CHAPTER – IV
ANALYSIS OF DATA AND INTERPRETATION OF RESULTS AND FINDINGS

4.0.0 INTRODUCTION

The first chapter deals with the introduction, conceptual framework, rationale of the study, objectives, hypotheses and delimitations of the research. The second chapter deals with the review of related literature. The methodology, sample, design, tools and procedure of data collection and statistical techniques used for the analysis of data have been presented in detail in Chapter – III. The present chapter is devoted to the presentation of data, analysis, results and their interpretations. Objectives-wise results and its interpretations are presented, below, under separate captions.

4.1.0 LEARNING PROGRESSION IN SCIENCE OF CLASS IX STUDENTS

The first objective of the investigation was to study the Learning Progression in Science of class IX students of Kendrapara District of Odisha. The data related to the Learning Progression in Science were collected with the help of administering the Achievement Test in Science developed by Ms. Sudhamayee Mahali, 2021. The maximum marks of Achievement Test in Science were 40, which further converted to 100 for analysis. The data were analysed with the help of Mean, SD, Range and Percentiles. The results are presented in Table 4.1, below.

Table – 4.1: Mean, SD, Range, N and Percentiles for Achievement in Science of Class IX Students of Experimental and Control Group

Sta. Techniques	Achievement in Science	
	Experimental	Control
N	30	27
Mean	81.41	67.96
Std. Deviation	11.34	9.87
Range	40	40
Percentiles		

P5	50.2	45
P10	63.00	55
P20	70.50	59
P25	72.50	60
P30	75.00	62.5
P40	77.50	63
P50	83.75	67.50
P60	86.50	69.50
P70	87.50	72.50
P75	90.00	77.50
P80	92.00	78.50
P90	97.50	80.50
P95	98	85.9

Table – 4.1 shows that the mean score of Achievement in Science of Experimental Group and Control Group are 81.41 and 67.96, respectively. The SD for Achievement in Science of Experimental Group and Control Group are 11.34 and 9.87, respectively. The Range for Achievement in Science of Experimental Group and Control Group are 40 and 40 respectively. It signifies that the mean score of Achievement in Science of Experimental Group is higher than the Control Group. The SD for Achievement in Science of Experimental Group is higher than the Control Group. It may be inferred that there was a small deviation of the scores of Achievements in Science of Experimental Group. The Range for Achievement in Science of Experimental Group and Control Group are the same. It shows that there was a small distribution of scores in Achievement in Science among the students of the Experimental Group.

The Percentiles for Achievement in Science of Experimental Group demonstrates that 50.2 marks or below scored by 5% students. It shows that 95% students scored more than 50.2%

marks. Likewise, 72.50 marks or below scored by 25% students and 83.75 marks or below scored by 50% students. It also shows that 90 marks or below scored by 75% of students and 97.50 marks or below scored by 90% students. The Table – 4.1 demonstrates that 98 marks or below was scored by 95% students of Experimental Group. In other words, it can be said that 98% marks are secured by 95% students of Experimental Group. It shows that 5% students scored more than 98% marks.

The Percentiles for Achievement in Science of Control Group demonstrates that 45 marks or below scored by 5% students. It shows that 80% students scored more than 21.2% marks. Likewise, 60 marks or below scored by 25% students and 67.50 marks or below scored by 50% students. It also shows that 77.50 marks or below scored by 75% of students and 80.50 marks or below scored by 90% students. The Table – 4.1 demonstrates that 85.9 marks or below was scored by 95% students of Control Group. In other words, it can be said that 85.9% marks are secured by 95% students of Control Group. It shows that 5% students scored more than 85.9% marks.

Findings: The Learning Progression of Students of Experimental group is higher than that of Control group students of class IX of Kendrapara district, Odisha

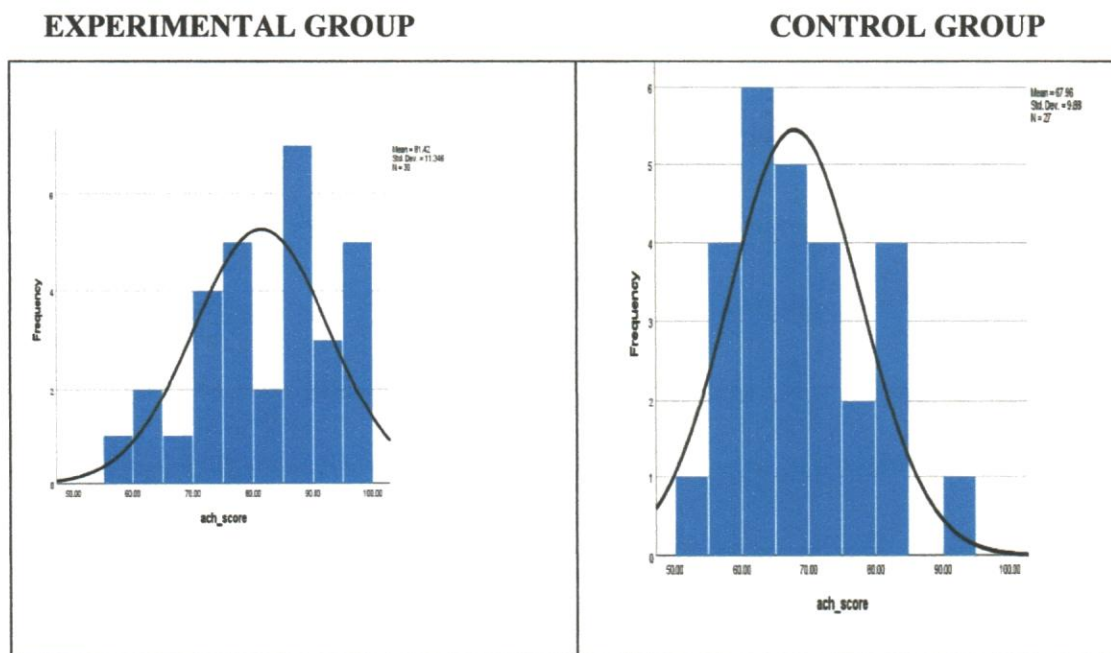**EXPERIMENTAL GROUP**   **CONTROL GROUP**

Fig. 4.1: Achievement in Science of Class IX Students of Experimental and Control Group

From the below presentations of the results of the present study, it can be concluded that the students of Experimental Group achieved higher in science than their counterparts, i.e., the

students of Control Group. Therefore, it can be inferred from the result of the present study that the Constructivist Approach was more effective than the Traditional Method of Teaching in terms of Achievement in Science. The Learning Progression of students taught through the Constructivist approach was higher than the students taught through the Traditional Method of Teaching.

4.2.0 ATTITUDE TOWARDS SCIENCE OF CLASS IX STUDENTS

The second objective of the investigation was to study the attitude towards science of class IX students of Kendrapara district, Odisha. The data related to the Attitude towards Science were collected with the help of administering the Attitude towards Science Scale developed by Prof. Abinash Grewal, 1978. The maximum score of Attitude Test in Science was 80 and the minimum score was 0. The data were analysed with the help of Mean, SD, Range and Percentiles. The results are presented in Table 4.2, below.

Table – 4.2: Mean, SD, Range, N and Percentiles for Attitude towards Science of Class IX Students of Experimental and Control Group

Sta. Techniques	Attitude towards Science	
	Experimental	Control
N	30	27
Mean	58.03	54.11
Std. Deviation	11.49	11.03
Range	49	40

Table – 4.2 shows that the mean scores of Attitudes towards Science of Experimental Group and Control Group are 58.03 and 54.11, respectively. The SD for Attitude towards Science of Experimental Group and Control Group are 11.49 and 11.03, respectively. The Range for Attitude towards Science of Experimental Group and Control Group are 49 and 40, respectively. It signifies that the mean score of Attitude towards Science of Experimental Group is higher than the Control Group. The SD for Attitude towards Science of Experimental Group is higher than the Control Group. It may be inferred that there was a small deviation of the scores of Attitudes towards Science of Experimental Group. The Range for Attitude towards Science of Experimental Group is higher than the Control Group. It shows that there

was a small distribution of scores in Attitude towards Science among the students of the Experimental Group.

Findings: The Attitude towards Science of Students of Experimental group is nearly Similar to that of Control group students of class IX of Kendrapara district, Odisha.
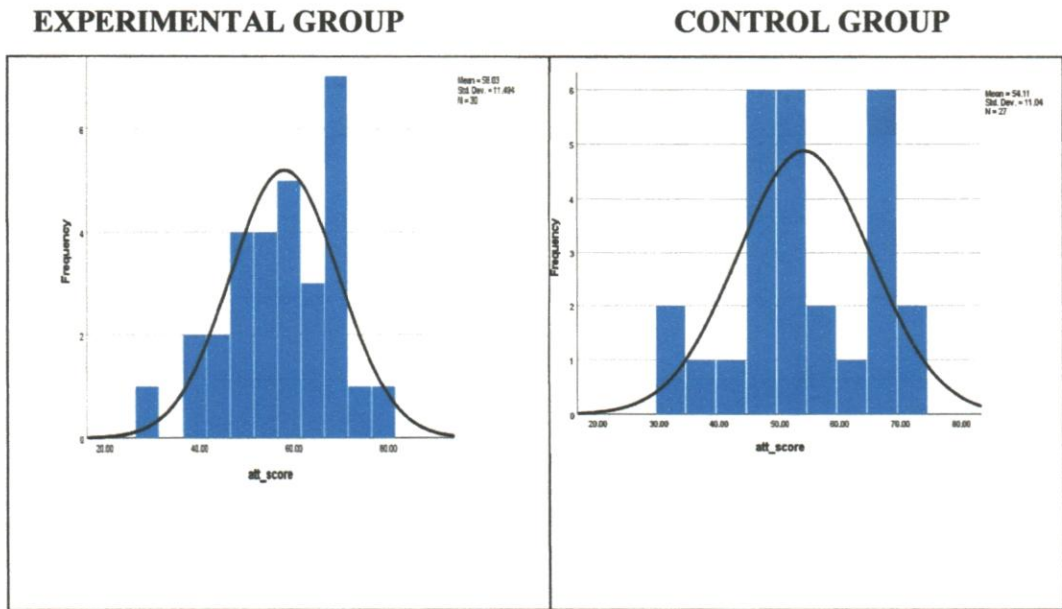
EXPERIMENTAL GROUP   CONTROL GROUP

Fig. 4.2: Attitude towards Science of Class IX Students of Experimental and
Control Group

From the above presentations of the results of the present study, it can be concluded that the students of Experimental Group slightly higher attitude towards science than their counterparts, i.e., the students of Control Group. Therefore, it can be inferred from the result of the present study that Constructivist Approach was not effective than the Traditional Method of Teaching in terms of student's Attitude towards Science. The Attitude towards Science of students taught trough the Constructivist Approach was nearly similar to the students taught through the Traditional Method of Teaching.

4.3.0 EFFECT OF TREATMENT, GENDER AND THEIR INTERACTION ON ACHIEVEMENT IN SCIENCE OF CLASS IX STUDENTS

The third objective of the investigation was to study the effect of Treatment, Gender and their interaction on Achievement in Science of Class IX students by taking their previous year Achievement in Science as covariate. Treatment and Gender were two independent variables. Treatment had two levels, namely, Constructivist Approach and Traditional Method of Teaching. Gender had two levels, namely, Boys and Girls. The data related to the Achievement in Science Learning Progression in Science were collected with the help of administering the

Achievement Test in Science developed by Ms. Sudhamayee Mahali, 2021. The maximum marks of the Achievement Test in Science were 100. The Class IX Scores of Achievements in Science was collected from the school Register and was designated as previous year Achievement in Science, which was taken as covariate. The data were analysed with the help of 2 X 2 Factorial Design ANCOVA of Unequal Cell Size. The results, interpretations and findings related to each of these above components are presented under captions 4.4.1, 4.4.2, and 4.4.3. The result has been presented, below, in Table 4.2

Table 4.3: Summary of 2 X 2 Factorial Design ANCOVA for Achievement in Science of Class IX Students by Taking Pre-test Scores of Achievements in Science of as Covariate.

Sources of Variance	Df	SSy.x	MSSy.x	F-Values	Sig.
Treatment	1	2561.61	2561.61	**21.44****	0.000
Gender	1	34.664	34.66	0.290	0.592
TreatmentX Gender	1	20.47	20.47	0.171	0.681
Error	52	6210.72	119.43		
Total	55	8843.64			

Table 4.4: Mean and SD for Achievement in Science of Experimental and Control Group

Group	Gender	N	Mean	Std. Deviation
Experimental	Boys	12	83.12	11.18
	Girls	18	80.27	11.62
	Total	30	81.41	11.34
Control	Boys	15	68.16	9.97
	Girls	12	67.70	10.19
	Total	27	67.96	9.87
Total	Boys	27	74.81	12.80
	Girls	30	75.25	12.56

	Total	57	75.04	12.56

4.3.1 Effect of Treatment on Achievement in Science of Class IX Students

From Table 4.3, it can be seen that the F- value for Treatment is 21.44 which is significant at 0.01 level with df equal to 1/55. It indicates that the adjusted mean scores of Achievements in Science Subject of Experimental Group and Control Group differ significantly when their pre-test scores of Achievements in Science Subject were taken as covariate. It shows that there was a significant effect of Treatment on Achievement in Science Subject of Class IX students when their Pre-test Scores of Achievements in Science Subject was taken as covariate. Thus, the null hypothesis, namely, "there is no significant effect of Treatment on Achievement in Science Subject of Class IX students when their Pre–test Scores of Achievements in Science Subject was taken as covariate", is rejected. It is, therefore, inferred that the Treatment produced a significant differential effect on the Achievements in Science Subject of students. Thus, it may be concluded that the Treatment was effective in terms of Achievements in Science Subjects of students.

Further, Table 4.4 indicates that the mean score and SD of Overall Achievement in Science Subject of Experimental Group is 81.41 and 11.34, respectively. The mean score and the SD of Overall Achievement in Science Subject of Control Group is 67.96 and 9.87, respectively. It is evident from the table that the mean score of Overall Achievement of the experimental group is higher than the Control group. It also shows that the SD of the Experimental group is higher than the Control group. It can be concluded that the Experimental Group was superior to the Control Group in terms of improving Overall Achievement in Science subject.

> **Finding:** There is a significant effect of Treatment (Constructivist Approach) on Achievement in Science Subjects of Class IX students as compared to traditional methods.

4.3.2 Effect of Gender on Achievement in Science of Class IX Students

From Table 4.3, it can be seen that the F- value for Gender is 0.29 which is not significant at 0.05 level with df equal to 1/55. It indicates that the Gender did not produce any significant differential effect on achievement in science. So, there was no significant effect of Gender on Achievement in Science Subject of Class IX students when their Pre-test Scores of Achievements in Science Subject was taken as covariate. Thus, the null hypothesis, namely, "there is no significant effect of Gender on Achievement in Science Subject of Class IX students when their Pre–test Scores of Achievements in Science Subject was taken as

covariate", is not rejected. It signifies that the achievement in science is independent of the Gender of the students.

Further, Table 4.4 indicates that the mean of the boys and girls taught through Constructivist approach is 83.12 and 80.27. It signifies that there was minimal difference in the achievement in science between the boys and the girls. Similarly, in the traditional approach of teaching also, the mean scores of achievements of boys and girls were 68.16 and 67.70, respectively. There was no such significant difference in their achievement in science.
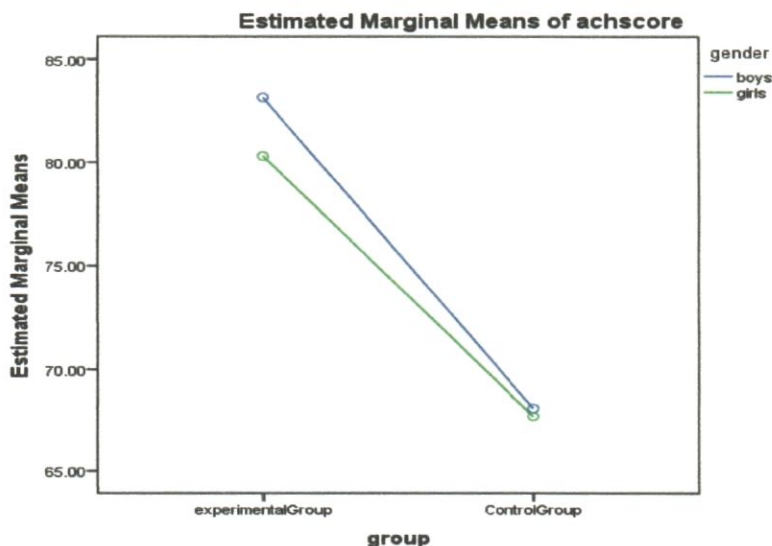
Finding: There is no significant effect of Gender on Achievement in Science Subject of Class IX students.

4.3.3 Interaction of Treatment and Gender on Achievement in Science of Class IX Students

From Table 4.3, it can be seen that the F- value for the interaction of Treatment and Gender is 0.29 which is not significant at 0.05 level with df equal to 1/55. It indicates that the interaction of Treatment and Gender did not produce a significant differential effect on the Achievement in Science. In other words, it can be said that there was no interactional effect of Treatment and Gender on the students' Achievement in Science. Therefore, the null hypothesis, namely, "there is no significant interaction of Treatment and Gender on Achievement in Science Subject of Class IX students when their Pre–test Scores of Achievements in Science Subject was taken as covariate", is not rejected. The students who taught through Constructivist Approach and the students who taught through the Traditional Approach benefited in the same way.

The effect of interaction between Treatment and Gender on the measure of achievement in science was not found significant. The result indicates that the boys and girls were benefited to the same extent in both the modes of teaching. Thus, Gender differential was not noticed in the said interaction on Achievement. But, the mean achievement scores of boys and girls of the experimental group were higher than that of the boys and girls of the control group. Further, achievement of girls of the experimental group was found higher than their boys' counterparts of the same group. Similarly, girls in the control group achieved higher than the boys of the same group. It may, therefore, be said that gender of the pupils did not affect their achievement in science in both experimental and control groups to the same degree.

Finding: There is no significant interaction effect of Treatment and Gender on Overall Achievement in Science Subject of Class IX students.

Estimated Marginal Means of achscore

Covariates appearing in the model are evaluated at the following values: pretest = 69.7368

Fig. 4.3: Interaction of Treatment and Gender on Achievement in Science

From the above presentations of the results of the present study, it can be concluded that the students of Experimental Group have higher Achievement in Science than their counterparts, i.e., the students of Control Group. Therefore, it can be inferred from the result of the present study that the Constructivist Approach was more effective than the Traditional Method of Teaching in terms of student's Achievement in Science. But when it comes to Gender, the result shows that there is no significant effect of it on the Achievement in Science of students. If we consider Gender independently, the presentation shows that the Treatment is effective for Boys and Girls individually, i.e. The Boys of Experimental group has higher Achievement in Science than those of Control group and the Girls of Experimental group have higher achievement rate in science than those of Control group. Therefore, it may be said that the gender of the pupils did not affect their achievement in science in both experimental and control groups to the same degree.