CHAPTER – 6
SUMMARY, FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

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CHAPTER – 6
SUMMARY, FINDINGS, IMPLICATIONS AND RECOMMENDATIONS

6.1 Introduction
The purpose of the study was to find out effectiveness of the Group Learning Approaches in teaching of subject Science and Technology for the students of STD IX. Construction and finalization (with experts comments & suggestions) of Lesson plans based on Group Learning Approaches (Cooperative Learning Approach and Project Based Learning Approach) were in the phase – 1 where as its implementation was in phase – 2 during this research study. This chapter helps to get overview of this research study. The detailed report of the present study has been given in the previous chapters. In the present chapter the summary of the report has been presented along with the findings, implications, observations and recommendations for prospective researches.

6.2 Summary
The summary with outline of the whole study is given in the next section.

6.2.1 Title of the Present Study
EFFECTIVENESS OF GROUP LEARNING APPROACHES IN TEACHING OF SCIENCE AND TECHNOLOGY

6.2.2 Objectives of the Present Study
The study was carried out with two types of objectives.

1. Task Objectives
   1. To prepare teaching Learning material from STD IX Science and Technology textbook for Group Learning Approaches (Cooperative Learning Approach and Project Based Learning approach) and get validated by experts.
   2. To translate Learning Style Inventory of Ketan Gohel and get validate by experts.
   3. To construct Social Skills Inventory and get validated by experts.
   4. To construct Problem Solving Inventory and get validated by experts.
5. To construct Achievement Test in Science and Technology of STD IX and get
validated by experts.
6. To prepare Social Skill observation form for students Learning Science and
Technology through Group Learning Approaches.
7. To prepare Feedback Questionnaire for students Learning Science and
Technology through Group Learning Approaches.
8. To get descriptive information of students self experience regarding Group
Learning Approaches (Viz. Project Based Learning Approach and Cooperative
Learning Approach).

2. Research objectives
1. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in teaching of
Science and Technology.
2. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in relation to
Learning Style Inventory (Audio, Visual and Kinesthetic) on Achievement
Test.
3. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in relation to
students Achievement Level (High, Middle and Low) on Achievement Test.
4. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in relation to Gender
(Boys and Girls) on Achievement Test.
5. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in relation to
Learning Style Inventory (Audio, Visual and Kinesthetic) on Problem Solving
Inventory.
6. To study the effectiveness of Group Learning Approaches (Project Based
Learning Approach and Cooperative Learning Approach) in relation to
students Achievement Level (High, Middle and Low) on Problem Solving
Inventory.
7. To study the effectiveness of Group Learning Approaches (Project Based Learning Approach and Cooperative Learning Approach) in relation to Gender (Boys and Girls) on Problem Solving Inventory.
8. To study the effectiveness of Group Learning Approaches (Project Based Learning Approach and Cooperative Learning Approach) in relation to Learning Style Inventory (Audio, Visual, Kinesthetic) on Social Skills Inventory.
9. To study the effectiveness of Group Learning Approaches (Project Based Learning Approach and Cooperative Learning Approach) in relation to students Achievement level (High, Middle and Low) on Social Skills Inventory.
10. To study the effectiveness of Group Learning Approaches (Project Based Learning Approach and Cooperative Learning Approach) in relation to Gender (Boys and Girls) on Social Skills Inventory.

6.2.3 Variables of the Present Study
The variables for the present study are as under.

A) Independent variables
- Learning Style (Audio, Visual and Kinesthetic)
- Achievement Level (High, Middle and Low)
- Instructional approaches
  I. Traditional Approach (TA)
  II. Group Learning Approaches (GLA)
    a. Project Based Learning Approach (PBLA)
    b. Cooperative Learning Approach (CLA))

B) Dependent Variables
- Achievement (Post test scores obtained on Achievement Test in Science and Technology)
- Problem Solving (Post test scores obtained on Problem Solving Inventory)
- Social Skills (Post test scores obtained on Social Skills Inventory)

C) Control Variables
- Class IX
- Content matter
D) **Moderate Variable**
- Gender

### 6.2.4 Hypotheses of the Present Study

The hypotheses were formulated in pursuance of the objectives and variables of the study as given in the table 6.1.

1. There will be no significant difference between Post-test mean scores of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

2. There will be no significant difference between the Post-test mean scores of students having Audio Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

3. There will be no significant difference between the Post-test mean scores of students having Visual Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

4. There will be no significant difference between the Post-test mean scores of students having Kinesthetic Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

5. There will be no significant difference between the Post-test mean scores of students having Audio Learning Style of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.

6. There will be no significant difference between the Post-test mean scores of students having Visual Learning Style of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.

7. There will be no significant difference between the Post-test mean scores of students having Kinesthetic Learning Style of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.

8. There will be no significant difference between the Post-test mean scores of students having Audio Learning Style of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.

9. There will be no significant difference between the Post-test mean scores of students having Visual Learning Style of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.
10. There will be no significant difference between the Post-test mean scores of students having Kinesthetic Learning Style of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.

11. There will be no significant difference between the Post-test mean scores of students having High Achievement Level of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

12. There will be no significant difference between the Post-test mean scores of students having Middle Achievement Level of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

13. There will be no significant difference between the Post-test mean scores of students having Low Achievement Level of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

14. There will be no significant difference between the Post-test mean scores of students having High Achievement Level of control group, experimental group – 1, experimental group – 2 on Problem Solving Inventory.

15. There will be no significant difference between the Post-test mean scores of students having Middle Achievement Level of control group, experimental group – 1, experimental group – 2 on Problem Solving Inventory.

16. There will be no significant difference between the Post-test mean scores of students having Low Achievement Level of control group, experimental group – 1, experimental group – 2 on Problem Solving Inventory.

17. There will be no significant difference between the Post-test mean scores of students having High Achievement Level of control group, experimental group – 1, experimental group – 2 on Social Skills Inventory.

18. There will be no significant difference between the Post-test mean scores of students having Middle Achievement Level of control group, experimental group – 1, experimental group – 2 on Social Skills Inventory.

19. There will be no significant difference between the Post-test mean scores of students having Low Achievement Level of control group, experimental group – 1, experimental group – 2 on Social Skills Inventory.

20. There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Achievement Test.
21. There will be no significant difference between the Post-test mean scores of Girls of control group, experimental group – 1 and experimental group – 2 on Achievement Test.

22. There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.

23. There will be no significant difference between the Post-test mean scores of Girls of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.

24. There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.

25. There will be no significant difference between the Post-test mean scores of Girls of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.

6.2.5 Population and Sample of the Present Study

The present study was carried out with STD IX students. The population consisted of STD IX students of English Medium School of Anand district of Gujarat state.

The investigator selected one school of Anand district i.e. I.B. Patel English Medium by convenient sampling method. The sampling procedure was followed systematically. There were four divisions of STD IX in I.B. Patel English Medium School. Three divisions of STD IX were selected by cluster sampling method. Sample consists of 108 students of STD IX. There were three groups out of which one was control group and two were experimental groups. Each group consisted of 36 students.

6.2.6 Tools of the study

The tools used in the present study were:

(A) Teaching Learning Materials:

a) Lesson Plans based on Group Learning Approaches (Cooperative Learning Approach and Project Based Learning Approach)
The lesson plan format given by Johnson, Johnson and Holubes (1989) was considered as a model lesson plan format and guidelines for planning a Cooperative Lesson plans as prescribed by Johnson and Johnson (1987) were also followed by the investigator to prepare lesson plans based on Cooperative Learning Approach. The lesson plan format given by Chotalia (2007) was considered as a model lesson plan format to prepare lesson plans based on Project Based Learning Approach.

The components included in preparing Cooperative Learning Lesson Plans were:

Instructional Objectives, Social Objectives, Materials needed, Group Size, Room arrangement, Assignments of students to groups, Roles, Assigning or explaining the task, Criteria for success, Components of cooperative Learning (Positive interdependence, Individual accountability, Intergroup cooperation, Equal Participation, Simultaneous interaction, Expected behaviors), Monitoring and intervening, Assessing and processing (Small group processing, Whole class processing), Celebrating.

The components included in preparing Project Based Learning Lesson Plans were:

Instructional Objectives, Defining problem, decide the sources for information, Group Formation, Groups Pre-planning, Providing Guidance to the group, Presentation of project in the classroom, Evaluation of the project.

Lesson plans were prepared by the investigator keeping in mind above components and format. Lesson plans prepared by the investigator were given to the experts (Suggestions and opinions).

b) Power point Presentations:

The investigator prepared power point presentations on Force and Laws of Motion, Properties of Matter and Why do we fall ill from Science & Technology Textbook Std IX.
c) Handouts & Tasks:
The investigator prepared handouts and tasks for the students to work in group using both CLA and PBLA were given to the experts (suggestions and opinions).

d) Learning Style Inventory
Learning Style Inventory constructed and standardized by Dr. Ketan Gohel was used. The investigator translated the Learning Style Inventory and gave to the experts (suggestions and opinions).

(B) Social Skills Inventory
The investigator constructed Social Skills Inventory and gave to the experts (suggestions and opinions).

(C) Problem Solving Inventory
The investigator constructed Problem Solving Inventory and gave to the experts (suggestions and opinions).

(D) Achievement Test
The investigator constructed Achievement Test in Science and Technology subject of STD IX and gave to the experts (suggestions and opinions).

(E) Feedback Questionnaire
The investigator constructed Feedback Questionnaire and gave to the experts (suggestions and opinions).

(F) Social Skills Observation Form
The investigator constructed Social Skills Observation Form and gave to the experts (suggestions and opinions).

(G) Field Diary
The investigator maintained field notes to record her field based observations and experiences.

6.2.7 Research Design
The study was experimental in nature. Control – Experimental Group only Post-test Design was followed in the present study. Treatments viz. (TA, PBLA and CLA) were given to the students of STD IX and Achievement Test was administered as a post-test to find out the effectiveness of GLA.

6.2.8 Data Collection

Teaching Learning material developed by the investigator was given to get the experts suggestions and comments. Treatments were given to the students of STD IX I.B. Patel English Medium School, Vallabh Vidyanagar. Achievement Test was administered as post-test to study the effectiveness of GLA in teaching of subject Science and Technology. Ketan Gohel’s standardized Learning Style Inventory was translated by investigator and given to the experts to get their suggestions and comments. Translated version was used for data collection. Problem Solving Inventory constructed by the investigator was given to the experts to get their suggestions and comments used for data collection. Social Skills Inventory constructed by the investigator and was given to the experts to get their suggestions and comments used for data collection. Above mentioned tools were administered as Post-test in the present study.

6.2.9. Analysis of Data

Achievement Test, Learning Style Inventory, Social Skill Inventory, Problem Solving Inventory were given as a post-test for the study and data was computed using descriptive statistics. Significance of hypotheses was found by using F – test and Post-hoc test.
### 6.2.10 Results of Hypotheses Testing

Results obtained after testing the hypotheses are presented in table 6.1

#### Table 6.1

Results of Hypotheses Testing using F - test

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Hypothesis</th>
<th>F</th>
<th>Significant level</th>
<th>Rejected / Not Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>There will be no significant difference between Post-test mean scores of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td>15.67</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>2.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Audio Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td>8.65</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>3.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Visual Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td>1.14</td>
<td>Not Significant</td>
<td>Not Rejected</td>
</tr>
<tr>
<td>4.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Kinesthetic Learning Style of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td>12.14</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>5.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Audio Learning Style of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.</td>
<td>7.82</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>6.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Visual Learning Style of control group, experimental group – 1 and experimental group – 2 on</td>
<td>4.68</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>Problem Solving Inventory.</td>
<td></td>
<td></td>
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<tr>
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</tr>
<tr>
<td>7</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>6.31</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Kinesthetic Learning Style of control group, experimental group – 1 and</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>experimental group – 2 on Problem Solving Inventory.</td>
<td></td>
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<tr>
<td>8</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>10.25</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Audio Learning Style of control group, experimental group – 1 and experimental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>group – 2 on Social Skills Inventory.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>6.96</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Visual Learning Style of control group, experimental group – 1 and experimental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>group – 2 on Social Skills Inventory.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>3.61</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Kinesthetic Learning Style of control group, experimental group – 1 and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>experimental group – 2 on Social Skills Inventory.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>15.08</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having High Achievement Level of control group, experimental group – 1 and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>experimental group – 2 on Achievement Test.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>21.68</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Middle Achievement Level of control group, experimental group – 1 and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>experimental group – 2 on Achievement Test.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>There will be no significant difference between the Post-test mean scores of students</td>
<td>14.51</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>having Low Achievement Level of control group, experimental group – 1 and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>experimental group – 2 on Achievement Test.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>There will be no significant difference between the Post-test mean scores of students having High Achievement Level of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.</td>
<td>3.84</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>15.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Middle Achievement Level of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.</td>
<td>4.08</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>16.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Low Achievement Level of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.</td>
<td>8.59</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>17.</td>
<td>There will be no significant difference between the Post-test mean scores of students having High Achievement Level of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.</td>
<td>3.83</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>18.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Middle Achievement Level of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.</td>
<td>7.21</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>19.</td>
<td>There will be no significant difference between the Post-test mean scores of students having Low Achievement Level of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory.</td>
<td>9.25</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>20.</td>
<td>There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td>7.92</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>21.</td>
<td>There will be no significant difference between the Post-test mean scores of</td>
<td>7.54</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>Girls of control group, experimental group – 1 and experimental group – 2 on Achievement Test.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>---</td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td>There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory.</td>
<td>5.60</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>23</td>
<td>There will be no significant difference between the Post-test mean scores of Girls of control group, experimental group – 1 and experimental group – 2 on Problem Solving Inventory</td>
<td>10.16</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>24</td>
<td>There will be no significant difference between the Post-test mean scores of Boys of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory</td>
<td>6.60</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
<tr>
<td>25</td>
<td>There will be no significant difference between the Post-test mean scores of Girls of control group, experimental group – 1 and experimental group – 2 on Social Skills Inventory</td>
<td>11.14</td>
<td>0.01</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

Investigator carried out post – hoc test when F was significant.
6.3 Findings of the Present Study

After testing the hypotheses, obtained findings are as given below

1) Group Learning Approaches for teaching Science and Technology subject is effective than the TA of teaching Science and Technology on Total Achievement.

2) Group Learning Approaches for teaching Science and Technology subject is effective for Audio and Kinesthetic Learning Style students than that of Audio and Kinesthetic Learning Style students Learning Science and Technology through TA on Achievement Test.

3) Group Learning Approaches and Traditional Approach were effective for teaching Science and Technology subject for students having visual Learning Style.

4) Achievement of Audio and Kinesthetic Learning Style students Learning Science and Technology through CLA is higher than that of Audio and Kinesthetic Learning Style students Learning Science and Technology through PBL and TA on Achievement Test.

5) Achievement of Audio and Kinesthetic Learning Style students Learning Science and Technology through PBL is significantly higher than that of Audio and Kinesthetic Learning Style students Learning Science and Technology through TA on Achievement Test.

6) Group Learning Approaches for teaching Science and Technology subject is effective for students having Audio, visual and Kinesthetic Learning Style than that of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through TA on problem solving.

7) Problem solving of Audio and Kinesthetic Learning Style students Learning Science and Technology through CLA is higher than that of Audio and Kinesthetic Learning Style students Learning Science and Technology through PBL and TA on Problem Solving Inventory.

8) Problem solving of Audio and Kinesthetic Learning Style students Learning Science and Technology through PBL is higher than that of Audio and Kinesthetic Learning Style students Learning Science and Technology through TA on Problem Solving Inventory.
9) Problem solving of visual Learning Style students Learning Science and Technology through PBL is higher than that of visual Learning Style students Learning Science and Technology through CLA and TA on Problem Solving Inventory.

10) Problem solving of visual Learning Style students Learning Science and Technology through CLA is higher than that of visual Learning Style students Learning Science and Technology through TA on Problem Solving Inventory.

11) Group Learning Approaches for teaching Science and Technology subject is effective for students having Audio, visual and Kinesthetic Learning Style than that of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through TA on social skills.

12) Social skills of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through CLA is higher than that of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through PBL and TA on Social Skills Inventory.

13) Social skills of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through PBL is higher than that of Audio, visual and Kinesthetic Learning Style students Learning Science and Technology through TA on Social Skills Inventory.

14) Group Learning Approaches for teaching Science and Technology subject is effective for students having High, Middle and Low Achievement Level than that of High, Middle and Low Achievement Level students Learning Science and Technology through TA on Achievement Test.

15) Achievement of high, Middle and low achievement level students Learning Science and Technology through CLA is higher than that of High, Middle and Low Achievement Level students Learning Science and Technology through PBL and TA on Achievement Test.

16) Achievement of high, Middle and low achievement level students Learning Science and Technology through PBL is higher than that of high, Middle and Low Achievement level students Learning Science and Technology through TA on Achievement Test.

17) Group Learning Approaches for teaching Science and Technology subject is effective for students having High and Low Achievement Level than that of High
and Low Achievement Level students Learning Science and Technology through TA on Problem Solving.

18) Problem Solving of High and Low Achievement Level students learning Science and Technology through CLA is higher than that of High and Low Achievement Level students learning Science and Technology through PBL and TA on Problem Solving Inventory.

19) Problem Solving of High and Low Achievement Level students learning Science and Technology through PBL is higher than that of High and Low Achievement Level students learning Science and Technology through TA on Problem Solving Inventory.

20) Problem Solving of Middle Achievement Level students learning Science and Technology through PBL is higher than that of Middle Achievement Level students learning Science and Technology through CLA and TA on Problem Solving Inventory.

21) Problem Solving of Middle Achievement Level students learning Science and Technology through CLA is higher than that of Middle Achievement Level students learning Science and Technology through TA on Problem Solving Inventory.

22) Group Learning Approaches for teaching Science and Technology subject is effective for students having High and Low Achievement Level than that of High and Low Achievement Level students learning Science and Technology through TA on Social Skills Inventory.

23) Social skills of High, Middle and Low Achievement Level students Learning Science and Technology through CLA is higher than that of High, Middle and Low Achievement level students learning Science and Technology through PBL and TA on Social Skills Inventory.

24) Social skills of High, Middle and Low Achievement Level students learning Science and Technology through PBL is higher than that of High, Middle and Low Achievement Level students learning Science and Technology through TA on Social Skills Inventory.

25) Group Learning Approaches for teaching Science and Technology subject is effective for Boys learning Science and Technology through TA on Achievement.
26) Achievement of Boys learning Science and Technology through CLA is higher than that of Boys learning Science and Technology through PBL and TA on Achievement Test.

27) Achievement of Boys learning Science and Technology through PBL is higher than that of Boys learning Science and Technology through TA on Achievement Test.

28) Group Learning Approaches for teaching Science and Technology subject is effective for Girls learning Science and Technology through TA on Achievement.

29) Achievement of Girls learning Science and Technology through CLA is higher than that of Girls learning Science and Technology through PBL and TA on Achievement Test.

30) Achievement of Girls learning Science and Technology through PBL is higher than that of Girls learning Science and Technology through TA on Achievement Test.

31) Group Learning Approaches for teaching Science and Technology subject is effective for Boys than that of Boys learning Science and Technology through TA on Problem Solving.

32) Problem Solving of Boys learning Science and Technology through CLA is higher than that of Boys learning Science and Technology through PBL and TA on Problem Solving Inventory.

33) Problem Solving of Boys learning Science and Technology through PBL is higher than that of Boys learning Science and Technology through TA on Problem Solving Inventory.

34) Group Learning Approaches for teaching Science and Technology subject is effective for Girls than that of Girls learning Science and Technology through TA on Problem Solving.

35) Problem Solving of Girls learning Science and Technology through CLA is higher than that of Girls learning Science and Technology through PBL and TA on Problem Solving Inventory.

36) Problem Solving of Girls learning Science and Technology through PBL is higher than that of Girls learning Science and Technology through TA on Problem Solving Inventory.
37) Group Learning Approaches for teaching Science and Technology subject is effective for Boys than that of Boys earning Science and Technology through TA on Social Skills Inventory.

38) Achievement of Boys learning Science and Technology through CLA is higher than that of Boys learning Science and Technology through PBL and TA on Social Skills Inventory.

39) Achievement of Boys learning Science and Technology through PBL is higher than that of Boys learning Science and Technology through TA on Social Skills Inventory.

40) Group Learning Approaches for teaching Science and Technology subject is effective for Girls than that of Girls Learning Science and Technology through TA on social skills.

41) Social skills of Girls learning Science and Technology through CLA is higher than that of Girls learning Science and Technology through PBL and TA on Social Skills Inventory.

42) Social skills of Girls learning Science and Technology through PBL is higher than that of Girls learning Science and Technology through TA on Social Skills Inventory.

6.4 Implications of the Present Study

Following are the educational implications of the present study.

1) Group Learning Approaches can be used to enhance the group learning in Science and Technology of STD IX students.

2) Group Learning Approaches can be used to enhance learning of students with Auditory and Kinesthetic Learning Style.

3) Group Learning Approaches can be used to enhance learning of students with High, Middle and Low achievement level.

4) Group Learning Approaches develop the Problem Solving skills of students having different Learning Styles.

5) Group Learning Approaches develop the Problem Solving skills of students having High, Middle and Low Achievement Level.

6) Group Learning Approaches provide an opportunity to develop Social Skills of students having different Learning Styles.
7) Group Learning Approaches develop Social Skills of students having High, Middle and Low Achievement Level.
8) Group Learning Approaches help students to develop interest towards the subject.
9) Group Learning Approaches will help students to build confidence, develops oral communication, share and accept ideas of each other, feeling of trust worthiness, positive interdependence, team building, etc.
10) The group tasks should be developed for all the subjects that enhance group Learning.
11) Science teachers should adopt Group Learning Approaches as an effective Learning strategy in order to improve student’s performance and social interaction skills.

**6.5 Observations of the Present study**

Following are the observations of the present study:
1) Students found Group Learning Approaches interesting in learning Science and Technology.
2) Students have never learnt Science and Technology using Group Learning Approaches.
3) Students were excited to participate and enjoyed learning through tasks / activities given in the group.
4) Learning Science and Technology through GLA created joyful atmosphere for students.
5) Students were ready to work with interactive and challenging activities.
6) Students in a group, discussed with group members, felt free to share, express their ideas, views, accept each other ideas, solve the doubts and come to the final answer.
7) Students were found cooperative to each other and completed the given task in given time span.
8) Students were engrossed in doing activity in the group and thinks critically as well as creatively to complete the assigned tasks.
9) Students appreciated printed learning materials like handouts, worksheets, Power-Point presentations that helped them to think beyond the textbook.
10) Students’ positive attitude was found towards the subject content.
11) The level of competition between students decreased when Group Learning Approaches were implemented in the classroom.
12) Students were interacting and establishing rapport with each other.
13) Students found more accountable towards their work with increased self confidence.

6.6. Suggestions from the Present study
1) Group Learning Approaches should be included in curriculum of pre-service and in-service training programme for teachers
2) Teacher educators should also undergo this training so that they can be competent enough to train their student teachers for using Group Learning Approaches in classroom practices.
3) Group Learning activities should be incorporated in the classroom teaching that develops Social Skills and Problem Solving skills.
4) Curriculum should be based on the Group Learning Approaches.
5) Workshops on GLA can be organized for teachers’ and students’.

6.7. Recommendations for further studies
The following are the recommendations for the further studies
1) Teacher should use Group Learning Approaches separately for High Achievers and Low Achievers of the class to foster their learning.
2) A study of Group Learning Approaches could be carried out on students of Primary education, higher secondary education and higher studies.
3) A study of Group Learning Approaches could be carried out in various secondary school subjects like mathematics, social science, languages, etc.
4) A comparative study could be carried out for Group Learning Approaches and TA at different level of education and in different subjects.
5) A study could be carried out for development and tryout of group learning lesson plans.
6) A study could be carried out to find the effectiveness of Group Learning Approaches on students’ attitude towards the subject.
7) A study could be carried out to find the effectiveness of Group Learning Approaches on students self esteem.
8) A study could be carried out to find the effectiveness of cooperative Learning models in context to science and mathematics teaching.

9) A study could be carried out to find the effectiveness of group learning activities in different school subjects.

10) A comparative study could be carried out on individual learning and group learning in context to different variables.

11) A study could be carried out on principals, teachers and students opinion about Group Learning Approaches in context to different variables.