

CHAPTER - IV

ANALYSIS AND INTERPRETATION OF DATA

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4.0.0 INTRODUCTION

Introduction and the review of researches are presented in Chapter I and Chapter II, respectively. The methodology employed for the study along with the technique of sample collection, design of the study, tools, procedure of data collection and the statistical techniques for analysis of data are presented in Chapter III.

In the present chapter, the results and its interpretations are presented in the following captions, objective wise. Relevant figures are included to add a visual element to the presentation of the data and statistical analysis.

4.1.0 EFFECTIVENESS OF INSTRUCTIONAL STRATEGY

The first objective of the investigation was to study the effectiveness of instructional strategy. The effectiveness of instructional strategy was studied in terms of the achievement of students in Chemistry and reaction of students towards the strategy.

The results of both the achievement of students in Chemistry, and reaction of students towards the strategy are presented separately in the following captions:

4.1.1 Effectiveness of Instructional Strategy in terms of Achievement of Students in Chemistry

An achievement test consisting of 25 questions was developed by the investigator to measure achievement of students in chemistry. The maximum marks of the achievement test were 25. The marks secured by the students were converted in 100 for the analysis purposes. The test was administered to both the groups after completion of 10 classes. The duration of the test was 30 minutes.

To study the effectiveness of instructional strategy in terms of Achievement of students in Chemistry, the scores of experimental group are taken into consideration. The scores were analyzed with the help of Percentiles, Mean and Standard Deviation. The results are presented in the table 4.1

Table – 4.1: Percentiles, Mean and Standard Deviation for Achievement in Chemistry of Experimental Group

Percentiles	Scores of Achievement in Chemistry
P90	89
P80	80
P70	80
P60	76
P50	72
P40	69
P30	68
P20	60
P10	48
N	25
Mean	71.36
S.D.	13.74
Variance	188.91
Range	48

Table 4.1 reveals that 10 percent students achieved 48% marks. 50 percent students achieved 72% marks and 90 percent students achieved 89% marks. In other words, 10 percent students scored more than 89% marks and 90 percent of the students scored more than 48% marks. Hence, it can be stated, that teaching through this instructional strategy was effective in terms of the achievement of students in chemistry.

Finding: The developed instructional strategy was effective in terms of students' achievement in chemistry

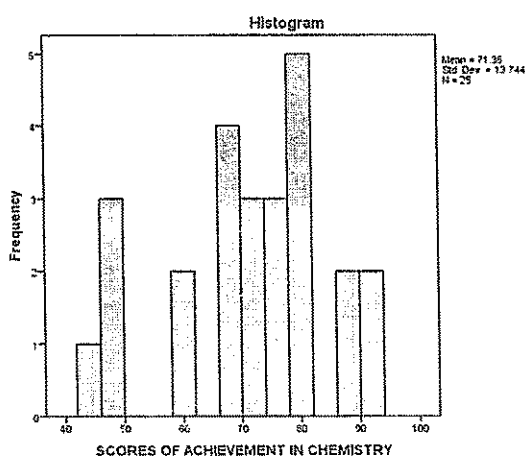


Fig. 4.1: Scores of Achievement in Chemistry

4.1.2 Effectiveness of Instructional Strategy in terms of Reaction of Students towards the Strategy

The second part of the first objective was to study the effectiveness of instructional strategy in terms of reaction of students towards the strategy.

The Reaction Scale was developed by the investigator was administered to the experimental group only after completion of 10 classes. The data was analyzed with the help of Percentages. Results are presented in table 4.2

Table-4.2 : Statement-wise Distribution of Responses of Students towards the Multi-media Model (In Percent)

S.No.	STATEMENTS	SA	A	UD	DA	SDA
1	Learning through this multimedia mediated approach is time consuming.	8	32	-	60	-
2	Sometimes it is boring to learn through this approach.	-	-	-	48	52
3	Learning through this approach is an interesting experience.	36	60	-	4	-
4	It is difficult to interact with the teacher while she/ he is teaching through the multimedia.	-	-	8	32	60
5	I feel motivated while learning through multimedia approach.	8	88	4	-	-
6	Study through this approach develops a competitive attitude.	12	84	-	4	-
7	I feel active and happy in the class when the teacher taught through this approach.	88	8	4	-	-
8	Teaching based on this approach gives chance to think independently.	-	80	12	4	4
9	I was encouraged to learn when other students attained concepts in the subject.	32	56	12	-	-
10	Studying through this approach motivated the students to explore examples other than those given in text books.	68	32	-	-	-
11	Presentation of the contents through this approach helped me to acquire concept.	28	68	4	-	-
12	Presentation of the examples/ illustrations helped me to understand the concepts well.	4	96	-	-	-

13	Provision for different example for illustrating a concept helped me to learn with comprehension.	24	76	-	-	-
14	The questions asked in the class helped me to think independently.	16	80	4	-	-
15	I felt motivated in answering questions after watching the videos/animation of the related content.	40	52	8	-	-
16	Linkage of different concepts in the content was well organized.	16	80	-	4	-

Table 4.2 reveals the reactions of the students in terms of reactions of the students towards the instructional strategy in percentages. Sixty percent of the students were of the opinion that learning through this multimedia mediated approach is not time consuming. Fifty two percent of the students disagreed that learning through this approach is boring. Learning through this approach is an interesting experience was opined by sixty percent of the students. Sixty percent of the students disagreed that it was difficult to interact with the teacher while she/ he is teaching through the multimedia. Eighty percent students felt motivated while learning through multimedia approach. Eight-four percent of the students agree that studying through this approach develops a competitive attitude. Eighty-eight percent students felt active and happy in the class when the teacher taught through this approach. Eighty percent of the students opined that teaching based on this approach gave a chance to think independently. Fifty-six of the students felt that they were encouraged to learn when other students attained concepts in the subject. Sixty-eight percent of the students felt that studying through this approach motivated them to explore examples other than those given in text books. Sixty-eight percent opined that presentation of the contents through this approach helped them acquire concept. Ninety-five percent of the students opined that presentation of the examples/ illustrations helped them to understand the concepts well. Seventy-six percent of the students agreed that provision for different example for illustrating a concept helped them to learn with comprehension. Eighty percent of the students were of the view that the questions asked in the class helped them to think independently. Fifty two percent of the

students felt motivated in answering questions after watching the videos/animation of the related content. Eighty percent of the students were of the view that linkage of different concepts in the content was well organized.

Finding: The developed instructional strategy was effective in terms of students' reactions towards the instructional strategy.

4.2.0 EFFECT OF TREATMENT, GENDER AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The second objective of the investigation was to study the effect of treatment, gender and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate. The scores of intelligence were collected by administering the Verbal Intelligence Test on both the groups. The achievement in chemistry was measured by an achievement test, developed by the investigator. The test was administered to both the groups after completion of the ten lessons. The treatment had two levels, i.e., instruction with the multi-media model and the instruction with the lecture cum demonstration method without the use of the multi-media package. Intelligence was taken as covariate. The data were analysed with the help of 2 X 2 Factorial design ANCOVA of Unequal Cell Size. The results are presented in table 4.3 and 4.4. The interpretations related to this are given in captions 4.2.1, 4.2.2 and 4.2.3.

4.2.1 Effect of Treatment on the Achievement in Chemistry

Table 4.3 reveals that the F – value of 5.237 for the treatment is significant at 0.05 level with df equal to 1/48. It indicates that the treatment produced a significant differential effect on the achievement in chemistry. In other words, it can be said that the instructional strategy was effective in enhancing the achievement in

Table - 4.3 F-value for Treatment, Gender and their Interaction on the Achievement in Chemistry

Sources of Variance	Df	SS	MSS	F
Group	1	816.667	816.667	5.237*
Gender	1	71.778	71.778	.460
Treatment X Gender	1	88.424	88.424	.567
Error	45	7018.019	155.956	
Total	48			

**Significance at 0.05 level*

Table - 4.4: Mean and SD for Achievement in Chemistry of Boys and Girls

Treatment	Instructional Strategy			Lecture cum Demonstration Method		
	N	Mean	SD	N	Mean	SD
Boys	11	66.55	17.369	9	63.11	18.950
Girls	14	75.14	9.037	16	63.25	11.975
Total	25	71.36	13.744	25	63.20	14.468

chemistry of the students taught through the multi-media model. Therefore, the null hypothesis, namely, “there is no significant effect of treatment on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate,” is rejected. Therefore, it can be said that the achievement in chemistry is dependent upon the method of instruction.

Further table 4.4 shows that the mean achievement scores in chemistry of the students taught through the developed instructional strategy (71.36) is higher than those taught through the Lecture cum Demonstration Method. (63.20). It can therefore be said that the developed instructional strategy was found to be more effective in terms of achievement of students in chemistry than the Lecture cum Demonstration Method.

Finding: The treatment produced a significant differential effect on the achievement of students in chemistry.

4.2.2 Effect of Gender on the Achievement in Chemistry

Table 4.3 reveals that the F – value of 0.460 for the gender is not significant at 0.05 level with df equal to 1/48. It indicates that the gender did not produce a significant differential effect on the achievement in chemistry. It shows that students’ achievement in chemistry is independent of gender. Therefore, the null hypothesis, namely, “there is no significant effect of gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Further table 4.4 also indicates that the mean achievement scores in chemistry of boys of experimental group and control group is 66.55 and 63.11 respectively. The means achievement scores of girls of experimental group and control group is 75.14 and 63.25 respectively. But, this difference is not significant.

Finding: There was no significant differential effect of gender on the achievement of students in chemistry.

4.2.3 Interaction of Treatment and Gender on Achievement in Chemistry

Table 4.3 reveals that the F – value of 0.567 for the interaction between treatment and gender is not significant at 0.05 levels with df equal to 1/48. It indicates that the interaction of treatment and gender did not produce a significant differential effect on the achievement in chemistry. In other words, there was no interactional effect of treatment and gender of students on achievement in chemistry. Therefore the null hypothesis, namely, “there is no significant interaction of treatment and gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected. It indicates that the students of both the groups were equally benefited on the measure of achievement in chemistry.

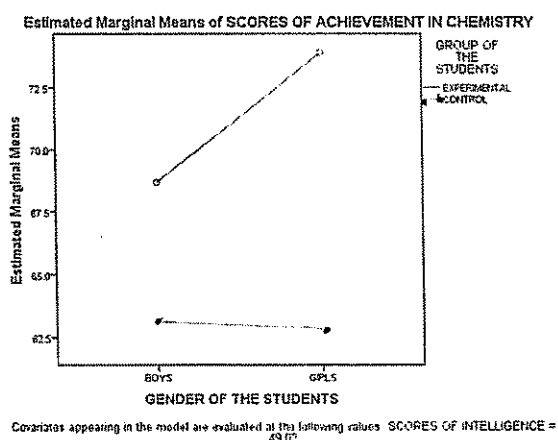


Fig. 4.2: Achievement in Chemistry of Boys and Girls

Finding: The interaction of treatment and gender did not produce a significant differential effect on the achievement of students in chemistry.

4.3.0 EFFECT OF TREATMENT, STYLE OF LEARNING AND THINKING AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The third objective of the investigator was to study the effect of treatment, style of learning and thinking and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate. The style of

learning and thinking tool was administered to both the groups after completion of 10 lessons. The scores of intelligence were taken as covariate. The data were analysed with the help of 2 X 2 Factorial design ANCOVA of Unequal Cell Size. The results are presented in table 4.5 and 4.6 and interpretations are given in captions 4.3.1, 4.3.2, and 4.3.3.

Table - 4.5: F-value for Treatment, Style of Learning And Thinking and Their Interaction on Achievement in Chemistry

Sources of Variance	Df	SS	MSS	F
Group	1	104.739	104.739	.680
Style of Thinking and Learning	1	84.762	84.762	.550
Treatment X Style of Thinking and Learning	1	190.203	190.203	1.234
Error	45	6933.713	154.083	
Total	48			

Table - 4.6: Mean and SD for Achievement in Chemistry of the Right and Left Hemispheres of Experimental and Control Groups

Treatment	Instructional Strategy			Lecture cum Demonstration Method		
	N	Mean	SD	N	Mean	SD
Style of Thinking and Learning						
Right Hemisphere	22	73.09	13.420	21	62.29	15.103
Left Hemisphere	3	58.67	10.066	4	68.00	10.832
Total	25	71.36	13.744	25	63.20	14.468

4.3.1 Effect of Treatment on the Achievement in Chemistry

The results and interpretations are presented under the caption 4.2.1.

4.3.2 Effect of Style of Learning and Thinking on Achievement in Chemistry

Table 4.5 indicates F – value of 0.550 for the style of learning and thinking on achievement in chemistry is not significant at 0.05 level with df equal to 1/48. It indicates that the style of learning and thinking did not produce a significant differential effect on the achievement in chemistry. It shows that students' achievement in chemistry is independent of style of learning and thinking. Therefore the null hypothesis namely, “ there is no significant effect of style of

learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Further, table 4.6 also indicates that the mean achievement scores in chemistry of students with right hemisphere dominance (73.09) for experimental group is higher than that of students of control group (62.29). The mean achievement scores in chemistry of students with left hemisphere dominance is 58.67 for experimental group and for the control group is 68.00. But, this difference is not significant.

Finding: There was no significant differential effect of style of learning and thinking on the achievement of students in chemistry.

4.3.3 Interaction of Treatment, Style of Learning and Thinking on Achievement in Chemistry

Table 4.5 reveals that the F – value of 1.234 for the interaction of treatment and style of learning and thinking is not significant at 0.05 levels with df equal to 1/48. It indicates that the interaction of treatment and style of learning and thinking did not produce a significant differential effect on the achievement in chemistry. Therefore the null hypothesis, namely, “there is no significant interaction of treatment and style of learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Finding: The interaction of treatment and style of learning and thinking did not produce a significant differential effect on the achievement of students in chemistry.

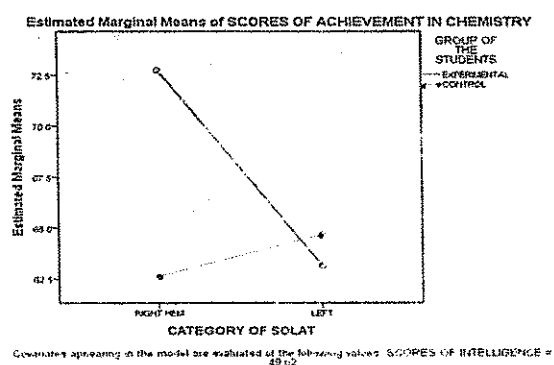


Fig. 4.3: Achievement scores of Students having different Styles of Learning and Thinking

4.4.0 EFFECT OF TREATMENT, PARENTAL PROFESSION AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The fourth objective of the investigator was to study the effect of treatment and parental profession and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate. The results are presented in table 4.7 and 4.8 and interpretations are given in captions 4.4.1, 4.4.2 and 4.4.3.

Table - 4.7: F-value for Treatment, Parental Profession and their Interaction on the Achievement in Chemistry

Sources of Variance	Df	SS	MSS	F
Group	1	1156.397	1156.397	7.544**
Parental Profession	1	.430	.430	.003
Treatment X Parental Profession	1	280.593	280.593	1.831
Error	45	6897.655	153.281	
Total	48			

** Significant at 0.01 Level

Table - 4.8: Mean and SD for Achievement in Chemistry of Students belonging to different Parental Professions of Experimental and Control Groups

Treatment	Instructional Strategy			Lecture cum Demonstration Method		
	N	Mean	SD	N	Mean	SD
Parental Profession						
Business	19	69.68	14.686	15	65.60	15.179
Service	06	76.67	9.266	10	59.60	13.260
Total	25	71.36	13.744	25	63.20	14.468

4.4.1 Effect of Treatment on the Achievement in Chemistry

The results and interpretations are presented under the caption 4.2.1.

4.4.2 Effect of Parental Profession on Achievement in Chemistry

Table 4.7 indicates F – value of 0.003 for the parental profession on achievement in chemistry is not significant at 0.05 levels with df equal to 1/48. It indicates that the parental profession did not produce a significant differential effect on the achievement in chemistry. It shows that students' achievement in chemistry is

independent of parental profession. Therefore the null hypothesis, namely, “there is no significant effect of parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Further table 4.8 also indicates that the mean achievement scores in chemistry of students with business as parental profession is 69.68 and 65.60 for experimental and control group respectively, while the mean achievement of students with service as parental profession is 76.67 and 59.60 for experimental and control group respectively. But, this difference is not significant.

Finding: There was no significant differential effect of parental profession on the achievement of students in chemistry.

4.4.3 Interaction of Treatment and Parental Profession on Achievement in Chemistry

Table 4.7 reveals that the F – value of 1.831 for the interaction of treatment and parental profession on achievement in chemistry is not significant at 0.05 levels with df equal to 1/48. It indicates that the interaction of treatment and parental profession did not produce a significant differential effect on the achievement in chemistry. Therefore, the null hypothesis, namely, “there is no significant interaction of treatment and parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

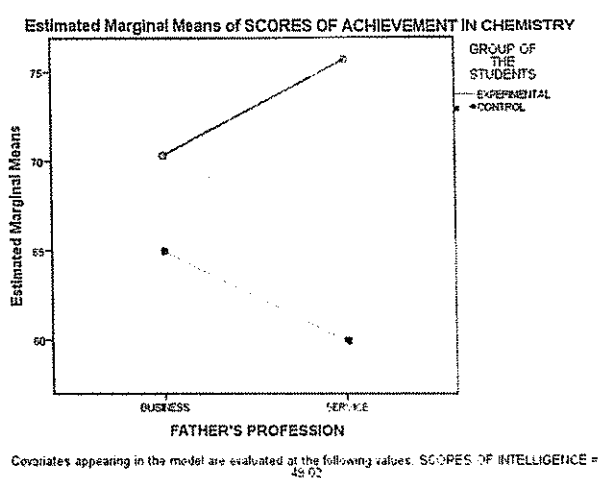


Fig. 4.4: *Achievement Scores of Students belonging to different Parental Profession*

Finding: The interaction of treatment and parental profession did not produce a significant differential effect on the achievement of students in chemistry.

4.5.0 EFFECT OF GENDER, PARENTAL PROFESSION AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The fifth objective of the investigator was to study the effect of gender, parental profession and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate. The total number of students was divided as per their parental profession, not as per the treatment given to them. The results are presented in table 4.9 and 4.10 and interpretations are given in captions 4.5.1, 4.5.2, and 4.5.3.

Table - 4.9: F-values for Gender and Parental Profession on the Achievement in Chemistry

Sources of Variance	Df	SS	MSS	F
Gender	1	19.481	19.481	.110
Parental Profession	1	34.408	34.408	.194
Gender X Parental Profession	1	24.045	24.045	.135
Error	45	7996.053	177.690	
Total	48			

Table - 4.10: Mean and SD for Achievement in Chemistry of Students belonging to different Parental Professions of Experimental and Control Groups

Gender	Boys			Girls		
	N	Mean	SD	N	Mean	SD
Business	15	65.33	17.545	19	69.89	12.391
Service	05	64.00	20.199	11	66.91	12.012
Total	20	65.00	17.693	30	68.80	12.133

4.5.1 Effect of Gender on the Achievement in Chemistry

Table 4.9 reveals that the F – value of 0.110 for the gender is not significant at 0.05 level with df equal to 1/48. It indicates that the gender did not produce a significant differential effect on the achievement in chemistry. It shows that students' achievement in chemistry is independent of gender. Therefore, the null hypothesis, namely, "there is no significant effect of gender on the achievement in

chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Further table 4.10 also indicates that the mean achievement scores in chemistry of boys of both the groups is 65.00, while the mean achievement scores in chemistry of girls of both the groups is 68.80. But, this difference is not significant.

Finding: There was no significant differential effect of gender on the achievement of students in chemistry

4.5.2 Effect of Parental Profession on Achievement in Chemistry

Table 4.9 indicates F – value of **0.194** for the parental profession on achievement in chemistry is not significant at 0.05 levels with df equal to 1/48. It indicates that the parental profession did not produce a significant differential effect on the achievement in chemistry. It shows that students’ achievement in chemistry is independent of parental profession. Therefore the null hypothesis, namely, “there is no significant effect of parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate”, is not rejected.

Further table 4.10 also indicates that the mean achievement scores in chemistry of boys and girls of business as parental profession is 65.33 and 69.89, respectively. The mean achievement scores in chemistry of boys and girls with service as parental profession is 64.00 and 66.9, respectively. But, this difference is not significant.

Finding: There was no significant differential effect of parental profession on the achievement of students in chemistry.

4.5.3 Interaction of Gender and Parental Profession on Achievement in Chemistry

Table 4.9 reveals that the F – value of **0.135** for the interaction of gender and parental profession on achievement in chemistry is not significant at 0.05 levels with df equal to 1/48. It indicates that the interaction of gender and parental profession did not produce a significant differential effect on the achievement in chemistry. Therefore, the null hypothesis, namely, “there is no significant interaction of gender and parental profession on the achievement in chemistry of

class VII students when their scores of intelligence were taken as covariate", is not rejected.

Estimated Marginal Means of SCORES OF ACHIEVEMENT IN CHEMISTRY

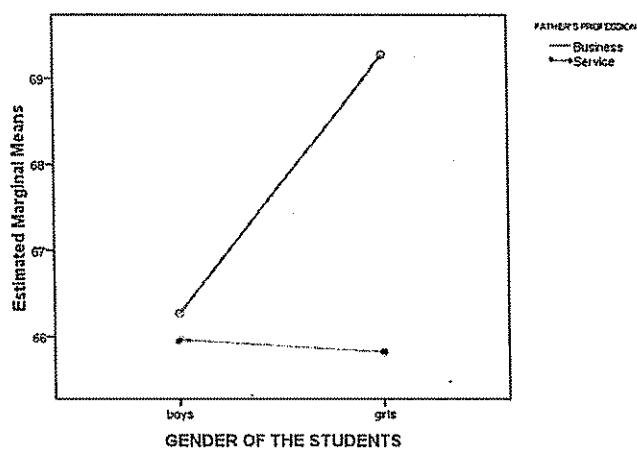


Fig. 4.5: Achievement Scores of Boys and Girls belonging to different Parental Profession

Finding: The interaction of gender and parental profession did not produce a significant differential effect on the achievement of students in chemistry.