CHAPTER V
ANALYSIS AND INTERPRETATION OF THE DATA
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5.0 Introduction

This chapter gives the details of the analysis of the data related to the impact of Dimensions of Learning Model on Achievement in Science, Creative Thinking and Attitude towards Science. It gives the details of both quantitative and qualitative analysis of the data collected of pre and post tests results on Achievement in Science, Creative Thinking, Attitude towards Science and students’ reactions towards Dimensions of Learning Model and the discussion of the findings of these results.

The details of the interpretation of the data are presented in two Sections as given below.
Section I: Quantitative Analysis of the collected data.
Section II: Qualitative Analysis of the collected data.

SECTION I

5.1 Quantitative Analysis of the Collected Data

In this Section, analysis has been done for the following three aspects of the study,

1. Testing the significant differences between pre-test means of the Experimental Group (EG) and Control Groups (CG) on Achievement in Science, Creative Thinking and Attitude towards Science.

2. Testing the significant differences between pre- test means of the Experimental Group students with respect to gender groups in Achievement in Science, Creative Thinking and Attitude towards Science.

4. Testing the significant differences between post-test means of the Experimental Group students with respect to gender groups in Achievement in Science, Creative Thinking and Attitude towards Science.

5. Testing the relationship between Achievement in Science, Creative Thinking and Attitude towards Science of the Experimental Group students.

5.1.1 Testing the Significant Differences between Pre-test Means of the Experimental Group (EG) and Control Groups (CG) on Achievement in Science, Creative Thinking and Attitude towards Science

In order to ensure that the Experimental Group and the Control Group are equivalent on the Pre-tests of dependent variables, namely, Achievement in Science, Creative Thinking and Attitude towards Science of eighth standard students, the data collected by administering the Achievement in Science Test, Creative Thinking test and Attitude Scale towards Science and collecting the marks obtained by the students of eighth standard was subjected to statistical analysis with the following three hypotheses.

5.1.1.1 Testing the Significant Differences between Pre-test Means of the Experimental Group (EG) and Control Groups (CG) on Achievement in Science

H01. There is no significant difference between Pre-test means of the Experimental Group and the Control Group in Achievement in Science.

The ‘t’ test was used to test the significant difference between pre-test mean scores of the Experimental Group and the Control Group in the level of Science Achievement and the details are given in the table 5.1.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental</td>
<td>93</td>
<td>13.07</td>
<td>4.1</td>
<td>183</td>
<td>1.29</td>
<td>0.19</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>92</td>
<td>12.34</td>
<td>3.61</td>
<td>183</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p>0.05
The result in the table 5.1 shows that the obtained t-value in Science Achievement (1.29) is not significant at 0.05 level. Hence the null hypothesis is accepted and it is concluded that there is no significant difference between pre-test means of the Experimental Group and the Control Group in the level of Science Achievement. Comparison of the mean scores of the Experimental Group and the Control Group on the level of Science Achievement is presented graphically too, vide graph 5.1. Thus it is concluded that the groups selected were equivalent in Science Achievement variable. The same details are presented in the graph no 5.1.

Graph 5.1: Showing the Science Achievement Level Pre-test Mean scores of EG & CG

5.1.1.2 Testing the Significant Differences between Pre-test Means of the Experimental and the Control Groups on Creative Thinking.

H02. There is no significant difference in the level of Creative Thinking between Pre-test means of the Experimental Group and the Control Group.

The ‘t’ test was used to test the significant difference between pre-test mean scores of the Experimental Group and the Control Group in the level of Creative Thinking and the details are given in the table 5.2.
Table 5.2: ‘t’ test Details for the Initial Difference between Pre-test Means of EG & CG in the Level of Creative Thinking

<table>
<thead>
<tr>
<th>S.N</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental</td>
<td>93</td>
<td>70.38</td>
<td>8.33</td>
<td>183</td>
<td>1.14</td>
<td>0.25</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>92</td>
<td>71.78</td>
<td>8.37</td>
<td></td>
<td></td>
<td>p&gt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

The result in the table 5.2 shows that the obtained t-value in Creative Thinking (1.14) is not significant at 0.05 level. Hence the null hypothesis is accepted and it is concluded that there is no significant difference in Creative Thinking between Pre-test means of the Experimental Group and the Control Group. Comparison of the mean scores of the Experimental Group and the Control Group on the level of Creative Thinking is presented graphically too, vide graph 5.2. Thus it is concluded that the groups selected were equivalent in Creative Thinking level. The same details are presented in the graph no 5.2.

Graph 5.2: Showing the Creative Thinking Level Pre-test Mean Scores of EG & CG
5.1.1.3 Testing the Significant Differences between Pre-test Means of the Experimental and the Control Groups on Attitude towards Science.

H03. There is no significant difference between pre-test means of the Experimental Group and the Control Group in Attitude towards Science.

The ‘t’ test was used to test the significant difference between pre-test mean scores of the Experimental Group and the Control Group in the level of Attitude towards Science and the details are given in the table 5.3.

**Table 5.3: ‘t’ test Details for the Initial Difference between Pre-test Means of EG & CG in the Level of Attitude towards Science**

<table>
<thead>
<tr>
<th>S.N</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental</td>
<td>93</td>
<td>51.69</td>
<td>3.60</td>
<td>183</td>
<td>1.63</td>
<td>0.10</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>92</td>
<td>50.63</td>
<td>5.08</td>
<td></td>
<td></td>
<td></td>
<td>Significant</td>
</tr>
</tbody>
</table>

p>0.05

The result in the table 5.3 shows that the obtained t-value in Attitude towards Science (1.63) is not significant at 0.05 level. Hence the null hypothesis is accepted and it is concluded that there is no significant difference between Pre-test means of the Experimental Group and the Control Group in the level of Attitude towards Science. Comparison of the mean scores of the Experimental Group and the Control Group on the level of Attitude towards Science is presented graphically too, vide graph 5.3. Thus it is concluded that the groups selected were equivalent in science Attitude towards Science level. The same details are presented in the graph no 5.3.
5.1.2 Testing the Significant Difference between Pre-test Means of the Experimental Group Students with Respect to Gender Groups in Achievement in Science, Creative Thinking and Attitude towards Science

To test the significant Difference among pre-means of the Experimental Group students belonging to gender in Science Achievement, Creative Thinking, and Attitude towards Science, the null hypotheses were formulated and ‘t’ test was used to test the hypotheses.

5.1.2.1 Testing the Significant Difference between Pre-test Means of the Experimental Group Students with Respect to Gender Groups in Achievement in Science

H01: There is no significant difference between Pre-test means of males and females in Achievement in Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Pre-mean scores of males and females in the Experimental Group on Science Achievement. The details are given in the table 5.4.
Table 5.4: ‘t’ test Details for the Initial Difference between Pre-test Means of Males & Females in the Experimental Group on Achievement in Science

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>12.66</td>
<td>4.29</td>
<td>91</td>
<td>0.95</td>
<td>0.34</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>13.47</td>
<td>3.91</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the table 5.4 it is clear that the obtained t-value (0.95) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Pre-test means of males and females in the Experimental Group on Science Achievement. The same details are presented in the graph no 5.4.

Graph 5.4: Showing the Difference between the Pre-test Mean Scores of Males and Females on Achievement in Science

5.1.2.2 Testing the Significant Difference between Pre-test Means of the Experimental Group Students with Respect to Gender Groups in Creative Thinking

H02: There is no significant difference between Pre-test means of males and females in Creative Thinking.
In order to test the above mentioned study hypothesis, the ‘t’ test was used to test the significant difference between the Pre-test mean scores of males and females in the Experimental Group on Creative Thinking. The details are given in the table 5.5.

Table 5.5: ‘t’ test Details for the Initial Difference between Pre-test Means of Males & Females in the Experimental Group on Creative Thinking

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>71.86</td>
<td>8.03</td>
<td>91</td>
<td>1.74</td>
<td>0.08</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>68.91</td>
<td>8.26</td>
<td></td>
<td></td>
<td>p&gt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

From the table 5.5 it is clear that the obtained t-value (1.74) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Pre-test means of males and females in the Experimental Group on Creative Thinking. The same details are presented in the graph no 5.5.

Graph 5.5: Showing the Difference between the Pre-test Mean Scores of Males and Females on Creative Thinking
5.1.2.3 Testing the Significant Difference between Pre-test Means of the Experimental Group Students with Respect to Gender Groups in Attitude towards Science

H03: There is no significant difference between pre-means of males and females in Attitude towards Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Pre-test mean scores of males and females in the Experimental Group on Attitude towards Science. The details are given in the table 5.6.

Table 5.6: ‘t’ test Details for the Initial Difference between Pre-test Means of Males & Females in the Experimental Group on Attitude towards Science

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>51.17</td>
<td>3.58</td>
<td>91</td>
<td>1.35</td>
<td>0.17</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>52.22</td>
<td>3.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p>0.05

From the table 5.6 it is clear that the obtained t-value (1.35) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Pre-means of males and females in the Experimental Group on Attitude towards Science. The same details are presented in the graph no 5.6.

Graph 5.6: Showing the Difference between the Pre-test Mean Scores of Males and Females on Attitude towards Science
5.1.3 Testing the Effect of Dimensions of Learning Model on Post-test Means of the Experimental Group and the Control Group in Achievement in Science, Creative Thinking and Attitude towards Science

To study the effect of Dimensions of Learning Model on Post-means of the Experimental Group and the Control Group in Achievement in Science, Creative Thinking, and Attitude towards Science among the eighth standard students, the null hypotheses were formulated. ‘t’ test was used to test the hypotheses.

5.1.3.1 Testing the Effect of Dimensions of Learning Model on Post-test Means of the Experimental Group and the Control Group in Achievement in Science

H01. There is no significant difference between Post-test means of the Experimental Group and the Control Group in Achievement in Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-test mean scores of the Experimental Group and the Control Group in Achievement in Science. The details are given in the table 5.7.

| Table 5.7: ‘t’ test Details for the Initial Difference between Post-test Means of EG & CG in Achievement in Science |
|---|---|---|---|---|---|---|---|
| S.N | Group | N | Mean | S.D | df | t-value | p-value | Level of Significance |
| 1 | Experimental | 93 | 51.66 | 7.65 | 183 | 8.67 | .000 | Significant beyond 0.01 |
| 2 | Control | 92 | 42.93 | 5.91 | | | | |

As it is shown in the table 5.7, the obtained t-value for the Post-means of the Experimental Group and the Control Group on Achievement in Science (8.67) is significant at 0.01 level. So the null hypothesis is rejected and it is concluded that there is a significant difference between Post-test means of the Experimental Group and the Control Group in Achievement in Science and it is also implied that the Experimental Group exhibited higher level of Achievement in Science than the Control Group as the Post-test mean of the Experimental Group (51.66) is significantly higher than the Control Group (42.93). The same details are presented in the graph no 5.7.
Graph 5.7: Showing the Post-test mean Scores of EG and CG on Achievement in Science

5.1.3.2 Testing the Effect of Dimensions of Learning Model on Post-test Means of the Experimental Group and the Control Group in Creative Thinking

H02. There is no significant difference on Creative Thinking between Post-test means of the Experimental Group and the Control Group.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-mean scores of Creative Thinking. The details are given in the table 5.8.

Table 5.8: ‘t’ test Details for the Initial Difference between Post-test Means of EG & CG in Creative Thinking

<table>
<thead>
<tr>
<th>S.N</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental</td>
<td>93</td>
<td>87.08</td>
<td>10.93</td>
<td>183</td>
<td>7.52</td>
<td>.000</td>
<td>Significant beyond 0.01</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>92</td>
<td>75.43</td>
<td>10.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p<0.01
As it is shown in the table 5.8, the obtained t-value for the Post-test means of the Experimental Group and the Control Group on Creative Thinking (7.52) is significant at 0.01 level. So the null hypothesis is rejected and it is concluded that there is a significant difference between the Experimental Group and the Control Group in Creative Thinking and it is also implied that the Experimental Group exhibited the higher Creative Thinking than the Control Group as the Post-test mean of the Experimental Group (87.08) is significantly higher than the Control Group (75.43). The same details are presented in the graph no 5.8.

**Graph 5.8: Showing the Post-mean Scores of EG and CG on Creative Thinking**

![Graph 5.8](image)

5.1.3.3 Testing the Effect of Dimensions of Learning Model on Post-test means of the Experimental Group and the Control Group in Attitude towards Science

H03. There is no significant difference between Post-test means of the Experimental Group and the Control Group in Attitude towards Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-test mean scores of Attitude towards Science. The details are given in the table 5.9.
Table 5.9: ‘t’ test Details for the Initial Difference between Post-test Means of EG & CG in Attitude towards Science

<table>
<thead>
<tr>
<th>S.N</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experimental</td>
<td>93</td>
<td>86.09</td>
<td>10.28</td>
<td>183</td>
<td>27.47</td>
<td>.000</td>
<td>Significant beyond 0.01</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>92</td>
<td>51.41</td>
<td>6.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p<0.01

As it is shown in the table 5.9, the obtained t-value for the post-test means of the Experimental Group and the Control Group on Attitude towards Science (27.47) is significant at 0.01 level. So the null hypothesis is rejected and it is concluded that there is a significant difference between the Experimental Group and the Control Group in Attitude towards Science and it is also implied that the Experimental Group exhibited the higher Attitude towards Science than the Control Group as the Post-test mean of the Experimental Group (86.09) is significantly higher than the Control Group (51.41). The same details are presented in the graph no 5.9.

Graph 5.9: Showing the Post-test mean Scores of EG and CG on Attitude towards Science
5.1.4. Testing the Significant Difference between Post-test Means of the Experimental Group Students with Respect to Gender Groups in Achievement in Science, Creative Thinking and Attitude towards Science

To test the significant Difference between Post-test means of the Experimental Group students belonging to gender groups in Achievement in Science, Creative Thinking and Attitude towards Science, the null hypotheses were formulated and ‘t’ test was used to test the hypotheses.

5.1.4.1 Testing the Significant Difference between Post-test Means of the Experimental Group Students belonging to Gender groups in Achievement in Science

H01: There is no significant difference between Post-test means of males and females in Achievement in Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-mean scores of males and females in the Experimental Group on Achievement in Science. The details are given in the table 5.10.

Table 5.10: ‘t’ test Details for the Initial Difference between Post-test Means of Males & Females in the Experimental Group on Achievement in Science

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>52.40</td>
<td>7.20</td>
<td>91</td>
<td>0.91</td>
<td>0.361</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>50.93</td>
<td>8.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p>0.05

From the table 5.10 it is clear that the obtained t-value (0.91) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Post-test means of males and females in the Experimental Group on Achievement in Science. The same details are presented in the graph no 5.10.
5.1.4.2 Testing the Significant Difference among Post-test Means of the Experimental Group Students belonging to Gender Groups in Creative Thinking

H02: There is no significant difference between Post-test means of males and females in Creative Thinking.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-mean scores of males and females in the Experimental Group on Creative Thinking. The details are given in the table 5.11.

Table 5.11: ‘t’ test Details for the Initial Difference between Post-test Means of Males & Females in the Experimental Group on Creative Thinking

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>86.82</td>
<td>10.86</td>
<td>91</td>
<td>0.22</td>
<td>0.823</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>87.33</td>
<td>11.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p>0.05
From the table 5.11 it is clear that the obtained t-value (0.22) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Post-means of males and females in the Experimental Group on Creative Thinking. The same details are presented in the graph no 5.11.

**Graph 5.11: Showing the Difference between the Post-test Mean Scores of Males and Females on Creative Thinking**

5.1.4.3 Testing the Significant Difference between Post-test Means of the Experimental Group Students belonging to Gender Groups in Attitude towards Science

H03: There is no significant difference between Post-test means of males and females in Attitude towards Science.

In order to test the above mentioned Study hypothesis, the ‘t’ test was used to test the significant difference between the Post-mean scores of males and females in the Experimental Group on Attitude towards Science. The details are given in the table 5.12.
Table 5.12: ‘t’ test Details for the Initial Difference between Post-Means of Males & Females in the Experimental Group on Attitude towards Science

<table>
<thead>
<tr>
<th>S.N</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Males</td>
<td>45</td>
<td>83.28</td>
<td>11.51</td>
<td>91</td>
<td>2.70</td>
<td>0.08</td>
<td>Not Significant</td>
</tr>
<tr>
<td>2</td>
<td>Females</td>
<td>48</td>
<td>88.91</td>
<td>8.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the table 5.12 it is clear that the obtained t-value (2.70) is not significant at 0.05 level. So the null hypothesis is accepted and it is concluded that there is no significant difference between the Post-test means of males and females in the Experimental Group on Attitude towards Science. The same details are presented in the graph no 5. 12.

Graph 5. 12: Showing the Difference between the Post-test Mean Scores of Males and Females on Attitude towards Science

5.1.5 Testing the Relationship among Achievement in Science, Creative Thinking and Attitude towards Science of the Experimental Group Students

Relationships measure to what extent variables are related. It is a measure of linear association. To study the relationship between independent variables the Pearson’s
Product Moment Correlation was applied on the Post-test scores of Achievement in Science, Creative Thinking and Attitude towards Science. The following null hypotheses were formulated to address the issue of relationship between the dependent variables of Achievement in Science, Creative Thinking and Attitude towards Science.

H01: there is no relationship between Achievement in Science and Creative Thinking.

H02: there is no relationship between Achievement in Science and Attitude towards Science.

H03: there is no relationship between Creative Thinking and Attitude towards Science.

A relationship matrix showing the relationships among Post-test scores on each of the three dependent variables is presented in table 5.13. Each dependent variable showed a positive relationship with the other two variables, although the strength of the relationship varied. The following table lists the result of relationship analysis:

**Table 5.13: Relationships between the Dependent Variables of the Experimental Group Students**

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Achievement in Science</th>
<th>Creative Thinking</th>
<th>Attitude towards Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement in Science</td>
<td><strong>0.489</strong> -</td>
<td><strong>0.305</strong></td>
<td><strong>0.255</strong></td>
</tr>
<tr>
<td>Creative Thinking</td>
<td><strong>0.489</strong> <strong>0.255</strong></td>
<td><strong>0.255</strong> -</td>
<td><strong>0.305</strong></td>
</tr>
<tr>
<td>Attitude towards Science</td>
<td><strong>0.305</strong> <strong>0.255</strong></td>
<td><strong>0.255</strong> -</td>
<td><strong>0.305</strong></td>
</tr>
</tbody>
</table>

*Relationship is significant at the 0.05 level (2-tailed).

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

From table 5.13 it can be seen that there is a significant and positive relationship between Achievement in Science and Creative Thinking, which is indicated by the r value 0.489, which is significant at 0.01 level. Hence, the null hypothesis stating that there is no relationship between Achievement in Science and Creative Thinking of
students is rejected. The alternative hypothesis which states that there is a positive relationship between Achievement in Science and Creative Thinking of the Experimental Group is accepted. The result is in tune with Al-Zaidy (2009) and Khatab (2007) who found that that Achievement in Science and Creative Thinking are positively correlated.

It can also be seen from the table 5.13 that there is significant and positive relationship between Achievement in Science and Attitude towards Science, as indicated by the r value 0.305, which is significant at 0.01 level. Hence, the null hypothesis stating that there is no relationship between Achievement in Science and Attitude towards Science of students is rejected. The alternative hypothesis which states that there is a positive relationship between Achievement in Science and Attitude towards Science of the Experimental Group is accepted. The result is in agreement with Al-Ghamdi (2009), Saleh (2009) and Unal & Ergin (2006) who reported that Achievement in Science and Attitude towards Science are positively correlated.

A significant positive relationship was found between Creative Thinking and Attitude towards Science also, as indicated by the r value 0.255, significant at 0.05 level. Hence, the null hypothesis stating that there is no relationship between Creative Thinking and Attitude towards Science of students is rejected. The alternative hypothesis which states that there is a positive relationship between Creative Thinking and Attitude towards Science of the Experimental Group is accepted.

SECTION II

5.2 Qualitative Analysis of the Results

The qualitative results are supported by the qualitative analysis of the responses given by the students’ reaction towards Dimensions of Learning Model. The qualitative analysis was done in the following section:

5.2.1 Analysis of the Students’ Reactions towards Dimensions of Learning Model

The students’ Reaction Scale used to record the reaction of the students towards the Dimensions of Learning Model consisted of the questions related to the approach
used to introduce the science topics, the environment surrounding and activities and assignments given during teaching processes.

- Ninety six percent of the students liked the Dimensions of Learning Approach and opined that they have learnt the science topics meaningfully through this approach.
- Eighty three percent of students expressed that they learnt science lessons without any difficulty and enjoyed learning science in the classroom.
- Ninety two of them agreed that the method helped them in understanding each other in a better way.
- Eighty seven percent of students expressed that the Investigator continually reinforced effort and boosted sense of their ability.
- Ninety four percent of students liked doing activities in cooperative groups and ninety of them opined that the approach used helped them in building their self-esteem.
- Ninety one percent of students expressed that the Investigator acknowledged them while trying to be particularly accurate, Ninety three percent of them opined that the Investigator encouraged them in engaging activity even when answers are not immediately apparent and eighty four percent of students expressed that Investigator provided some time for their groups to evaluate their action.
- Ninety five percent of students liked the lessons taught by the Investigator, to be repeated again.
- Eighty six percent of students agreed that the Investigator asked the questions a second time and they were given wait time to answer and eighty eight percent of them agreed that they were given freedom to ask questions in the class.
- Eighty two percent of them expressed that their ideas were accepted and encouraged by the Investigator.
- Eighty one percent of students agreed that they were given an opportunity to conduct experiment in the laboratory and eighty five percent of them opined that they took initiative to perform the activities in the class.
Ninety four percent of students like the classroom environment because it helped them in building good relationship with their classmates and opined that they were accepted by the Investigator and eighty nine percent of them agreed that the classroom’s desks and other furniture were arranged.

Eighty two percent of students expressed that the Investigator presented a Model of how each activity should look when it is completed and eighty eight percent of them like activities given to them in the classroom.

Ninety percent of them opined that the assignments helped them to apply their knowledge in meaningful ways and agreed that they were doing assignments without any difficulty.

Ninety four percent of students liked to work in cooperative groups and expressed that the cooperative work helped them in understanding the topics taught clearly.

Eighty three percent of students agreed that the activities that they were asked to perform have a value and eighty seven percent of them opined that the activities made their learning meaningful.

Apparently, through the analysis of the reactions of the students, it can be concluded that the students really liked the way the science lessons were introduced, the learning environment and the activities and assignments given to them to learn science content.

5.3 Discussion of the Results of the Study

The main purpose of the Study was to find out the effect of Dimensions of Learning Model in learning science among eighth standard students. The Study employed The Randomized Groups, Pre-test, Post-test two Groups Design. The performances of the students were analysed using both descriptive and inferential analysis.

From the analysis and interpretation given in the preceding Sections, it is revealed that Dimensions of Learning Model had an effect on Achievement in Science, Creative Thinking and Attitude towards Science of eighth standard students which is evident through both descriptive and inferential analysis. The data were analyzed wherefore a highly significant difference in Achievement in Science was observed (t=8.67, p< 0.01)
between the Experimental and Control Groups. The mean score of the Experimental Group (51.66) was found to be significantly higher than the Control Group (42.93). The findings of this Study confirmed the findings of Aal-Sauad (2010) and Abu Bakr (2003), demonstrating that the Achievement was enhanced in students. The Study also confirms the findings of Al-Bali (2003), Al-Rehali (2007), Al Saud (2009) and Saleh (2009) that the Achievement is improved through the use of Dimensions of Learning Model through the intervention of the Approach. Furthermore, the findings of the Study corroborated with other research findings of Alfinio (1999) who asserted that Dimensions of Learning Model enhanced Achievement of students, and Al-Haroon (2003), Al-Zoqbi and Al-Salamat (2011) who in their studies found that Dimensions of Learning Model could enhance Achievement of students in biology and physics respectively.

As the Study revealed, the reason for the increase in students’ Achievement is the Investigator offered concepts map, a picture, a short story, or scientific riddle at the beginning of the class, raising interesting questions to stimulate student. This resulted in an increase in the students’ motivation towards learning, participation in the performance of the activities, and discussion of the findings and reviewing them with each other.

On another plane, students’ improvement is perhaps the result of an interest in what they have learned rather than in the grades they were offered. Thus, the positive involvement of the students in the learning process itself has built in them the desire to know, and encouraged them to participate and produce, avoiding the threatening situation associated with answering the classroom questions. Besides, by creating a climate of mutual respect and acceptance between students and between students and teachers, the Study observed a highly positive effect on students’ high interest and attitudes toward science which led to enhance students’ achievement. Hence, the findings of the Study come in line with Jelinek’s (1998) contention that one of the most important reasons for the low Achievement seems to be students’ low interest and negative attitudes toward science (cited in Turkmen, 2007, 67).

The other reason for the increase in students’ Achievement is attributed to the use of various strategies of teaching Dimensions of Learning Model such as Cooperative Learning, K.W.L, Brain Storming, Advance Organizations, Think Aloud, etc which
emphasize on learning through the active participation of the students. By using K.W.L strategy, the students were given a chance to link new knowledge to knowledge they already knew. Besides, by deploying advance organizers and mental pictures approach, the teacher could help students organize their information and store their information in their long-term memory which conductively enables them to retrieve their information.

Further, the second dimension involves interaction between what the students already know and what they want to learn. So, by inquiring new knowledge, students could link it to their prior knowledge, organize this knowledge and store it in a long-term memory, thus making the learning process much easier. In addition, by extending knowledge and refining learning among the students, Dimensions of Learning gives more opportunities for students via sharing knowledge, solving problems, providing ideas, discussing with teammates and teacher, correcting misunderstanding related to their prior knowledge, realizing weak points during team work and helping and supporting each other during engagement intensity in classroom tasks which lead to develop their understanding in-depth. This Model also provides the students with explicit opportunities to apply their knowledge in meaningful ways through extra-curricular activities and assignments. As Marzano (1992) reported, when positive attitudes and perceptions are in place and productive habits of mind are being used, learners can more effectively do the thinking required in the other three dimensions, that is, acquiring and integrating knowledge (Dimension 2), extending and refining knowledge (Dimension 3) and using knowledge meaningfully (Dimension 4).

The Study has shown that one of the reasons for the improved Achievement in Science is due to the students’ performance of classroom activities cooperatively in the form of worksheets which included cognitive operations such as comparison, classification, induction, deduction, error analysis etc, which led to greater engagement of the students in a way that allowed learners to refashion their knowledge of content. The learning in a collaborative learning is based on learning from peers through the division of students into heterogeneous cooperative groups in scholastic attainment (high - medium - low). Therefore, each member in the group becomes an active participant through the exchange of views and ideas to accomplish the activity. Then, learning from
pears leads to make low achievers learn from high achievers, which in turn leads to increase in Achievement of the Experimental Group. Also, Continuous feedback was an influential factor in students’ Achievement. It continually reinforced students’ effort and boosted their sense of ability and the role of the Investigator thereby was just a guide and supervisor.

Nevertheless, there are two important factors which helped students achieve a successful learning process: Group Goals and Individual Accountability. Consistently, while the Group Goals process motivated students to help each other learn by giving them a stake in one another’s success, Individual Accountability deterred the likelihood that one or two group members would do all the work exclusively. So, if the group’s success depended on the individual learning of each group member, then group members were more motivated to engage every member in mastering the material being studied. Each group was given the opportunity to shoulder its responsibilities under the guidance of the teacher. This learning process also gave the learners the chance to discuss things with each other and to express their own view and opinions.

The analysis of the student’s reactions to the Dimensions of Learning revealed that the students of the Experimental Group gave positive feedback regarding the Dimensions of Learning Model. About ninety six percent of the students liked the approach and eighty three percent of them opined that they learned science lessons without any difficulty. Ninety percent of them also opined that the assignments helped them apply their knowledge in meaningful ways and agreed that they were doing assignments without any difficulty. Moreover, ninety four percent of students liked classroom environment because it helped them in building good relationship with their classmates and they expressed that this gave them opportunity to ask question, perform experiments and activities. Therefore, learning environment played important role in enabling students to obtain scientific knowledge and develop more positive attitude toward science. Marzano (1992) in this regard has aptly asserted that if the students have positive attitudes and perceptions, they will learn more and learning will be easier.

In the Control Group, the Investigator played the main role-explaining, demonstrating, showing audio-visual aids etc., but rarely chances were provided to
students to engage in learning, whereby most of the students become passive recipients of knowledge in the classroom. The cause for the failure of this conventional method is the presentation of science as a prepared and inexperienced knowledge to the students. Rote learning strictly dominated in the classroom, and as a result, students tended to imitatively memorize rather than meaningfully understand what they learnt at school. Besides, students could not relate what they learned as science at school to their daily lives.

The results of the Study proved that the Experimental Group taught through Dimensions of Learning Model showed significant improvement in their Creative Thinking than the conventionally taught Control Group. The data was analyzed wherefore a highly significant difference in Creative Thinking was observed \( (t=7.52, p<0.01) \) between the Experimental and Control Groups. The mean score of the Experimental Group \( (87.08) \) was found to be significantly higher than the Control Group \( (75.43) \). This result is in tune with AlBaz (2001) and Taha (2007) who found that Creative Thinking was increased due to intervention through Dimensions of Learning Model. Enhancement of Creative Thinking of the Experimental Group may be due to the establishment of a creative classroom environment that affected positively on Creative Thinking by creating a warm supportive atmosphere of freedom and security in exploratory thinking. This included listening to and laughing with students, providing learning tasks of appropriate difficulty, allowing time for students to think about and develop their creative ideas, encouraging students’ participation, supporting and reinforcing unusual students’ ideas, showing an interest in what they have learned rather than in their grades, avoiding the threatening situation associated with answering the classroom questions and creating a climate of mutual respect and acceptance between students and between students and teachers, so that students could share, develop, and learn together and from one another as well as independently. In the light of this, Feldhusen and Treffinger (1984) and Davis (1991) argued that establishing a “creative climate” was important to stimulate Creative Thinking.

The Study also showed a highly significant difference in Post-test mean scores of the Experimental Group and the Control Group in their Attitude towards Science in favor
of Experimental Group. The data was analyzed wherefore a highly significant difference in Attitude towards Science was observed ($t=27.47$, $p< 0.01$) between the Experimental and Control Groups. The mean score of the Experimental Group (86.09) was found to be significantly higher than the Control Group (51.41). As illustrated by Saleh (2009), students in the Experimental Group showed positive Attitudes towards Science. According to Abu Bakr (2003), Al-Zoqbi and Al-Salamat (2011) and Hassaneen (2006), Dimensions of Learning Model developed a positive Attitude towards a variety of subjects among the students.

Furthermore, by giving more opportunities for students to discuss, solve problems, create solutions, DOL incited students’ desire and potentials to develop their understanding in-depth and building good social relationship with their group mates. In addition, this Model provided the students with appropriate classroom climate in the beginning of lesson to enhance students’ positive attitude and perceptions about learning through the creation of positive relationship between teacher and students that improved their attitude towards science. Olatunde (2009) noted that to improve student’s attitude towards science, the teacher should develop positive relationship with students and stress classroom activities that involve active teaching-learning process and students’ participation in the class.

It was revealed from analysis that the impact of Dimensions of Learning Model was found influential equal on both males and females with respect to their Achievement in Science, Creative Thinking and Attitude towards Science. The findings of this Study were in tune with other researchers’ like Ali (2006), who confirmed that there was no difference among males and females in Creative Thinking, Sokadar and kulce (2008) and Wang and Berlin (2010) who confirmed that there were no significant differences at the students’ Attitudes towards Science relating to gender. As attributed to the treatment given to the students of the Experimental Group, the Dimensions of Learning Model fits males and females because they are learning in an equal learning environment and there is no difference between males and females in terms of behaviors performed by them during their learning through active participation in the discussion with each other.

The analysis also showed that there are significant relationships between the
variables Achievement in Science and Creative Thinking ($r = 0.489$), Achievement in Science and Attitude towards Science ($r = 0.305$) and between the variables of Creative Thinking and Attitude towards Science ($r = 0.255$). This positive relationship between all variables with each other is an ultimate result of the efficiency of learning activities such as assignment and extra-curricular acts which were given to students to think and act cooperatively. All of these factors helped students to build stronger social relations among group members, motivated students to help each other, encouraged every member in the group to engage in mastering the tasks and activities being accomplished. Hassan (2008) confirmed that students’ attitude toward science is an important factor influencing student motivation and achievement. This was also resonated in the studies of Oluwatelure & Oloruntegbe (2010), who found out in their studies that there was a meaningful relationship between students’ Attitudes towards Science and their Science Achievement.

It was also found that appropriate instructional climate helps creating positive relationships between the variables. For instance, democratic environment provides students with positive attitudes and perceptions about learning by encouraging students to develop mental habits which enable them to think critically, think creatively, and regulate their behavior so as to engage intensely in task even when answers/solutions are not immediately apparent. Thus, the students should be encouraged not to respond to any question immediately without much thinking prior to their response, providing some time for groups to evaluate their action after accomplishing the classroom activity so that they help themselves to learn from their mistake. Consequently, students will learn more and their learning process will be facilitated.

In the next Chapter the summary of the major findings and implications of the Study are presented.