This chapter deals with the result obtained for the verification of the hypotheses. For developing this chapter each objective of the present study has been stated. It is followed by its corresponding null hypothesis. Discussion and interpretation of the obtained result for a particular hypothesis has been presented along with the result. The first objective of the study has been specified as follows —

4.1 Objective – 1

To study the effect of Advance Organizer Model based teaching on pupils' achievement in Biological Sciences.

The corresponding null hypothesis formulated is as follows —

"There is no significant difference between the pre-test and post-test achievement scores of pupils in Biological Sciences taught through Advance Organizer Model".

To test this hypothesis 't'-test of significance of mean difference was applied and the 't'-value along with the means and SDs of the two trials have been given in table 4.1 —

Table 4.1
Table showing the pupils’ achievement when taught through Advance Organizer Model

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>'t' value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Advance Organizer Model</td>
<td>23</td>
<td>31.95</td>
<td>3.47</td>
<td>41.91</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level

The above table shows that the 't'-value of is 9.48 is found significant at 0.01 level. It means that there is a significant gain in achievement when taught through Advance Organizer Model. Post-test mean of 41.91 is greater than the mean of pre-test scores of 31.95. It indicates that the difference in achievement is due to the treatment and not by chance. Thus, the hypothesis stated above is rejected. This deference is due to the effect of Advance Organizer Model.

The possible reason for Advance Organizer Model to produce significantly greater instructional effect could be attributed to the following reasons:

i. Advance Organizer Model contends that human cognition gate activated when presented with some clarity as to what is being taught. The entire process of instructions, thus, is in terms of presentation of advance organizer, the process of clarifying it through information collection and processing the information for
possible conception with the advance organizer. In this process the mind is activated, curiosity generated action and process carried out and the collation for new meaning performed. In this way the advance organizer model represent all aspect of the cognitive thinking. It helps in enhancing the achievement of the learner.

ii. The learner's existing cognitive structure according to Ausubel is of utmost importance, determining whether the new material will be meaningful and how well it can be observed and retained in mind. In this way it is a system of information processing and information sorting. In this model stability and clarity of students cognitive structure are increased before presenting new material effectively. This is done by presenting to them the concept that govern the information to be presented to them. From the above discussion it is clear that advance organizer model seems to be more effective. Further, The result that advance organizer model is effective so far as students’ achievement is concerned is in consonance with the studies conducted by Avalos (1986); Pandey (1986), Raina (1994), Viswanath (2002), Pratima (2005), Dange and Gangashree (2008).

iii. The learners might have the ideational scaffolding i.e. the meaningful context for the content to be taught to them to which
potentially meaningful new knowledge could be related, making it possible for them to utilize advance organizers.

iv. The presentation of general introductory material in the form of advance organizer ahead of learning task at a higher level of abstraction and inclusiveness than the learning task itself might have proved to be helpful to the learner in comprehending the contents in Biological Sciences.

v. It is psychologically pleasing to the learners if they are given advance learning materials prior to the learning content itself.

4.2 Objective – 2

To study the effect of Concept Attainment Model based teaching on pupils' achievement.

The corresponding null hypothesis formulated is as follows—

"There is no significant difference between the pre-test and post-test achievement scores of pupils in Biological Sciences taught through Concept Attainment Model".

To test this hypothesis 't' test of significance of mean difference was applied and the 't' value along with the means and SDs of the two trials have been given in table 4.2 —

Table – 4.2

(115)
Table showing the pupils’ achievement when taught through Concept Attainment Model teaching

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>'t' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Attainment Model</td>
<td>23</td>
<td>31.60</td>
<td>44.17</td>
<td>12.28*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.47</td>
<td>3.32</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.01 level

The above table shows that the 't'-value of 12.28 is found significant at 0.01 level. This shows that there is a significant gain in achievement when taught through Concept Attainment Model. Post-test scores mean of 44.17 is greater than the pre-test mean scores of 31.60. It indicates that the difference in achievement is due to the treatment and not due to any chance. Thus, the hypothesis stated above is rejected. It means that there is significant difference between the pre-test and post-test achievement scores thought Concept Attainment Model.

The possible reason for concept attainment model to produce significantly greater instructional effect could be attributed to the following reasons:

i. In the Bruner's model cognitive development is given more emphasis, and from the theories of learning it is clear that the development of cognitive structure facilitates learning.
Significant 't'-value found here may be due to the relationship among the facts and ideas already present in the cognitive structure.

ii. The primary aim of the present model is to acquaint the students with the pre-existing concepts. The 't'-value of 12.28 indicates that researcher is able to do the task. This may be due to the reason that materials presented before the students through the model are so organized that students are able to acquire the concept easily.

iii. Concept Attainment Model shapes the behaviour of students in an organized way by presenting the data in a sequence which may have facilitated learning.

iv. Highly significant result may be due to the presentation of materials in phases, which many times help in attracting the concentration of students. In Concept Attainment Model the learning material is presented in an organized way so that the learner acquire the concept after successive steps of concept mastery. The significant 't'-value of 12.28 may be due to the above reason of organized material presentation. The result that Concept Attainment Model is effective so far as students’ achievement is concerned is in consonance with the studies conducted by – Chitrv (1983), Sushma (1987), Bhaveja (1988), Manocha (1991) and Khan & Siddiqui (1992).
4.3 Objective – 3

To compare the effectiveness of Advance Organizer Model, Concept Attainment Model and Conventional teaching on Pupils’ Achievement in Biological Sciences.

Null hypothesis formulated to realize the above said objective is—

"There is no significant difference among the mean gain achievement scores of the pupils in Biological Sciences taught through Advance Organizer Model, Concept Attainment Model and Conventional teaching".

This hypothesis was tested by applying 'F'-ratio of significance of difference among the means of gain scores of achievement when taught through Advance Organizer Model, Concept Attainment Model, and Conventional teaching and the result found is given in table 4.3 –

Table – 4.3

Summary table for ANOVA among means of gain scores in achievement of pupil in Biological Science when taught, through Advance Organizer Model, Concept Attainment Model and Conventional teaching.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>df</th>
<th>SS</th>
<th>SS (mean)</th>
<th>'F'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among means</td>
<td>2</td>
<td>268.42</td>
<td>134.21</td>
<td></td>
</tr>
</tbody>
</table>
The above table shows that the 'F'-ratio of 24.26 is significant at 0.01 level. In this case null hypothesis is rejected. It means there are significant difference among means of gain scores in achievement when thought trough Advance Organizer Model, Concept Attainment Model and Conventional teaching. This clearly shows that these three different approaches have differential effects. For finding out the relative merits of these approaches 't'-test of significance of difference among the means for pair of groups have been applied and this is tabulated in table 4.4.

Table – 4.4

Summary table showing means, SDs, and 't' values for the gain scores in achievement of pupils when two treatments taken together at a time:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>'t' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOM</td>
<td>23</td>
<td>9.95</td>
<td>2.83</td>
<td>3.10*</td>
</tr>
<tr>
<td>CAM</td>
<td>23</td>
<td>12.56</td>
<td>2.19</td>
<td></td>
</tr>
<tr>
<td>AOM</td>
<td>23</td>
<td>9.95</td>
<td>2.83</td>
<td>3.08*</td>
</tr>
<tr>
<td>CT</td>
<td>23</td>
<td>7.73</td>
<td>1.93</td>
<td></td>
</tr>
<tr>
<td>CAM</td>
<td>23</td>
<td>12.56</td>
<td>2.19</td>
<td>7.85*</td>
</tr>
<tr>
<td>CT</td>
<td>23</td>
<td>7.73</td>
<td>1.93</td>
<td></td>
</tr>
</tbody>
</table>

* significant at 0.01 level
Advance Organizer Model Vs. Concept Attainment Model

Table 4.4 shows that the difference among the means of the gain scores of achievement when taught through Advance Organizer Model and Concept Attainment Model is significant at 0.01 level. The mean of gain scores of 12.56 for Concept Attainment model is greater than the mean of gain scores of 9.95 for the Advance Organizer model. From the table it is very clear that the Concept Attainment Model is superior to the Advance Organizer Model at 0.01 level of Significance.

This result may be due to the following reasons –

i. One objective of the Bruner's model is to maximize the information obtained from each instances which reduces the cognitive strain and regulates the risk. This may be the reason of the better achievement by teaching through Concept Attainment Model.

ii. Systematically presented instructional modes can produce effective learning. The significant result here also supports his view as while teaching through Concept Attainment Model each teaching instance has a systematic order.

iii. In the case of Advance Organizer model a broader inclusive material is being presented before the student which may get
motivation to learn, whereas in the Concept Attainment Model the examples are presented before the students. Thus, giving clues through examples under Concept Attainment Model may have facilitated learning.

iv. The school selected for data collection follows the curriculum which is text book based, and, thus, "learning by doing" is not emphasized and also there lies scopes for meaningful learning. May be due to this reason comparatively less effective result was found in the group taught through Advance Organizer Model. Advance organizer model might have seems to the learner not so specific as concept attainment model in so far as the presentation of content is concerned. This result supports the views given by Grewal and Kaur (1987), Mahajan (1992).

**Advance Organizer Model Vs. Conventional Teaching**

It is evident from the Table 4.4 that the t-value of 3.08 is significant at 0.01 level. It means there is significant difference between the means of gain achievement scores of pupils in Biological Sciences, and this difference is due to the variation in treatment. The mean of 9.95 for the AOM group is greater than that of 7.73 for the control group. This indicate that Advance Organizer Model produced higher mean and, therefore, is superior to conventional teaching in its effect on pupils achievement in biological sciences.
Chapter – IV : Result, Discussion & Interpretation

This result may be due to the following reasons:

i. Ausubel thinks that the cognitive structure is the most important variable affecting the pupils might have been facilitated by the manipulation of ideas and concepts already existing in their cognitive structure.

ii. The presentation of general introductory material before the learning task might have proved helpful to the pupils in understanding the content in Biological Sciences.

iii. The most general ideas were presented first followed by a gradual increase in details and specificity, and the new ideas were consciously related to the previously learnt ideas while teaching in the classroom. This might have been logical and psychologically pleasing to the pupils and they learnt more when taught through Advance Organizer Model.

iv. The pupils might have been more enthusiastic and interested in listening to the teacher, attending to the class in a new teaching – learning situations under Advance Organizer Model. On the other hand, conventional teaching might have been less fascinating and interesting to the pupils due to its becoming reutilized.

The present result is in agreement with the conclusions drawn by Alexander, Frankiewics & Williams (1979); Faw & Waller (1976);

**Concept Attainment Model Vs. Conventional Teaching Model**

The 't'-value of 7.85 given in table 4.4 is significant at 0.01 level which indicates that the Concept Attainment Model is far superior than Conventional teaching when the means of gain in achievement scores were compared for the two approaches. The mean of gain scores of the group taught through Concept Attainment model is 12.56 and the mean of gain scores of the group taught through Conventional teaching is 7.73.

This result may be due to the following reasons —

i. The sequences of activities in Concept Attainment Model have proved to be helpful and interesting to the students in understanding the learning material and, thus, they have learned
more than the students who were taught through conventional teaching.

ii. Concept Attainment Model emphasizes on the thinking and certain mental operations are involved in the learning process. These mental operations are reasoning, assimilation, induction, deduction, classification etc. These mental operations are also there while teaching through Herbartian steps but all these are dominated by the teacher. Which may be one of the causes of less effective result by conventional approach.

iii. Instant feedback system is embedded in concept attainment model. Feedback plays an important role in the achievement of students (Dunkin & Biddle, 1974, Gage & Berliner 1984; Soar and Soar, 1979; Rosenshine, 1979). In the teaching through Concept Attainment Model learning has taken place or not is very clear at the end of the lesson which acts as a reinforcer. Reinforcement is a very important factor in the learning (Skinner, 1954) and, thus, the students taught through Concept Attainment Model have been able to solve the problem more enthusiastically and easily than the students taught through conventional teaching.

This result is similar to the findings given by Sushma (1987), Bhaveja (1988), Khan & Siddiqui (1992).
4.4 Objective – 4

To study the effect of Advance Organizer Model based teaching on pupils attitude towards Biological Sciences.

To fulfill this objective null hypothesis formulated is as –

"There is no significant difference between the pre-test and post-test attitude scores of pupils’ in Biological Sciences taught through Advance Organizer Model".

Table – 4.5

Table showing the pupils’ attitude towards Biological Sciences when taught through Advance Organizer Model

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Pre Test</th>
<th></th>
<th>Post Test</th>
<th></th>
<th>'t' value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Advance Organizer Model</td>
<td>23</td>
<td>70.08</td>
<td>11.06</td>
<td>76.30</td>
<td>10.62</td>
<td>1.90*</td>
</tr>
</tbody>
</table>

* Not significant at 0.05 level

The above table shows that the ‘t’ value of 1.09 is not significant at 0.05 level.
Chapter – IV : Result, Discussion & Interpretation

't' test of significance of difference among the means was applied to test the above hypothesis and the result found (table 4.5). It means there is no significant difference among the means of pre-test and post-test attitude scores of pupils taught through Advance Organizer model and thus the above hypothesis is accepted.

Attitude are relatively stable affective response to an object, Rosenberg (1960). It take time to change. The treatment duration of 30 periods of 35 minutes only might have produce somewhat similar effects on pupils attitude towards Biological Sciences. For Attitudinal change it may be necessary to extend treatment duration. Under Advance Organizer Model –

This result is in consonance with Das, et.al. (1980), Singh & Singh (1985), Pandey (1986).

4.5 Objective – 5

To study the effect of Concept Attainment Model based teaching on pupils’ attitude towards Biological Sciences.

To fulfill this objective null hypothesis formulated is as —

“There is no significant difference between the pre-test and post-test attitude scores of pupils’ in Biological Sciences taught through Concept Attainment”.

(126)
Table – 4.6

Table showing the pupils attitude towards Biological Sciences when taught through Concept Attainment Model

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Pre Test</th>
<th>Post Test</th>
<th>‘t’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept Attainment Model</td>
<td>23</td>
<td>73.17</td>
<td>80.65</td>
<td>1.91*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.58</td>
<td>13.33</td>
<td></td>
</tr>
</tbody>
</table>

* Not significant at 0.05 level

The ‘t’ test of significance of difference among the means was applied to test the above hypothesis and the result found is given in table 4.6. The table shows that the t-value of 1.91 is not significant at .05 level. It means that there is no significant difference among the means of pre-test and post-test attitude scores of pupils taught through Concept Attainment model and thus, the above hypothesis is accepted. Though mean scores of 80.65 for the post-test is greater than that of 73.17 for the pre-test when taught through Concept Attainment Model, it may said that the Concept Attainment Model do some effect on students’ attitude towards Biological Sciences. But this deference is not significant at .05 level.

This result is in consonance with Das, et.al. (1980), Singh & Singh (1985), Sushama (1987).

4.6 Objective – 6
To study the difference in change in attitude towards Biological Sciences when taught through Advance Organizer Model, Concept Attainment Model and Conventional teaching.

To fulfill this objective null hypothesis formulated is as –

“There is no significant difference among the mean of gain scores of pupils’ attitude towards Biological Sciences when taught through Advance Organizer Model, Concept Attainment Model and Conventional teaching”.

To verify the above mentioned null hypothesis analysis of variance was applied.

**Table – 4.7**

*Summary table for ANOVA among means of gain score in Attitude of pupils towards Biological Sciences when taught through Advance Organizer Model Concept Attainment Model, Conventional teaching.*

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>df</th>
<th>SS</th>
<th>SS (mean)</th>
<th>‘F’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among means</td>
<td>2</td>
<td>120.89</td>
<td>60.44</td>
<td>5.05*</td>
</tr>
<tr>
<td>Within groups</td>
<td>66</td>
<td>789.10</td>
<td>11.95</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

The above table shows that the 'F'-ratio of 5.05 is significant at 0.05 level. In this case null hypothesis is rejected. It means there are
significant difference among means of gain scores in attitude when thought through Advance Organizer Model, Concept Attainment Model and Conventional teaching. This clearly shows that these three different approaches have differential effects. For finding out the relative merits of these approaches 't'-test of significance of difference among the means for pair of groups have been applied and this is tabulated in table 4.8.

**Table – 4.8**

**Summary table showing means, SDs, and ‘t’ values for the gain scores in attitude of pupils when two treatments taken together at a time**:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOM</td>
<td>23</td>
<td>6.22</td>
<td>4.19</td>
<td>1.07**</td>
</tr>
<tr>
<td>CAM</td>
<td>23</td>
<td>7.47</td>
<td>3.51</td>
<td></td>
</tr>
<tr>
<td>AOM</td>
<td>23</td>
<td>6.22</td>
<td>4.19</td>
<td>1.92**</td>
</tr>
<tr>
<td>CT</td>
<td>23</td>
<td>4.26</td>
<td>2.41</td>
<td></td>
</tr>
<tr>
<td>CAM</td>
<td>23</td>
<td>7.47</td>
<td>3.51</td>
<td>3.56*</td>
</tr>
<tr>
<td>CT</td>
<td>23</td>
<td>4.26</td>
<td>2.41</td>
<td></td>
</tr>
</tbody>
</table>

* significant at 0.01 level
** not significant at 0.05 level

**Advance Organizer Model Vs. Concept Attainment Model**

The table 4.8. shows that the mean of gain attitude scores for Advance Organizer Model of 6.22 is somewhat similar of 7.47 for (129)
Concept Attainment Model with the t-value of 1.07 is not significant at 0.05 level. It means both the models are similar so far as change in students’ attitude towards Biological Sciences are concerned. Both the models are equally effective in case of attitudinal changes towards Biological Sciences.

This result may be due to the following reason –

Advance Organizer model provides specific introductory material at the higher level of abstraction and inclusiveness in form of Advance Organizers.

In case of Concept Attainment Model the data was presented before the student through examples. In both the cases students reacted similarly towards the liking of Biological Sciences.

**Advance Organizer Model Vs. Conventional teaching**

The means of gain scores in attitude due to the Advance Organizer model is of 6.22 is greater than that of 4.26 gain in attitude due to Conventional teaching.

The above table shows that ‘t’ value of 1.92 is not significant at 0.05 level. It means both the models are similar so far as change in students’ attitude towards Biological Sciences are concerned. Both the models are equally effective in case of attitudinal changes towards Biological Sciences.

This result may be the following reasons—
Attitudes are a complex concept. It represent once liking and disliking towards a particular object. It takes time to change. It is relatively stable affective response to an object. The 30 periods of 35 minutes duration in both the cases has an equal effect both the teaching approaches are thus similar to each other so far as the change in students’ attitude towards the Biological Sciences is concerned.

Usually in conventional teaching to introductory material are given by the teacher in advance. This might have some what make students’ fill similar to that of advance organizer. This might have possibly been the reason in making both the teaching approaches similar to each other in altitudinal changes towards Biological Sciences. This result is similar to the findings of Das et al. (1980), Singh & Singh (1985), Pandey (1986).

**Concept Attainment Model Vs. Conventional Teaching**

The table 4.8 shows that the t-value 3.56 is significant at 0.01 level. It means Concept Attainment model is superior than conventional teaching in changing attitude towards the positive side. The mean of gain scores in attitude due to Concept Attainment Model is of 7.47 which is greater than that of 4.26 gain in attitude due to Conventional teaching.
Chapter – IV : Result, Discussion & Interpretation

This result may be the following reasons—

i. The student learn more when thought in an innovative manner. Novelty in teaching in form of Concept Attainment Model might have created interest leading to the motivation among the students. This might have caused the favorable attitudinal change among students towards Biological Sciences.

ii. In traditional classroom teacher dominates while students are forced to follow. The teacher little care for the interest of students. This has become so routinised as student may not be enthusiastic to learn and, so, react favorably towards the subject.

iii. Direct intellectual process develops favorable attitudes among pupils. Change in students’ attitude towards Biological Sciences among students under Concept Attainment Model is more than that of under Conventional teaching may be due to the fact that Concept Attainment Model involves intellectual process while conventional teaching does, but very little. This result is similar to that of Sushma (1987).

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(132)