
<td>$T_1 O_2$</td>
<td>-</td>
<td>-</td>
<td>1.02</td>
<td>1.43</td>
<td>2.60*</td>
<td>6.49**</td>
</tr>
<tr>
<td>$T_2 O_1$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.40</td>
<td>3.63**</td>
<td>7.52**</td>
</tr>
<tr>
<td>$T_2 O_2$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.03**</td>
<td>7.92**</td>
</tr>
<tr>
<td>$T_3 O_1$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.89**</td>
</tr>
<tr>
<td>$T_3 O_2$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level
The interaction between Treatment and Categories of objectives for mean gain in achievement scores has been presented in Fig 6.4.

The Table 6.5 reveals that

- Inquiry Training Model yielded comparable mean gain on achievement scores at knowledge and comprehension category of objectives in mathematics. Thus H5.01 was retained.

- Mastery learning model yielded comparable mean gain on achievement scores at knowledge and comprehension category of objectives. Thus H5.02 was retained.

- Student taught through conventional method exhibited better mean gain on achievement scores at knowledge category as compared to comprehension category of objectives in mathematics. The t-ratio between the means at the two categories of objectives was significant at 0.01 level of confidence. Thus H5.03 was rejected.

- At knowledge category of objectives, Inquiry Training Model and Mastery Learning Model yielded comparable mean gain on achievement scores in mathematics. Thus H5.04 was retained.

- At knowledge category of objectives, Inquiry Training Model and conventional method yielded comparable mean gains on achievement scores. Thus H5.05 was rejected.

- At knowledge category of objectives, students taught through mastery learning model yielded better mean gain on achievement scores in mathematics as compared to those taught through conventional
method of teaching. The t-ratio between the two groups was found to be significant at 0.01 level confidence. Thus H5.06 was rejected.

- At comprehension category of objectives, Inquiry Training Model and Mastery Learning Model yield comparable mean gain on achievement scores in Mathematics. Thus H5.07 was retained.

- At comprehension category of objectives, students taught through inquiry Training Model yielded better mean gain on achievement scores in mathematics as compared to those taught through conventional method of teaching. The t-ratio between the two groups was found to be significant at 0.01 level of confidence. Thus H5.08 was rejected.

- At comprehensive category of objectives students taught through Mastery Learning Model yielded better mean gain on achievement scores in mathematics as compared to those taught through conventional method of teaching. The t-ratio between the two groups was found to be significant at 0.01 level of confidence. Thus H5.09 was rejected.

Cognitive style and categories of objectives (CSXO)

The F-ratio for the interaction between cognitive style categories of objectives was found to be significant at 0.01 level of confidence leading to the inference that the two variables interact with each other. Thus H6 was rejected. The interaction has also been presented in fig 6.5.

The interaction was further investigated with the help of t-ratios to test following hypotheses:
FIG. 6.5: INTERACTION BETWEEN COGNITIVE STYLE AND CATEGORY OF OBJECTIVES FOR MEAN GAIN IN ACHIEVEMENT SCORES
H6.01 Field independent students yield comparable mean gain on achievement scores at knowledge and comprehension category of objectives.

H6.02 Field dependent students yield comparable mean gain on achievement scores at knowledge and comprehension category of objectives.

H6.03 Field independent and field dependent students yield comparable mean gain on achievement scores at knowledge category of objectives.

H6.04 Field independent and field dependent students yield comparable mean gain on achievement scores at comprehension category of objectives.

Table 6.6

<table>
<thead>
<tr>
<th>Group</th>
<th>C₁ O₁</th>
<th>C₂ O₂</th>
<th>C₂ O₁</th>
<th>C₂ O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means</td>
<td>30.57</td>
<td>32.5</td>
<td>29.72</td>
<td>25.94</td>
</tr>
<tr>
<td>C₁ O₁</td>
<td>-</td>
<td>2.44*</td>
<td>1.075</td>
<td>5.86 **</td>
</tr>
<tr>
<td>C₁ O₂</td>
<td>-</td>
<td>-</td>
<td>3.518**</td>
<td>8.303**</td>
</tr>
<tr>
<td>C₂ O₁</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.78**</td>
</tr>
<tr>
<td>C₂ O₂</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

The table 6.6 reveals that

- Field independent students exhibited better mean gain on achievement scores at comprehension category as compared to
knowledge category of objectives in mathematics. The t-ratio between the means at the two categories of objectives was significant at 0.05 level of confidence. Thus H6.01 was rejected.

Field dependent students exhibited better mean gain on achievement scores at knowledge category as compared to comprehension category of objectives in mathematics. The t-ratio between the means at the two categories of objectives was significant at 0.01 level of confidence. Thus H6.02 was rejected.

Field independent and field dependent students yield comparable mean gain on achievement scores at knowledge category of objectives. Thus H6.03 was retained.

Field independent students yielded better mean gain on achievement scores in Mathematics at comprehension category of objectives as compared to field dependent students. The t-ratio between the two groups was found to be significant at 0.01 level of confidence. Thus H6.04 was rejected.

THREE ORDER INTERACTION

Treatment, cognitive style and categories of objectives (TxC.S.xO)

The t-ratio for the interaction among the three variables was not found to be significant. This indicates that treatment, cognitive style and categories of objectives do not interact with each other. Hence H7 was retained.

6.2.1 DISCUSSION OF THE RESULTS OF ACHIEVEMENT SCORES

The present study revealed that there is a difference in the mean gains on achievement scores in mathematics of the students taught by
Students taught through Inquiry Training Model and Mastery Learning Model yielded comparable mean gains on achievement in Mathematics. Thus H1.01 was retained.

Students taught mathematics by Inquiry Training Model exhibited better mean gains as compared to conventional method. Thus H1.02 was rejected.

The results were consistent with the finding that inquiry oriented teaching is more effective that traditional teaching in science (Henkal, 1968, Ivany, 1969; Collins, 1969; Richardson and Renner, 1970; Schrenker, 1976; Gabel, Rubba and Franz, 1977; Russell and Chippetta, 1981; Voss, 1982; Hankoos and Penick, 1983; Shymansky, Kyle and Alport, 1983; Mulopa and Fowler, 1987; Saunders and Shepardson, 1987; Kyle, Bonnstetter and Gadsden, 1988; Sidney, 1989; Hall and McCurdy, 1990; Geban, Askar and Ozkar, 1992; Basega, Geban and Tekkaya, 1994; Lazarowitz, 1995; Gupta 1995; Ertepinar and Geban, 1996; Chastain, 1998 and Chang and Barufaldi, 1999); earth science (Chang and Mao, 1999); Mathematics (Sassi, Morse and Goldsmith, 1997); Social studies (Pandey, 1986); Physical science (Singh, 1990); Chemistry (Vijay Kumar, 1990); Biology (Louden, 1997) language arts instruction (Peck and Hughes, 1997) and college algebra (Retzer, 1998).

Students taught through Mastery Learning Model exhibited better results as compared to conventional method. Thus H1.03 was rejected. The results are in consonance with findings of other researchers where Mastery learning was found to be more effective than traditional instruction in statistics at university level (Mayo, et al, 1969); biology, psychology and philosophy (Moore et al., 1968), higher level concept learning (Airasian, 1969); Sixth grade geometry (Kim et al., 1969) seventh grade
mathematics, English and physics (Kim, 1970), junior high school modern mathematics (Collins, 1970); introductory undergraduate Educational Psychology (Biehler, 1970); college elementary math's course (Duncan, 1976); fifth and sixth grade Arithmetic and science (Lee et al., 1971); in different school conditions (Block, 1971); undergraduate history (Tiernay, 1973); geography achievement of low aptitude students (Myers, 1975), retention of cognitive achievement in chemistry (Swanson, 1976) in different subjects and in different grades (Bloom, 1976), achievement of students (Miller and Ellsworth, 1979; Thomson, 1980; Soto, 1983); teacher education (Bauman, 1980), cognitive knowledge in high school social studies (Mathews, 1982), group based teacher-paced undergraduate education course (Benninga, 1983, Clark, 1983); cognitive knowledge in high school social studies (Mathews, 1982); basic English skills (Pratt, 1983); acquisition and retention of mathematics modelling skills (Srivastva, 1983); science achievement (Dillashaw and Okey, 1983); introductory account (Tse, 1983); logical reasoning of preservice elementary science teachers (Jones, 1983); elementary mathematics (Hooda, 1983); verbal and non verbal creativity (Hooda and Jarial, 1983); XI grade physics (Mathur, 1983); IX class mathematics (Jangira and Yadav, 1984); high school mathematics (Yadav, 1984); physical education (Blakemoore, 1985). Intermediate French (Kuhn, 1985); reading achievement (Sanor, 1985); music (Larson, 1986); college algebra (Ehlers, 1986); school geography (Chand, 1987, Verma, 1991); geometry (Patadia, 1987); statistics achievement of graduate and post graduate students (Mathur, 1988); positive learning outcomes (Guskey and Pigott, 1988); science (Joyce, 1988); enhanced cognitive entry behaviors (Menzer, 1989) examination performance of college, high school upper-grades school students (Kulik, 1990), reading achievement of first graders (Charles, 1992, low achieving students performed comparable to
their average and high achieving counterparts (Stetson, 1992); fractions to fifth graders (Ritchie, 1994); sixth grade geometry (Bajaj, 1994); undergraduate course on curriculum development and instruction (Senemoglu, 1995); low learning ability university students (Jaw-Sin, 1996); sixth grade Hindi (Chaudhary and Vaidya, 1998), work-related task of Navy recruits (Lee, 1998) college algebra (Pezeshki, 1998); and biology, (Sharma, 1999).

H2 was rejected as field independent students performed better in mathematics as compared to field dependent students. The results are consistent with the findings that field independent students performed better at all levels (Mackie, 1978; Lin chi –hui, 1993); problem solving (Schorck, 1979; Roessler-jacoby, 1985; Dutt, 1987; Arrigton, 1989); holistic scores (Graffin, 1982); task behavior (Walker, 1984); mathematics (Peterson, 1984; Mrasla, 1984; Hota, 1995); Science (Randolph, 1984; Yore, 1986); processing and comprehending scientific textual materials (Panda, 1985); Koh’s Block design test (George et al., 1987); creativity (Gill, 1989); intellectual ability and autonomous achievement (Panda, 1991); concept learning (Vyas, 1992); higher chemistry achievement (Custer, 1994); and chemical kinetics (Lynch, 1999).

H3 was retained as students performed equally well at knowledge and comprehension category of objectives. The finding is supported by Mehra (1992) in Biology.

H4 was retained as there was no significant difference between treatment and cognitive style.

H5 was rejected as the variables, treatment and category of objectives interacted significantly Inquiry Training Model and Mastery Learning Model yielded comparable mean gains on achievement scores at knowledge and comprehension category of objectives in mathematics. Thus
H5.01 and H5.02 were retained. But students taught through conventional method exhibited better mean gains on achievement scores at knowledge category as compared to comprehension category of objectives in mathematics. Thus H5.03 was rejected.

At knowledge category of objectives students taught through Inquiry Training Model and Mastery Learning Model yielded comparable mean gains on achievement scores. Also students taught through Inquiry Training Model and Conventional Method yielded comparable mean gains on achievement scores. But students taught through Mastery Learning Model yielded better mean gains on achievement scores as compared to those taught through conventional method. Thus H5.04 and H5.05 were retained and H5.06 was rejected.

At comprehension category of objectives Inquiry Training Model and Mastery Learning Model yielded comparable mean gains on achievement scores in mathematics. But students taught through Inquiry Training Model and Mastery Learning Model yielded better mean gains on achievement scores in mathematics as compared to those taught through conventional method of teaching. Thus H5.07 was retained and H5.08 and H5.09 were rejected.

H6 was rejected as the variables cognitive style and category of objectives interacted significantly. Field independent students exhibited better mean gains on achievement scores at comprehension category as compared to knowledge category of objectives in mathematics. Thus H6.01 was rejected.

Field dependent students exhibited better mean gains on achievement scores at knowledge category as compared to comprehension category of objectives in mathematics. Thus H6.02 was rejected.

Field independent and field dependent students yielded comparable
mean gains on achievement scores at knowledge category of objectives. But field independent students yielded better mean gains on achievement scores in mathematics at comprehension category of objectives as compared to field dependent students. Thus H6.03 was retained and H6.04 was rejected.

H7 was retained as the three variables namely treatment, cognitive style and category of objective did not interact significantly.

6.3 ANALYSIS OF RETENTION SCORES

Retention scores are the scores obtained by the student one month after the administration of the posttest. The obtained scores were subjected to 3 x 2 x 2 analysis of variance.

The following set of null hypotheses were tested through this analysis.

H8 Retention is independent of instructional treatment.

H9 Retention is independent of cognitive style.

H10 Retention is independent of categories of objective.

H11 Students taught through different instructional treatments attained comparable retention scores at knowledge and comprehension category of objectives.

H12 Field independent and field dependent students retain comparably when taught mathematics through different instructional treatments.

H13 Field independent and field dependent students retain comparably at knowledge and comprehension categories of objectives.

H14 Field independent and field dependent students retain comparably at knowledge and comprehension categories of objectives when taught through different instructional treatments.
The mean's and S.D.'s of different sub-samples were calculated and have been presented in Table 6.7 and the summary at ANOVA for 3 x 2 x 2 design for retention scores in mathematics in the Table 6.8.

The data was tested according to the specifications of Winer (1971).

**TABLE 6.7**

**MEANS AND S.D.'S OF SUB. SAMPLES OF 3 X 2 X 2 DESIGN OF RETENTION SCORES**

<table>
<thead>
<tr>
<th>Cognitive Style</th>
<th>Treatment Objectives</th>
<th>( T_1 )</th>
<th>( T_2 )</th>
<th>( T_3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.I. (( C_1 ))</td>
<td>( O_1 )</td>
<td>M=44.38</td>
<td>M=45.44</td>
<td>M=40.88</td>
</tr>
<tr>
<td></td>
<td>( O_1 )</td>
<td>N =18</td>
<td>n=18</td>
<td>n=18</td>
</tr>
<tr>
<td></td>
<td>( O_1 )</td>
<td>S.D.=2.5849</td>
<td>S.D.=1.8324</td>
<td>S.D.=3.3147</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>M=36.22</td>
<td>M=38</td>
<td>M=31.11</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>N =18</td>
<td>n=18</td>
<td>n=18</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>S.D.=3.794</td>
<td>S.D.=3.8873</td>
<td>S.D.=5.5366</td>
</tr>
<tr>
<td>F.D. (( C_2 ))</td>
<td>( O_1 )</td>
<td>M=39.11</td>
<td>M=40.66</td>
<td>M=37.16</td>
</tr>
<tr>
<td></td>
<td>( O_1 )</td>
<td>N =18</td>
<td>n=18</td>
<td>n=18</td>
</tr>
<tr>
<td></td>
<td>( O_1 )</td>
<td>S.D.=3.4783</td>
<td>S.D.=3.6362</td>
<td>S.D.=3.0230</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>M=27.27</td>
<td>M=28.66</td>
<td>M=19.44</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>N =18</td>
<td>n=18</td>
<td>n=18</td>
</tr>
<tr>
<td></td>
<td>( O_2 )</td>
<td>S.D.=6.623</td>
<td>S.D.=7.1802</td>
<td>S.D.=3.7891</td>
</tr>
</tbody>
</table>
TABLE 6.8
SUMMARY OF 3 X 2 X 2 ANOVA FOR RETENTION SCORES

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects</td>
<td>7374.94</td>
<td>107</td>
<td>68.924</td>
<td>2.290</td>
<td>S**</td>
</tr>
<tr>
<td>T (Treatment)</td>
<td>1433.34</td>
<td>2</td>
<td>716.67</td>
<td>23.81</td>
<td>S**</td>
</tr>
<tr>
<td>C.S. (Cognitive Style)</td>
<td>2867.44</td>
<td>1</td>
<td>2867.44</td>
<td>95.29</td>
<td>S**</td>
</tr>
<tr>
<td>T x C.S. (Treatment X Cognitive Style)</td>
<td>4.51</td>
<td>2</td>
<td>2.25</td>
<td>0.074</td>
<td>NS</td>
</tr>
<tr>
<td>Error Term</td>
<td>3069.65</td>
<td>102</td>
<td>30.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Subjects</td>
<td>8330.5</td>
<td>108</td>
<td>77.13</td>
<td>7.96</td>
<td></td>
</tr>
<tr>
<td>O(Categories of objectives)</td>
<td>6721.44</td>
<td>1</td>
<td>6721.44</td>
<td>694.36</td>
<td>S**</td>
</tr>
<tr>
<td>T x O (Treatment X Objectives)</td>
<td>182.17</td>
<td>2</td>
<td>91.085</td>
<td>9.409</td>
<td>S**</td>
</tr>
<tr>
<td>C.S. x O (Cognitive Style X Objectives)</td>
<td>392.03</td>
<td>1</td>
<td>392.03</td>
<td>40.49</td>
<td>S**</td>
</tr>
<tr>
<td>T X C.S. x O (Treatment X Cognitive Style X Objectives)</td>
<td>45.86</td>
<td>2</td>
<td>22.93</td>
<td>2.36</td>
<td>NS</td>
</tr>
<tr>
<td>Error Term</td>
<td>988.11</td>
<td>102</td>
<td>9.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

MAIN EFFECTS

Treatment

F-ratio for the difference in the mean retention scores of the three treatment groups was found to be significant at 0.01 level of confidence. Examination of the means indicate that retention is dependent upon the instructional treatment. Thus H8 was rejected. To investigate further the difference in retention between different treatments, t-ratios were computed to test the following hypotheses:

H8.01 Inquiry Training Model and Mastery Learning Model yield comparable retention scores in mathematics.

H8.02 Inquiry Training model and conventional method yield comparable retention scores in mathematics.
Mastery Learning Model and conventional method yield comparable retention scores in mathematics.

The t-ratio for the difference in means of retention scores of the three treatment groups have been placed in Table 6.9.

<table>
<thead>
<tr>
<th>Group</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means</td>
<td>36.75</td>
<td>38.19</td>
<td>32.15</td>
</tr>
<tr>
<td>T1</td>
<td>-</td>
<td>1.114</td>
<td>3.56**</td>
</tr>
<tr>
<td>T2</td>
<td>-</td>
<td>-</td>
<td>4.67**</td>
</tr>
<tr>
<td>T3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*significant at 0.05 level
**significant at 0.01 level

The above table 5.8 reveals that students taught by Inquiry Training Model and Mastery Learning Model yield comparable retention scores in mathematics. Thus H8.01 was retained.

Students taught by Inquiry Training Model yielded better retention scores than students taught by conventional method of teaching as is evident from the value of 't' which is significant at 0.01 level of confidence. Thus H8.02 was rejected.

Students taught by Mastery Learning Model yielded better retention scores than students taught by conventional method of teaching as is evident from the value of 't' which is significant at 0.01 level of confidence. Thus H8.03 was rejected.

Cognitive Style (C.S.)

F-ratio for the difference in retention scores of the field independent and field dependent groups was found to be significant at 0.01 level of
confidence. Thus, H9 was rejected as field independent students retained more than field dependent students.

**Categories of Objectives (O)**

F-ratio for the difference in retention at the two categories of objectives was found to be significant at 0.01 level of confidence. Retention at knowledge category of objectives was found to be better as compared to that at comprehension category of objectives. Thus H10 was rejected.

The mean gain of three main effects have been shown through bar diagrams in Fig. 6.6.

**TWO-ORDER INTERACTION**

**Treatment and Categories of Objectives (TXO)**

The F-ratio for the interaction between treatment and category of objectives was found to be significant at 0.01 level of confidence, leading to the inference that the two variables interact with each other. Thus, H11 was rejected.

To investigate further the interaction between the treatment and the categories of objectives, the t-ratios were computed to test the following hypotheses:

- **H11.01** Inquiry Training Model yields comparable retention scores at knowledge and comprehension category of objectives in mathematics.
- **H11.02** Mastery Learning Model yields comparable retention scores at knowledge and comprehension category of objectives.
- **H11.03** Conventional method yields comparable retention scores at knowledge and comprehension category of objectives.
- **H11.04** At knowledge category of objectives Inquiry Training Model and Mastery Learning Model yield comparable retention scores in mathematics.
FIG. 6.6: BAR DIAGRAM SHOWING MEANS OF RETENTION SCORES CORRESPONDING TO THE THREE MAIN EFFECTS

TREATMENTS

CATEGORIES OF OBJECTIVES

COGNITIVE STYLES

RETENTION SCORES
H11.05 At knowledge category of Objectives Inquiry Training Model and conventional method yield comparable retention scores in Mathematics.

H11.06 At knowledge category of objectives Mastery Learning Model and conventional method yield comparable retention scores in Mathematics.

H11.07 At comprehension category of objectives Inquiry Training Model and Mastery Learning Model yield equal retention scores in Mathematics.

H11.08 At comprehension category of objectives Inquiry Training Model and Conventional Method yield equal retention scores in Mathematics.

H11.09 At comprehension category of objectives Mastery Learning Model and Conventional Method yield equal retention scores in Mathematics.

The t-ratios have been placed in table 6.10.

### Table 6.10

| Group | $T_1 O_1$ | $T_1 O_2$ | $T_2 O_1$ | $T_2 O_2$ | $T_3 O_1$ | $T_3 O_2$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Means</td>
<td>41.75</td>
<td>31.75</td>
<td>43.05</td>
<td>33.33</td>
<td>39.02</td>
<td>25.27</td>
</tr>
<tr>
<td>$T_1 O_1$</td>
<td>-</td>
<td>13.64**</td>
<td>1.77</td>
<td>11.48**</td>
<td>3.72**</td>
<td>22.48**</td>
</tr>
<tr>
<td>$T_1 O_2$</td>
<td>-</td>
<td>-</td>
<td>15.41**</td>
<td>2.15*</td>
<td>9.918**</td>
<td>8.84**</td>
</tr>
<tr>
<td>$T_2 O_1$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.26**</td>
<td>5.49**</td>
<td>24.25**</td>
</tr>
<tr>
<td>$T_2 O_2$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7.76**</td>
<td>10.99**</td>
</tr>
<tr>
<td>$T_3 O_1$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>18.75**</td>
</tr>
<tr>
<td>$T_3 O_2$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

The interaction has been presented through fig 6.7.
Fig. 6.7: Interaction between treatment and categories of objectives for retention scores.
The table 6.10 reveals that

- Students taught by Inquiry Training model exhibited more retention at knowledge category of objectives as compared to that at comprehension category of objectives. The t-ratio between the mean scores at two categories of objective was found to be significant at 0.01 level of confidence. Hence, H11.01 was rejected.

- Students taught by Mastery Learning Model exhibited more retention at knowledge category of objectives as compared to that at comprehension category of objectives. The t-ratio between the mean scores at two categories of objectives was found to be significant 0.01 level of confidence. Thus H11.02 was rejected.

- Students taught by conventional method exhibited more retention at knowledge category of objectives as compared to it at comprehension category of objectives. The t-ratio between the mean scores at two categories of objectives was found to be significant at 0.01 level of confidence. Hence H11.03 was rejected.

- At knowledge category of objectives, Inquiry Training Model and Mastery Learning Model yield comparable retention scores in Mathematics. Thus H11.04 was retained.

- At knowledge category of objectives students taught by Inquiry Training Model retained more in Mathematics as compared to those taught by the conventional method. The t-ratio between the mean retention scores of the two groups was found to be significant at 0.01 level of confidence. Hence H11.05 was rejected.

- At knowledge category of objectives students taught by Mastery Learning Model retained more in mathematics as compared to those
taught by the conventional method. The t-ratio between the mean retention scores of the two groups was found to be significant at 0.01 level. Hence H11.06 was rejected.

- At comprehension category of objectives students taught by Mastery Learning Model retained more as compared to those taught by Inquiry Training Model. The t-ratio between the mean retention scores of the two groups was found to be significant at 0.05 level of confidence. Hence, H11.07 was rejected.

- At comprehension category of objectives, students taught by Inquiry Training Model retained more as compared to those taught by conventional method. The t-ratio between the mean retention scores of the two groups was found to be significant at 0.01 level of confidence. Hence, H11.08 was rejected.

- At comprehension category of objectives, students taught by Mastery Learning Model retained more as compared to those taught by conventional method. The t-ratio between the mean retention scores of the two groups was found to be significant at 0.01 level of confidence. Hence H11.09 was rejected.

**Treatment and Cognitive Style (T x CS)**

F-ratio for the interaction between treatment and cognitive style was found to be insignificant. Thus H12 was rejected.

**Cognitive Style and Categories Of Objectives (CS x O)**

The F-ratio for the interaction between cognitive style and categories of objectives was found to be significant at 0.01 level of confidence, leading to the inference that the two variables interact with each other. Thus H13
was rejected. To investigate further, the t-ratios were computed to test the following hypotheses:

H13.01 Field independent students yield comparable retention scores at knowledge and comprehension category of objectives.

H13.02 Field dependent students yield comparable retention scores at knowledge and comprehension category of objectives.

H13.03 Field independent and field dependent students yield comparable retention scores at knowledge category of objectives.

H13.04 Field independent and field dependent students yield comparable retention scores at comprehension category of objectives.

The t-ratios have been placed in Table 6.11 given below and the interaction has been presented through fig. 6.8.

<table>
<thead>
<tr>
<th>Groups</th>
<th>C₁O₁</th>
<th>C₁O₂</th>
<th>C₂O₁</th>
<th>C₂O₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means</td>
<td>43.57</td>
<td>35.11</td>
<td>38.98</td>
<td>25.12</td>
</tr>
<tr>
<td>C₁O₁</td>
<td>-</td>
<td>14.14**</td>
<td>7.67**</td>
<td>30.85**</td>
</tr>
<tr>
<td>C₁O₂</td>
<td>-</td>
<td>-</td>
<td>6.47**</td>
<td>16.705**</td>
</tr>
<tr>
<td>C₂O₁</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>23.17**</td>
</tr>
<tr>
<td>C₂O₂</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

The Table 6.11 reveals that

- Field independent students exhibited better retention scores at knowledge category of objectives as compared to comprehension category of objectives in Mathematics. The t-ratio between the mean
FIG. 6.8: INTERACTION BETWEEN COGNITIVE STYLE AND CATEGORIES OF OBJECTIVES FOR RETENTION SCORES
retention scores at the two categories of objective was found to be significant at 0.01 level of confidence. Thus H13.01 was rejected.

Field dependent students exhibited better retention scores at knowledge category of objectives as compared to comprehension category of objectives in Mathematics. The t-ratio between the mean retention scores at the two categories of objectives was found to be significant at 0.01 level of confidence. This H13.02 was rejected.

Field independent students yielded better retention scores at knowledge category of objectives as compared to field dependent students. The t-ratio between the mean retention scores of two groups was found to be significant at 0.01 level of confidence. Thus H13.03 was rejected.

Field independent students yielded better retention scores at comprehension category of objectives as compared to field dependent students. The t-ratio between the mean retention scores of two groups was found to be significant at 0.01 level of confidence. Thus H13.04 was rejected.

Treatment, Cognitive Style and Categories of Objectives (T x CS x O)

The t-ratio for the interaction among the three variables was not found significant. This indicates that treatment, cognitive style and categories of objectives do not interact with each other. Hence H14 was rejected.

6.3.1 DISCUSSION OF RESULTS RELATED TO RETENTION SCORES

H8 was rejected as the mean retention scores of the three groups was found to be significant. Students taught by Inquiry Training Model and Mastery Learning Model yielded comparable retention scores in mathematics. But the students taught by Inquiry Training Model and
Mastery Learning Model yielded better retention scores than those students taught by conventional method of teaching. Thus H8.01 was retained and H8.02 and H8.03 were rejected. The results were supported by Swanson, (1976); Wae (1977); Srivastava (1983); Koul and Chand (1985) and Coffey (1981).

- H9 was rejected as field independent students exhibited better retention in Mathematics as compared to field dependent students.

- H10 was rejected as students at Knowledge category retained better as compared to the comprehension category of objectives.

- H11 was rejected as the interaction between treatment and category of objectives was found to be significant. The students taught by the three instructional treatments, viz., Inquiry Training Model, Mastery Learning Model and conventional method exhibited more retention at knowledge category of objectives as compared to that at comprehension category of objectives. Hence H11.01, H11.02 and H11.03 were rejected.

At knowledge category of objective, students taught by Inquiry Training Model and Mastery Learning Model yielded comparable retention scores in Mathematics. But the students taught by Inquiry Training Model and Mastery Learning Model retained more in mathematics as compared to those taught by the Conventional Method. Thus H11.04 was retained and H11.05 and H11.06 were rejected.

- At comprehension category of objectives students taught by Mastery Learning Model retained more as compared to those taught by Inquiry Training Model. Hence H11.07 was rejected. Both the groups taught
by Inquiry Training Model and Mastery Learning Model retained more as compared to those students taught by conventional method of teaching. Hence H11.08 and H11.09 were rejected.

- H12 was retained as interaction between treatments and cognitive style was found to be insignificant.

- H13 was rejected as the interaction between cognitive style and category of objectives was found to be significant. Field independent students and field dependent students exhibited better retention scores at knowledge category of objectives as compared to comprehension category of objectives in Mathematics. Thus H13.01 and H13.02 were rejected.

- Field independent students exhibited better retention scores at knowledge and comprehension category of objectives as compared to field dependent students. Thus H13.03 and H13.04 were rejected.

- H14 was retained as the three variables namely, treatment, cognitive style and category of objective were found to be independent with respect to retention in mathematics.

6.4 ANALYSIS OF SELF-CONCEPT SCORES

The gain as measured by the difference in post and pre-test scores on self-concept test was calculated for each student. The obtained scores were subjected to analysis of variance.

This analysis was done to test the following hypotheses:

H15 The three instructional treatments yield comparable mean gain scores on self-concept test.

H16 Field independent and field dependent students attain equal mean gain scores on self-concept test.
There is no significant interaction between instructional treatments and types of cognitive style.

The means and S.D.'s of different sub-samples were computed and have been presented in Table 6.12 and summary of ANOVA for 3 x 2 design for gain scores on self concept test have been given in Table 6.13.

<table>
<thead>
<tr>
<th>Cognitive Style</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.I. (C₁)</td>
<td>M=3.66 N=18 S.D.=2.666</td>
<td>M=4.11 N=18 S.D.=1.7916</td>
<td>M=1.72 n=18 S.D.=1.0957</td>
</tr>
<tr>
<td>F.D. (C₂)</td>
<td>M=3.66 N=18 S.D.=2.185</td>
<td>M=4.66 n=18 S.D.=1.7638</td>
<td>M=2.5 n=18 S.D.=1.5365</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>SS</th>
<th>df</th>
<th>MSS</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (Treatment)</td>
<td>97.55</td>
<td>2</td>
<td>48.775</td>
<td>15.95</td>
<td>S**</td>
</tr>
<tr>
<td>C.S. (Cognitive Style)</td>
<td>5.336</td>
<td>1</td>
<td>5.336</td>
<td>1.745</td>
<td>NS</td>
</tr>
<tr>
<td>1 x C.S. (Treatment X Cognitive Style)</td>
<td>186.434</td>
<td>2</td>
<td>93.217</td>
<td>30.49</td>
<td>S**</td>
</tr>
<tr>
<td>Error Term</td>
<td>311.9</td>
<td>102</td>
<td>3.057</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

MAIN EFFECTS

Treatment (T)

F-ratio for the difference between mean gain scores on self concept of the three treatment groups was found to be significant at 0.01 level of confidence. Examination of the means indicates that there is a difference in
the development of self-concept of students taught through different instructional treatments. Thus, H15 was rejected. To investigate further the difference between the impact of different treatments on self-concept, t-ratios were computed to test the following hypotheses:

H15.01 Inquiry Training Model and Mastery Learning Model yield comparable mean gain scores on self-concept.

H15.02 Inquiry Training Model and Conventional Method yield comparable mean gain scores on self-concept.

H15.03 Mastery Learning Model and Conventional Method yield comparable mean gain scores on self-concept.

The t-ratios for the difference in self-concept scores of the three treatment groups have been placed in Table 6.14.

<table>
<thead>
<tr>
<th>Group</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>3.66</td>
<td>4.38</td>
<td>2.11</td>
</tr>
<tr>
<td>T2</td>
<td>-</td>
<td>1.748</td>
<td>3.764**</td>
</tr>
<tr>
<td>T3</td>
<td>-</td>
<td>-</td>
<td>5.5137**</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level
** Significant at 0.01 level

The Table 6.14 reveals that:

- Inquiry Training Model and Mastery Learning Model yield comparable mean gain scores on self-concept test. Thus H15.01 was retained.
- Students taught by Inquiry Training Model developed better self-concept as compared to their counterparts taught by conventional method of teaching. This is evident from the t-ratio between the mean
of these two groups which was significant at 0.01 level of confidence. Thus, H15.02 was rejected.

Students taught by Mastery Learning Model developed better self-concept as compared to those taught by the conventional method of teaching. The t-ratio for the difference between the means of these two groups was found to be significant at 0.01 level of confidence. Thus, H15.03 was rejected.

Cognitive Style (C.S.)

F-ratio for the difference in mean gain scores on self-concept of the two groups viz., field independent and field dependent was found to be insignificant even at 0.05 level of confidence. Thus H16 was retained. The mean gain of the two main effects have been shown through bar diagram in fig. 6.9

TWO ORDER INTERACTION

Treatment x Cognitive Style (T x C.S.)

F-ratio for the interaction between treatment and cognitive style was found to be significant at 0.01 level of confidence. Thus H17, was rejected, as the variables of treatment and cognitive style interacted with one another.

For further investigations of the interaction between treatment and cognitive style, t-ratios were computed for the following hypotheses:

H17.01 Through Inquiry Training Model field independent and field dependent students attain comparable mean gain scores on self-concept.

H17.02 Through Mastery Learning Model field independent and field dependent students attain comparable mean gain on self-concept.
FIG. 6.9: BAR DIAGRAM SHOWING MEAN GAIN ON SELF-CONCEPT SCORES CORRESPONDING TO THE TWO MAIN EFFECTS
H17.03 Through Conventional Method field independent and field dependent students attain comparable mean gain on self-concept.

H17.04 Field independent students yield comparable mean gain scores on self-concept when taught by Inquiry Training Model and Mastery Learning Model.

H17.05 Field independent students yield comparable mean gain scores on self-concept when taught by Inquiry Training Model and conventional method.

H17.06 Field independent students yield comparable mean gain scores on self-concept when taught by Mastery Learning Model and Conventional Method.

H18.07 Field dependent students yield comparable mean gain scores on self-concept when taught by Inquiry Training Model and Mastery Learning Model.

H18.08 Field dependent students yield comparable mean gain scores on self-concept when taught by Inquiry Training Model and Conventional Method.

H18.09 Field dependent students yield comparable mean gain scores on self-concept when taught by Mastery Learning Model and Conventional Method.

The t-ratios have been placed in Table 6.15 below and the interaction has been presented through Fig.6.10
FIG. 6.10: INTERACTION BETWEEN TREATMENT AND COGNITIVE STYLE FOR MEAN GAIN ON SELF-CONCEPT SCORES
The above table 6.15 reveals that:

- Through Inquiry Training Model field independent and field dependent students attained comparable mean gain scores on self-concept. Thus H17.01 was retained.

- Through Mastery Learning Model field independent and field dependent students yielded comparable mean gain scores on self-concept. Thus H17.02 was retained.

- Through Conventional Method field independent and field dependent students yielded comparable mean gain scores on self-concept. Thus H17.03 was retained.

- Field independent students yielded comparable mean gain scores on self-concept when taught by Inquiry Training Model and Mastery Learning Model. Thus H17.04 was retained.
Field Independent students taught by Inquiry Training Model developed better self-concept as compared to those taught by Conventional Method. The t-ratio between the mean gain scores on self-concept of the two groups was found to be significant at 0.01 level of confidence. Hence H17.05 was rejected.

Field independent students taught by Mastery Learning Model developed better self-concept as compared to those taught by conventional method. The t-ratio between the mean gain scores on self-concept of the two groups was found to be significant at 0.01 level of confidence. Hence H17.06 was rejected.

Field dependent students taught by Inquiry Training Model and Mastery Learning Model yielded comparable mean gain scores on self-concept. Thus H17.07 was retained.

Field dependent students taught by Inquiry Training Model and Conventional Method yielded comparable mean gain scores on self-concept. Thus H17.08 was retained.

Field dependent students taught by Mastery Learning Model developed better self-concept as compared to those taught by conventional method. The t-ratio between the mean gain scores on self-concept of the two groups was found to be significant at 0.01 level of confidence. Hence H17.09 was rejected.

6.4.1 DISCUSSION OF RESULTS RELATED TO SELF-CONCEPT SCORES

The three instructional treatments yielded different means gain scores on self-concept. Thus H15 was rejected. Students taught through Inquiry Training Model and Mastery Learning Model developed comparable self-concept. But, students taught through Inquiry Training Model developed
better self-concept as compared to those taught through conventional method. Also, students taught through Mastery Learning Model developed better self-concept as compared to those taught through conventional method. The finding was in contrast to the findings of Singh (1993) and Mathur (1988). Thus H15.01 was retained and H15.02 and H15.03 were rejected.

Field independent and field dependent students attain equal mean gain scores on self-concept test. Thus H16 was retained.

Instructional treatments and types of cognitive style interacted with one another significantly. Hence, H17 was rejected.

Field independent and field dependent students developed comparable self-concept when taught through Inquiry Training Model, Mastery Learning Model and Conventional Method. Thus H17.01, H17.02 and H17.03 were retained.

Field independent students yielded comparable mean gain scores on self-concept when taught by Inquiry Training Model and Mastery Learning Model. Teaching field independent students by Inquiry Training Model led to development of better self-concept as compared to conventional method. Also Mastery Learning Model led to development of self-concept better in field independent as compared to their counterparts taught by Conventional Method. Thus 17.04 was retained and H17.05 and H17.06 were rejected.

Field dependent students yielded comparable mean gain scores on self-concept when taught by Inquiry Training Model and Conventional Method. Thus H17.07 was retained. Field dependent students taught by Inquiry Training Model developed better self-concept as compared to those taught by Conventional Method. Thus H17.08 was rejected.
Field dependent students taught by Mastery Learning Model developed better self-concept as compared to those taught by conventional method. Thus H17.09 was rejected.

Thus, it may be said that teaching strategies help to build students' self-concept (Mejia, 1999) as compared to conventional method.