CHAPTER 5

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"In the light of the interpretation of data, conclusions and generalizations are formulated. This final step of research process demands critical and logical thinking in summarizing the findings of the study and co-pairing them with the hypotheses formulated in the beginning." A conclusion of the study is given below in a nutshell.

5.1 PURPOSE OF THE STUDY

The purpose of the research was to study the effectiveness of activity-oriented method in teaching Biology in small groups and large groups of students in secondary classes. The Experimental group-I (taught by activity-oriented method-I) was compared with Experimental group-II (taught by activity-oriented method-II) and both groups were separately compared with the Control group (which was taught in the conventional textbook approach). Such comparisons will help to find the effectiveness of different types of activities over the textbook approach. The three groups were compared on the basis of total achievement and also based on objectives.

Retention test results of the three groups were compared in total and also objective-wise to find whether different types of activities has any significant effect on the retention capacity of students. The objectives included in the study are Knowledge, Understanding and Application.
Each of the two Experimental groups were divided into three based on intelligence to test the achievement of high, average and low intelligence sections of students when taught by activity-oriented methods-I and II.

The experimental groups were also divided into high, average and low SES sections to check the achievement of students belonging to different socio-economic status when taught by activity-oriented methods-I and II.

The study will definitely help teachers in choosing suitable activities for secondary students. The investigator also hopes that the present study may help in improving the curriculum of secondary classes.

5.2 **OBJECTIVES OF THE STUDY**

1. To find out the achievement of pupils when taught by activity-oriented method-I.

2. To find out the achievement of pupils when taught by activity-oriented method-II.

3. To find out the achievement of pupils when taught by conventional textbook approach.

4. To compare the achievement (total and objective-wise) of pupils taught by activity-oriented method-I with conventional textbook approach.
5. To compare the achievement (total and objective-wise) of pupils taught by activity-oriented method-II with conventional textbook approach.

6. To compare the achievement (total and objective-wise) of pupils taught by activity-oriented method-I with activity-oriented method-II.

7. To compare the retention (total and objective-wise) of pupils taught by activity-oriented method-I with conventional textbook approach.

8. To compare the retention (total and objective-wise) of pupils taught by activity-oriented method-II with conventional textbook approach.

9. To compare the retention (total and objective-wise) of pupils taught by activity-oriented method-I with activity-oriented method-II.

10. To compare the achievement of pupils at different levels of intelligence when taught by activity-oriented methods-I & II.

11. To compare the achievement of pupils at different levels of SES when taught by activity-oriented methods I & II.

5.3 HYPOTHESES

1. Achievement and Retention (Total and Objective-wise) of VIII standard students in Biology when taught by activity-oriented
method-I is significantly higher than that of students taught by conventional textbook approach.

2. Achievement and Retention (Total and Objective-wise) of VIII standard students in Biology when taught by activity-oriented method-II is significantly higher than that of students taught by conventional textbook approach.

3. Achievement and Retention (Total and Objective-wise) of VIII standard students in Biology when taught by activity-oriented method-I is significantly higher than that of students taught by activity-oriented method-II.

4. Achievement of VIII standard students in Biology when taught by activity-oriented methods I & II is positively related to the intelligence and SES of the students.

5.4 METHODOLOGY

The method used in the study is experimental method. The dependant variable is the achievement of students while the independent variable is the teaching method. The experimental groups-I & II were taught by giving individual & small group activities and large group activities. The control group was taught through conventional textbook approach. The achievement test scores were analyzed in total and objective-wise and subjected to ANCOVA. The total and objective-wise retention capacity of the three groups was
compared by analyzing the retention test score and subjecting it to ANCOVA. Comparisons were made between (i) Exp.Gp-I & Control Gp., (ii) Exp.Gp.-II & Control Gp. and (iii) Exp.Gps.-I & II.

Each experimental group is divided into three based on intelligence test score, viz. – High, Average and Low. The achievement test scores of high intelligent section of each experimental group is compared with that of the average intelligent section of the same group. Likewise, comparisons are made between average & low and high & low to test whether intelligence plays any significant role in achievement when activity-oriented methods-I and II are used. Each experimental group is also divided into three – high, average and low based on SES score and comparisons were made between high & average, average & low, high & low sections of each experimental group based on post-test score. To compare the achievement of students in the experimental groups at different levels of intelligence and SES, ANCOVA (of three groups) is used.

The tools used in the study were standardized Achievement test, Retention test, Intelligence test, SES scale, lesson plans based on individual and small group activities for experimental group-I and lessons plans based on large group activities for experimental group-II and other teaching aids like Activity sheets, specimen instruction cards etc.
**Tenability of the Hypotheses**

The first hypothesis states that “Achievement and Retention (Total and Objective-wise) of VIII standard students in Biology when taught by activity-oriented method-I is significantly higher than that of students taught by conventional textbook approach”.

The findings of the study substantiate this hypothesis. The results of the study indicate that the Achievement and Retention (Total and Objective-wise) of students in Exp.Gp.-I taught by activity-oriented method-I is significantly higher than the students in control group taught by conventional textbook approach. (All values are significant at 0.01 level).

The second hypothesis is “Achievement and Retention (Total and Objective-wise) of VIII standard students in Biology when taught by activity-oriented method-II is significantly higher than that of students taught by conventional textbook approach”.

This hypothesis is partly substantiated and partly rejected. Achievement (total and objective-wise) in Biology of standard VIII students in Exp.Gp.-II taught by activity-oriented method-II (large group activities) is not significantly higher than control group taught in conventional textbook approach. The sole exception was in the comparison of the two groups at understanding level where the Control group performed better than Exp.Gp.-II (the difference was significant at 0.05 level). But when the two groups were compared on the basis of
total retention test marks, experimental group-II performed better than the control group (the difference was significant at 0.05 level). When the understanding level retention marks of Exp.Gp.-II were compared with that of the Control group the difference was significant at 0.01 level. The score of Exp.Gp.-II was higher.

The third hypothesis states that the “Achievement and Retention (Total and Objective-wise) of VIII Standard students in Biology when taught by activity-oriented method-I is significantly higher than that of students taught by activity-oriented method-II”.

This hypothesis is substantiated since the achievement and retention test scores (total and objective-wise) of the students taught by activity-oriented method-I is significantly higher than that of students taught by activity-oriented method-II. (all values are significant at 0.01 level). The only exception is the achievement of students of both groups at understanding level in the retention test where the difference between the two groups was not significant even though Exp.Gp.-I got better score than Exp.Gp.-II.

The fourth hypothesis states that the “achievement of VIII Standard students in Biology when taught by activity-oriented methods-I and II is positively related to the intelligence and SES of the students”.
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5.5 CONCLUSIONS BASED ON THE FINDINGS

Comparison of performance of the control and the two experimental groups with regard to total achievement.

Comparison of performance of pupils in the experimental and control groups helped the investigator to arrive at the following conclusions:-

1. Activity-oriented method-I is more effective than the conventional text book approach in increasing the achievement in Biology of students in standard VIII.

This conclusion is based on the following findings:-
The F value obtained from the Analysis of Covariance of the pre-test and post-test scores of students of experimental group-I and control group was significant (F_{y.x} = 68.24, p<0.01) which is due to higher achievement of students in experimental group-I.

The t-value between Total Achievement scores of Experimental group-I and control group is 8.27 which is significant when tested for significance for df 1/132 (p<0.01). The adjusted means of post-test scores show that the total achievement of Experimental group-I is significantly more than control group (Experimental group-I M = 22.15, Control group M = 18.25).

2. The activity-oriented method II (in which only large group activities were given) is not more effective than the conventional text book approach in increasing the total achievement in Biology of students in standard VIII

This conclusion is derived from the following findings:-

The F value obtained from the Analysis of Covariance of pre-test and post-test scores of Experimental group-II and control group is not significant even at 0.05 level. (F_{y.x} = 0.08, p>0.05).
The adjusted means for post-test scores of Experimental group-II and control group when tested for significance for df 1/132 also was not significant even at 0.05 level. (t value = 0.28, p>0.05).
(Experimental group-II M = 18.07, Control group M = 18.22).

3. The activity-oriented method I is more effective than the activity-oriented method II in increasing the total achievement in biology of students in standard VIII.

This conclusion was deducted from the following findings:-

The F value obtained from the Analysis of Covariance of pre-test and post-test scores of Experimental group-I and Experimental group-II is significant at 0.01 level (Fy.x = 54.83, p<0.01).

The t-value between total post-test achievement scores of Experimental group-I and Experimental group-II is 7.50 which is significant at 0.01 level (p<0.01). The adjusted means for post-test scores of experimental groups I and II are 22.00 and 18.5 respectively which clearly shows that activity-oriented method-I is more effective than activity-oriented method-II.
Comparison of the control and the two experimental groups with regard to knowledge-level achievement.

Comparison of performance of pupils in control and experimental groups with regard to knowledge-level objective helped the investigator to arrive at the following conclusions:

4. The achievement of students of Experimental group-I taught by activity oriented method-I is better than the achievement of students in control group at knowledge-level which clearly states that activity-oriented method-I is more effective than conventional text book approach in standard VIII Biology class.

This conclusion is based on the following findings:

The F value obtained from the Analysis of Covariance of pre-test and post-test scores of students of Experimental group-I and control group is significant at 0.01 level. \((F_{y.x} = 22.53, p<0.01)\)

The adjusted means for knowledge-level score of Experimental group-I and control group is 5.51 and 4.85 respectively and t value is 4.87 which is significant at 0.01 level. This clearly indicates that the performance of students at knowledge-level of Experimental group-I is significantly better than students of control group. Experimental group-I is taught using individual and small group activities while control group is taught through conventional text book approach.
5. Activity-oriented method-II is not effective than conventional textbook approach in improving the knowledge-level achievement of students in standard VIII.

The knowledge-level achievement of students of Experimental group-II was not significantly better than the knowledge level achievement of students in control group. This conclusion is derived from the following findings:-

The F value of the Analysis of Covariance of Experimental group-II and control group for knowledge-level achievement was not significant even at 0.05 level ($F_{y.x} = 2.97, p > 0.05$).

Adjusted means of the post-test knowledge level scores of Experimental group-II and control group when tested for significance for df 1/135 was not significant even at 0.05 level (Experimental group-II $M = 4.49$, Control group $M = 4.82$).

The t value obtained is 1.72 ($p > 0.05$).

6. The activity-oriented method I is more effective than the activity-oriented method II in increasing the knowledge level achievement of students in biology in standard VIII.
The above conclusion is based on the following findings:-

The F value obtained from the Analysis of Covariance of knowledge level scores of Experimental groups I and II was found significant at 0.01 level (Fy.x = 27.91, p < 0.01).

The adjusted means for knowledge level post-test scores of experimental groups-I and II when tested for significance for df = 1/134 was also found significant at 0.01 level (Experimental group-I M = 5.51, Experimental group-II M = 4.54, t value = 5.39, p < 0.01)

Comparison of the control and the two experimental groups with regard to understanding level achievement.

Performance of pupils in the control and experimental groups with regard to understanding level achievement lead to the following conclusions:

7. **The activity-oriented method is more effective than the conventional text book approach in increasing the understanding level achievement of students in biology in standard VIII.**

This conclusion is based on the finding that performance of students in Experimental group-I who were taught in activity-oriented
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method-I is significantly higher than that of control group who were taught in the conventional text book approach. The following findings confirm this conclusion:-

The F value obtained from Analysis of Covariance of pre-test and post-test understanding level scores of students in Experimental group-I and control group is 8.98 which is significant at 0.01 level (p < 0.01).

The adjusted means for post-test understanding level scores of Experimental group-I and control group differ considerably. (Experimental group-I M = 7.20, Control group M = 6.63). The t value is 3.00 which is also significant at 0.01 level (p < 0.01).

8. Conventional text book approach is more effective than activity-oriented method-II in increasing the understanding level achievement in Biology of students in standard VIII.

The above conclusion is deduced from the following findings:-

The F value obtained from Analysis of Covariance of pre-test and post-test understanding level scores of students in Experimental group-II (based on large group activities) and control group was found significant at 0.01 level (Fy.x = 4.53, p < 0.01).

The adjusted means for post-test understanding level scores of Experimental group-II and control group when tested for significance
for df = 1/135 was found significant at 0.05 level. (t value = 2.13 which is significant at 0.05 level, \( p < 0.05 \)), (Experimental group-II \( M = 6.14 \), Control group \( M = 6.60 \)).

9. **The activity-oriented method I is more effective than the activity oriented method II in increasing the understanding level achievement of students in biology in standard VIII**

The above conclusion is drawn from the following findings:

The F value obtained from the Analysis of Covariance of pre-test and post-test understanding level scores of experimental group-I (which gives only individualized activities) and experimental group-II (which gives only large group activities) is significant at 0.01 level (\( F_{y.x} = 26.16, p < 0.01 \)).

The t value obtained is 5.135 which is also significant at 0.01 level (\( p < 0.01 \)). The adjusted means of post-test understanding level scores show that activity-oriented method-I is more effective than activity-oriented method-II. (Experimental group-I \( M = 7.20 \), Experimental group-II \( M = 6.14 \)).

**Comparison of the control and the two experimental groups with regard to Application level achievement**

The application level marks of the control and experimental groups were compared. The results of the comparisons guided the investigator to arrive at the following conclusions:
10. Activity-oriented method-I is more effective than conventional text book approach in increasing the achievement in Biology of VIII standard students at the application level.

The following findings prove this conclusion:

The F value obtained from the Analysis of Covariance of pre-test and post-test application level scores of students in experimental group I (taught through activity-oriented method-I) and control group (taught through conventional text book approach) was found significant at 0.01 level (Fy.x value is 72.63, p < 0.01).

The t value between experimental group-I and control group is 8.53 which is also significant at 0.01 level (p < 0.01). Adjusted means for post-test application level scores for experimental group-I is 9.36 and control group is 6.83.

11. Activity-oriented method-II (using large group activities) is not more effective than conventional text book approach in increasing application level achievement in Biology in standard VIII.

The following findings support the above conclusion:

The F value obtained from the Analysis of Covariance of pre-test and post-test application level scores of students in experimental group II (taught through activity-oriented method-II) and control
group (taught by conventional text book approach) was found not significant even at 0.05 level (Fy.x value = 0.07, p > 0.05).

The adjusted means for post-test application level scores for experimental group-II and control group when tested for significance for df = 1/135 was not significant even at 0.05 level (t value = 0.26, p > 0.05).

Adjusted post-test means for experimental group-II is 6.72 and for control group is 6.81 which clearly shows that there isn’t much difference between the performances of two groups in the application level achievement.

12. The activity-oriented method I is more effective than the activity-oriented method II in increasing the application level achievement of students in biology in standard VIII.

This conclusion is supported by the following findings:-

The F value obtained from the Analysis of Covariance of the pre-test and post-application level scores of students in Experimental group-I (taught through activity oriented method-I giving emphasis to individual activities) and Experimental group-II (taught through activity oriented method-II giving emphasis to group activities) is 61.78 which is significant at 0.01 level (p < 0.01)
The adjusted means for post-test application level scores of experimental group-I and II when tested for significance for df = 1/134 was also found significant at 0.01 level (t value 7.87, p < 0.01).

Experimental group I M = 9.37, Experimental group-II M = 6.74.

The above mentioned values clearly prove that the achievement of Experimental group-I is significantly better than experimental group-II.

**Comparison of performance of the control and the two experimental groups with regard to total achievement in the retention test.**

Comparison of the total retention test scores of the pupils in the control and two experimental groups helped the investigator to arrive at the following conclusions:-

13. **Activity oriented method-I where individual and small group activities were given is more effective than the conventional textbook method in increasing the capacity for retention in Biology in standard VIII.**

This conclusion is supported by the following findings of the study:

The F value obtained from the Analysis of Covariance of post-test and retention test scores of Exp.Gp-I and Control group was
found significant at 0.01 level. ($F_{x} = 20.27$, $p < 0.01$) which is due to higher retention capacity of students in Exp.Gp-I.

The t value between total achievement scores of Exp.Gp.-I and Control group in the retention test is significant at 0.01 level when tested for $df = 1/132$ ($t = 5.52$, $p < 0.01$). The adjusted means of retention test scores show that the total achievement of Exp.Gp.-I is significantly more than control group (Exp.Gp.-I $M = 18.19$, Control group $M = 15.50$) which clearly indicates that the higher retention capacity of Exp.Gp.-I is due to use of the activity oriented method I.

14. The activity–oriented method II in which only large group activities were given is more effective than the conventional text book approach in increasing the total retention in biology in standard VIII.

This conclusion is derived from the following findings:

The F value obtained from the Analysis of Covariance of post-test and retention test scores of Exp.Gp.-II and control group was found significant at 0.05 level. ($F_{x} = 4.12$, $p < 0.05$).

The adjusted means for retention test scores of experimental group-II and control group when tested for significance for $df = 1/135$ was also found significant at 0.05 level. ($t$-value = 2.03, $p < 0.05$). (Exp.Gp.-II $M = 15.46$, control group $M = 14.46$). The significant value proves that
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the students taught by activity oriented method-II have better retention capacity when compared to students of the control group.

15. **Activity-oriented method I is more effective than the activity-oriented method II in increasing the total retention capacity in biology in standard VIII.**

This conclusion is deduced from the following findings:

The F value obtained from the Analysis of Covariance of post-test and retention test scores of Exp.Gp.-I and Exp.Gp-II is significant at 0.05 level. (Fy.x = 6.46, p < 0.05).

The t-value between total retention test scores of Exp.Gp.-I and Exp.Gp-II is significant at 0.01 level. (t-value = 3.06, p < 0.01). The adjusted means of retention test scores of Exp.Gp.-I and Exp.Gp.-II are 17.95 and 16.58 respectively which clearly shows that activity oriented method-I is more effective than activity oriented method II in increasing the total retention capacity of students.

Comparison of retention capacity of the control and the two experimental groups at knowledge level.

Comparison of performance of pupils in the control and experimental groups with regard to knowledge-level retention score helped the investigator to arrive at the following conclusions:
16. **Activity oriented method I was more effective than the conventional textbook approach in increasing the retention capacity of Standard VIII students in Biology at knowledge level.**

This conclusion is based on the following findings:

The F value obtained from the Analysis of Covariance of post-test and retention test scores of students of Exp.Gp.-I and control group is significant at 0.01 level. (Fy,x = 9.99, p < 0.01).

The adjusted means of knowledge level scores in the retention test of Exp.Gp.-I and control group is 4.81 and 4.13 respectively and the t-value is 3.48 which is significant at 0.01 level. This clearly indicates that the knowledge level retention test score of Exp.Gp.-I taught by activity oriented method I is significantly better than students in control group taught by conventional textbook approach.

17. **Activity oriented method II is not significantly effective than conventional textbook approach in improving the knowledge level retention score of Standard VIII students in Biology.**

Although the knowledge level retention score of Exp.Gp.-II was slightly higher than control group, the difference was not significant. This conclusion is derived from the following findings:
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The F value of the Analysis of Covariance of post-test and retention test scores of Exp.Gp.-II and control group at knowledge level was not significant even at 0.05 level. (Fy.x = 0.204, p > 0.05).

Adjusted means of the knowledge level retention test scores of the Exp.Gp.-II and control group when tested for significance for df 1/135 was not significant even at 0.05 level. (Exp.Gp.-II M = 4.10, Control group M = 4.00). The t-value obtained is 0.46.

18. The activity-oriented method I in which only individual and small group activities were given is more effective than the activity-oriented method II in which only large group activities were given in increasing the knowledge level retention of VIII standard students in biology.

The above conclusion is based on the following findings:

The F value obtained from the Analysis of Covariance of knowledge level retention scores of Exp.Gp.-I and II was found significant at 0.01 level. (Fy.x = 9.57, p < 0.01).

The adjusted means for knowledge level retention scores of Exp.Gp.-I and Exp.Gp.-II when tested for significance for df = 1/134 was also found significant at 0.01 level (Exp.Gp.-I M = 4.81, Exp.Gp.-II M = 4.17, t = 3.45, p < 0.01).
Comparison of retention capacity of the control and the two experimental groups at understanding level

Comparison of performance of pupils in the control and two experimental groups with regard to understanding level retention lead to the following conclusions:

19. **The activity oriented method I is more effective than the conventional textbook approach in increasing the understanding level retention of VIII standard students in biology.**

This conclusion is based on the finding that the performance of students in Exp.Gp.-I who were taught in activity oriented method I is significantly higher than that of control group who were taught in the conventional textbook approach in the retention test. The following findings confirm this conclusion:

The F value obtained from Analysis of Covariance of post-test and retention tests understanding level scores of students in Exp.Gp.-I and control group is 18.46 which is significant at 0.01 level (p < 0.01).

The adjusted means of retention test scores (of understanding objective) for Exp.Gp.-I was 6.15 and for the control group was 5.12. The t value obtained was 4.29 which are also significant at 0.01 level (p < 0.01).
20. The activity-oriented method II is more effective than the conventional textbook approach in increasing the understanding level retention of VIII standard students in biology.

The conclusion is based on the finding that the performance of students in Exp.Gp.-II who were taught through activity oriented method II (large group activities) is significantly higher than the control group taught in conventional textbook approach. The understanding level scores of the test for retention were taken into consideration for the comparison. Following findings support the above conclusion:

The F value obtained from the Analysis of Covariance of post-test and retention test understanding level scores of students in Exp.Gp.-II and control group was found significant at 0.01 level (F_{yx} = 8.32, p < 0.01).

The t value obtained was 2.88 which is also significant at 0.01 level (p < 0.01). The adjusted means of understanding level scores in the retention test for Exp.Gp.-II was 5.85 and for control group was 5.12 respectively which shows that the performance of Exp.Gp.-II was better than the control group.
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21. The activity-oriented method I is not more effective than the activity-oriented method II in increasing the understanding level retention of VIII standard students in biology.

The performance at understanding level of Exp.Gp.-I taught through activity oriented method-I was not significantly better than that of Exp.Gp.-II taught through activity oriented method-II. This conclusion is deduced from the following findings:

The F value obtained from the Analysis of Covariance of post-test and retention test understanding level scores of Exp.Gp.-I and Exp.gp.-II was not significant even at 0.05 level. ($F_{y.x} = 1.77, p > 0.05$).

The t value obtained was 1.33 which is also not significant at 0.05 level ($p > 0.05$). The adjusted means show that increase in the Exp.Gp.-I score ($\text{Exp.Gp.-I M} = 6.16$, $\text{Exp.Gp.-II} = 5.85$) is insignificant.

Comparison of retention capacity of the control and two experimental groups at application level

The comparison of the three groups based on retention test marks at application level helped the investigator to arrive at the following conclusions:
22. Activity oriented method-I is more effective than conventional textbook approach in increasing the application level retention capacity of Standard VIII students in Biology.

The following findings prove this conclusion:
The F value obtained from the Analysis of Covariance of post-test and retention test application level scores of Exp.Gp.-I (taught through activity oriented method I) and control group (taught in conventional textbook approach) was found significant at 0.01 level. ($F_{y.x} = 16.63, p < 0.01$).

The t value between Exp.Gp.-I and control group is 5.07 which is also significant at 0.01 level ($p < 0.01$).

The adjusted means of application level scores of Exp.Gp.-I and control group are 7.61 and 5.88 respectively which clearly prove that the performance of Exp.Gp.-I at application level is far better than that of control group.

23. Activity oriented method-II (using large group activities) is not significantly more effective than conventional textbook approach in retaining the content at application level in Biology in Standard VIII.

The following findings support the conclusion stated above:
The F value obtained from the Analysis of Covariance of post-test and retention test scores at application level of Exp.Gp.-II (taught by activity oriented method II) and control group (taught by conventional textbook approach) is 0.06 which is not even significant at 0.05 level. (p > 0.05).

The t value obtained is 0.25 which is also not significant at 0.05 level (p > 0.05). This clearly proves that although there is a slight increase in application level scores of Exp.Gp.-II when compared to control group, the difference is not significant. (Exp.Gp.-II M = 5.45, Control group M = 5.36).

24. Activity oriented method-I is more effective than activity oriented method II in retaining the matter learnt in application level in Standard VIII Biology class.

The conclusion is supported by the findings given below:

The F value obtained from the Analysis of Covariance of the post-test and retention test scores at application level of students in Exp.Gp.-I taught through activity-oriented method-I (giving emphasis on individual and small group activities) and Exp.Gp.-II taught through activity oriented method II (giving emphasis to large group activities) is 9.55 which is significant at 0.01 level (p < 0.01). The t value obtained is also significant at 0.01 level. (t = 3.74, p < 0.01)
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The adjusted means of Exp.Gp.-I is 7.35 and the Exp.Gp._II is 6.16 which confirms that there is marked increase in the retention capacity (at application level) of students in Exp.Gp.-I when compared to Exp.Gp.-II.

Comparison of performance of the two experimental groups at different levels of intelligence

Following conclusions are made by comparing the achievement of students belonging to different intelligence sections in Exp.Gp.-I.

25. There is no significant difference in the achievement in Biology of Standard VIII students belonging to different intelligence sections when activity-oriented method-I is used.

The following findings support this conclusion:

The F value obtained from the analysis of pre-test and post-test scores of students belonging to different intelligence sections in Experimental group-I is 0.835 which is not significant even at 0.05 level. (p > 0.05).

The difference in adjusted mean between low intelligence and medium intelligence students is 0.18, between low and high intelligence students is 0.86 and between medium and high intelligence students is 0.59.
intelligence students is 0.68. All these values are not significant even at 0.05 level.

This proves that although there is a slight difference in the achievement of low, medium and high intelligence students of Experimental group-I (taught by activity-oriented method-I), the difference is not significant or activity-oriented method-I is equally good for students belonging to different intelligence levels.

26. **There is significant difference between the achievements of students belonging to different intelligence groups of Standard VIII students in Biology when activity-oriented method-II is used.**

The following findings support this conclusion:

The F value obtained from the analysis of pre-test and post-test scores of students belonging to different intelligence sections in Experimental group-II is 6.53 which is significant at 0.01 level ($p < 0.01$).

The difference in adjusted mean between low intelligence and medium intelligence students is 1.64, between low and high intelligence students is 3.33 and between medium and high intelligence students is 1.69. The difference in adjusted mean between low and high intelligence students is significant at 0.01 level.
This proves that there is a difference in the achievement of low, medium and high intelligence students of Experimental group-II (taught by activity-oriented method-II) which means that the achievement of students is related to their intelligence level when activity-oriented method-II is used.

Comparison of performance of the two experimental groups at different levels of SES

The following conclusions are made by comparing the achievement of students belonging to different SES level in Experimental groups-I and II.

27. There is no significant difference in the achievement in Biology of Standard VIII students belonging to different SES sections when activity-oriented method-I is used.

The following findings support this conclusion:

The F value obtained from the analysis of pre-test and post-test scores of students belonging to different SES sections in Experimental group-I is 1.02 which is not significant even at 0.05 level. (p > 0.05).

The difference in adjusted mean between students belonging to low and medium SES is 0.68, between low and high SES is 0.41 and between medium and high SES is 1.09. All these values are not significant even at 0.05 level.
This proves that there is no difference in the achievement of low, medium and high SES level students of Experimental group-I (taught by activity-oriented method-I) or activity-oriented method-I is equally good for students belonging to different SES levels.

28. **There is no significant difference in the achievement in Biology of Standard VIII students belonging to different SES sections when activity-oriented method-II is used.**

   The following findings support this conclusion:

   The F value obtained from the analysis of pre-test and post-test scores of students belonging to different SES sections in Experimental group-II is 1.17 which is not significant even at 0.05 level. ($p > 0.05$).

   The difference in adjusted mean between students belonging to low and medium SES is 0.12, between low and high SES is 1.29 and between medium and high SES is 1.41. All these values are not significant even at 0.05 level.

   This proves that there is no difference in the achievement of low, medium and high SES level students of Experimental group-II (taught by activity-oriented method-II) or activity-oriented method-II is equally good for students belonging to different SES levels.
5.6 **EDUCATIONAL IMPLICATIONS OF THE STUDY**

The activity-oriented method will encourage the students to observe the nature carefully and this skill of keen observation will help them to understand the matter more clearly and precisely. The method also helps to correlate the theory and practical which is not possible in conventional textbook approach. According to this study the best results are obtained only when individual activities are given. The teaching method of using only large group activities (activities to the whole class like observing charts, seeing experimental setups etc.) have produced almost the same results as taught in the conventional textbook approach.

In the total and objective-wise comparisons, the experimental group-I taught through individual activities performed significantly better than experimental group-II (where large activities were given) and the control group. The performance of the experimental group-II was equal to the Control group when the post-test marks were compared (total and objective-wise) except at the understanding level comparison, where the control group has performed even better than experimental group-II (significant at 0.05 level). When the retention capacity of the three groups was compared, experimental group-I performed significantly better than experimental group-II except at understanding level, where the difference was not significant. In total and objective-wise level comparisons, experimental group-II is found
to have better retention capacity than control group. The difference is significant at 0.05 level when total retention scores of two groups (Exp.Gp.-II and Control group) was compared. At the understanding level also the difference was significant at 0.05 level. The understanding level retention score of Exp.Gp.-II was better than the Control group. The total and objective-wise scores of Exp.Gp-II were better than that of the Control group.

In general, we can say both activity-oriented methods-I and II were helpful to students in increasing the retention capacity in Biology.

The activity-oriented method will help the students to learn the theory and apply the newly-acquired knowledge simultaneously. The conclusions of the study prove that the individual activity method has helped the students to score better in the achievement test. Both activity-oriented methods helped in increasing the retention capacity of students. The reason is that when the actual specimens are shown and when the major share of the practical work is done by the students, the content will be better imprinted in the students' memory. So they would be able to retain the matter for a much longer period than other students who are taught in the conventional textbook approach. The fact that the activity method- II, though it has not helped in increasing the achievement of students, has contributed to increasing the retention capacity of students is worth mentioning. In the activity-
oriented method-I, the students themselves are learning the content while the teacher is playing only a passive role. “Learning by doing” is encouraged. The method is helpful in de-formalizing science education and also takes into account individual differences. In activity-oriented method-II, the role of the teacher and the students were equal whereas in activity-oriented method-I the students had a more active role than the teacher.

The teachers also are encouraged to learn more and test their knowledge when activity-oriented methods are used. The teachers should have a thorough knowledge in the subject to conduct such classes. The teacher brings a lot of specimens to the class and the students also are asked to bring specimens and to do experiments and assignments. The teacher should be able to clear all the doubts of students. The classes will be lively and there will be good teacher-pupil interaction. All students actively participate in the discussions and no one sits idle.

The socio-economic status of the students does not produce any significant effect whether activity-oriented methods-I or II is used. In both Exp.Gps.-I and II, the differences in achievement between High, Average and Low students (based on SES) were insignificant.

Another significant outcome of the study is that when the achievement of high, average and low students (based on intelligence)
in the experimental groups were compared activity oriented method-II was influenced by the intelligence of the students. This point to the fact that the effectiveness of activity oriented method-II depends on intelligence of students. When the teacher shows a chart or demonstrates an experiment to the whole class only the students of high and average intelligence are able to follow the activities while the rest may simply be listening without grasping the facts. They are not benefited by the activities given to the whole class. The achievement of all sections of students when activity-oriented method-I was employed was equally good irrespective of their intelligence level because there was individualization. Based on this study the investigator strongly recommends that when activities are given to high school children, there should be some degree of individualization. Such activities will definitely enhance achievement and retention. However, if large group activities are given, the achievement of students is not significantly higher than the students taught by conventional textbook method. But such activities do enhance retention capacity.

Since the subject of the investigator is Biology, it can be said beyond doubt that these methods will produce similar results with other Biology topics also. The study may help in selecting suitable activities to attain specific objectives for VIII standard students.
5.7 SUGGESTIONS FOR FURTHER STUDY

This work was done in secondary classes. The same method can be tested at other levels also.

The effectiveness of activity-oriented method-I which is proved in teaching one particular topic in Biology will definitely be equally effective in teaching other Biology topics. The effectiveness of activity-oriented method-II can also be tested similarly.

The activity-oriented methods-I and II can be used in all science topics. Since very little research work has been done in teaching subjects other than science through activity-oriented methods, it could also be an area for further research.

A survey can be conducted among teachers regarding their opinion about these methods. Such a study will be helpful in analyzing the expert opinion of teachers and also may give an insight into practical difficulties that the teachers could encounter in conducting such classes.

The opinion of students and their parents can be collected through a survey.

Further studies can also be conducted by dividing different types of activities to check which type of activity is best suited to increase the achievement and retention capacity of students belonging to different age groups.
The attitude of teachers, students, parents and educators about bifurcating activity-oriented method can be collected and analyzed. It will be helpful in improving the method and organizing it according to the necessities of the students.

A survey can be done to identify the schools in which some innovations are used to improve the teaching-learning process. The various innovations done and its effect can be studied.

"Research is a process of making new discoveries, disproving old notions, establishing facts and improving current knowledge continually through tests and experiments which are repeatable and can be verified independently any time".