

CHAPTER - IV

**ANALYSIS OF DATA
AND INTERPRETATION OF
THE RESULTS**

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4.0.0 INTRODUCTION

The need and justification, objectives along with the hypotheses of the study are presented under different headings in the chapter- I. The reviews of the related literature are presented in the chapter – II. The methodology, sample, design, tools and techniques, procedure of data collection and the statistical techniques used for the analysis of data are presented in chapter – III. In this chapter, objective-wise analysis of the data are presented, below, under separate headings.

4.1.0 EFFECTIVENESS OF ALTERNATIVE TECHNIQUES OF ASSESSMENT

The first objective of the investigation was to study the effectiveness of the material developed for the alternative techniques of evaluation in terms of students' achievement in Science and their participation in the classroom. As this objective has two components, therefore, the result and the analysis of each component of this objective is presented in the caption 4.1.1 and 4.1.2.

4.1.1 Effectiveness of the Alternative Techniques of Evaluation in terms of Students' Achievement in Science

In order to study the above mentioned objective, the alternative techniques, such as, portfolio assessment, rubrics, concept map preparation, self- assessment, peer-assessment and oral answers, etc. were conducted by the investigator. The assessment was conducted during and after the completion of teaching of one unit. The treatment was given for the 10 days. As evaluation is an integral part of the learning process, so, different techniques of alternative evaluation was incorporated in the process. As per the individual score of the learner, the data were analysed with the help of mean, SD, range, variance and the percentile. The results are presented in the table – 4.1.

Table-4.1: Mean, SD, Range, Variance. and Percentiles of Achievement in Science

N	35
Mean	62.31
SD	16.46
Range	52
Variance	270.81
Percentiles	
10	41.20
20	46.20
30	48.00
40	56.20
50	62.00
60	64.60
70	71.00
80	82.00
90	89.00

Table 4.1 indicates that the mean score of the group is 62.31. It also indicates that the SD, range and variance of the group is 16.46, 52 and 270.81, respectively. The percentiles show that 90% students scored more than 41 marks; fifty percent students scored 62 marks, 20% students scored 82 marks and 10%

students scored 89 marks. Generally, this kind of achievement was not experience in normal or traditional mode of teaching. Therefore, it can be said that the alternative techniques of assessment was effective in terms of the achievement in Science.

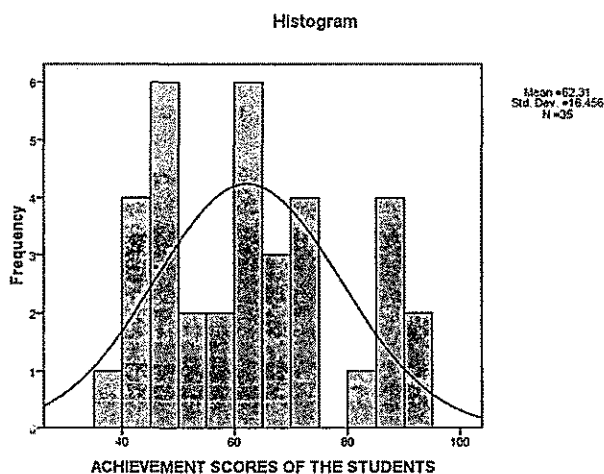


Fig. 4.1: Students' Achievement in Science

Finding: The alternative techniques of assessment was effective in terms of the students' achievement in Science

b. Students Participation in the Classroom

It was observed during the classes that almost all the students participated in the classroom activities. Therefore, it can be said that alternative techniques of assessment was effective in terms of the students' participation in the classroom.

Finding: The alternative technique of assessment was effective in terms of the students' participation in the classroom.

4.2.0 COMPARISON OF ACHIEVEMENT IN SCIENCE OF THE STUDENTS OF EXPERIMENTAL AND CONTROL GROUP

Second objective of the present investigation was to compare the achievement in Science of the students taught through the ICT-

based alternative assessment techniques and the students taught through the traditional method. Ten days treatment through the ICT-based alternative assessment techniques was provided to the experimental group where as the control group was taught through the traditional method of teaching. The assessment procedure was mentioned in caption 4.1.1. The assessment was conducted during and after the completion of teaching of one unit. The data related to the achievement in Science were analysed with the help of One-way ANOVA. The results are presented in table 4.2.

Table- 4.2: Summary of 2 X 2 ANOVA for Achievement in Science of Experimental and Control Group

Sources of Variance	Degree of Freedom	Sum of Squares	Mean Sum of Square	F-Values
Among	1	8492.01	8492.01	40.85**
Within	68	14136.69	207.89	
Total	69	22628.70		

**** Significant at 0.01 level**

Table - 4.3: Mean and S.D. for Achievement in Science of Experimental and Control Group

Groups	N	Mean	SD
Experimental	35	62.31	16.46
Control	35	40.29	12.04
Total	70	51.30	18.11

Table 4.2 indicates that the F-value for achievement in Science is 40.85, with df equal to 1/69, is significant at 0.01 level. Therefore, the null hypothesis, namely, "there is no significant difference in mean achievement score of the students taught through the ICT-based alternative techniques of assessment and the students taught through the traditional method", is rejected.

Further, table-4.3, indicate that the mean of the experimental and the control group is 62.31 and 40.29, respectively. The table 4.3, also, shows that the SD of the experimental and the control group is 16.46 and 12.04, respectively.

Finding: There is a significant difference in mean achievement score of the students taught through the ICT-based alternative techniques of assessment and the students taught through the traditional method.

4.3.0 RELATIONSHIP BETWEEN THE INTELLIGENCE AND ACHIEVEMENT IN SCIENCE

The third objective of the study was to find the relationship between the achievement in Science and Intelligence. For this purpose, only the scores of achievement in Science and Intelligence of experimental group were taken into consideration. The control group score were not taken for the analysis. Only, the relationship between the achievement in Science and Intelligence of experimental group was studied. As the effectiveness of the ICT-based alternative techniques of assessment was studied, so only the experimental group scores were taken into consideration for the analysis. The results are given in the table 4.4.

Table-4.4: Mean, SD and 'r'-value of achievement in Science and Intelligence (N=35)

Measures	Achievement in Science	Intelligence
Mean	62.31	62.14
SD	16.46	12.04
Correlation	0.88**	

**** Significant at 0.01 level**

Table 4.4 reveals that the 'r' value for achievement in Science and intelligence is 0.88, which is significant at 0.01 level. There

is a significant relationship between the intelligence and achievement in Science. Therefore, the null hypothesis, namely, “there is no significant relationship between the achievement in Science and intelligence”, is rejected. Therefore, it can be inferred that there was significant positive relationship between the achievement in Science and intelligence. It signifies that intelligent students can achieve more.

Finding: There was significant relationship between the achievement in Science and intelligence.

4.4.0 RELATIONSHIP BETWEEN THE PERSONALITY AND ACHIEVEMENT IN SCIENCE

The fourth objective of the study was to find the relationship between the achievement in Science and personality. For this purpose, only the scores of achievement in Science and personality of experimental group were taken into consideration. The control group score were not taken for the analysis. Only, the relationship between the achievement in Science and personality of experimental group was studied. As the effectiveness of the ICT-based alternative techniques of assessment was studied, so, only, the experimental group scores were taken into consideration for the analysis. The results are presented in table 4.5

Table-4.5: Mean, SD and ‘r’-Value of achievement in Science and Personality (N=35)

Measures	Achievement in Science	Personality
Mean	62.31	48.66
SD	16.64	19.21
Correlation	0.84**	

** Significant at 0.01 level

The table 4.5 indicates that the 'r' value for achievement in Science and personality is 0.84, which is significant at 0.01 level. There is a significant relationship between the personality and achievement in Science. Therefore, the null hypothesis, namely, "there is no significant relationship between achievement in Science and personality", is rejected. Therefore, it can be inferred that there was significant positive relationship between the achievement in Science and personality. It can be said that the type of personality influences the students achievement in Science.

Finding: There was significant positive relationship between the achievement in Science and personality.

4.5.0 EFFECT OF GENDER, INTELLIGENCE AND THEIR INTERACTION ON THE STUDENTS' ACHIEVEMENT IN SCIENCE

The fifth objective of the investigation was to study the effect of gender, intelligence and their interaction on the students' achievement in Science. For this purpose, only the scores of achievement in Science and intelligence of experimental group were taken into consideration. The control group score were not taken for the analysis. The effect of gender, intelligence and their interaction on the achievement in Science of the experimental group was studied. Gender has two levels, i.e., boys and girls. Intelligence has two levels, such as, high intelligence and average intelligence. Achievement in Science was collected with the help of an achievement test developed by the investigator. The data related to intelligence were collected by administering the intelligence test developed by Ojha and Ray Cahudhary (1971). Data were analysed with the help of the 2 X 2 Factorial Design ANOVA of unequal Cell Size. The

results and its interpretations are given in table 4.6. The interpretations related to the gender, intelligence and their interactions are presented in caption 4.5.1, 4.5.2 and 4.5.3, separately.

Table- 4.6: Summary of 2 X 2 Factorial Design ANOVA for Achievement in Science

Sources of Variance	Degree of Freedom	Sum of Squares	Mean Sum of Square	F-Value
Intelligence	1	4659.01	4659.01	34.94**
Gender	1	88.83	88.83	0.67
Intelligence X Gender	1	389.41	389.41	2.92
Error	31	4133.65	133.34	
Total	34	9270.90		

**** Significant at 0.01 level**

Table-4.7: Mean and S.D. for Achievement in Science High and Average Intelligent Boys and Girls

Gender	High Intelligent			Average Intelligent			Total		
	N	Mean	S.D.	N	ean	S.D.	N	Mean	S.D.
Boys	10	68.10	11.68	08	51.62	12.34	18	60.78	14.35
Girls	09	78.00	13.14	08	48.12	8.09	17	63.94	18.74
Total	19	72.79	13.07	16	49.88	10.24	35	62.31	16.46

4.5.1 Effect of Gender on the Students' Achievement in Science

Table 4.6 indicates that the F-value of achievement in Science for gender (0.67), with df equal to 1/34, is not significant at 0.05 level. It signifies that there is no significant effect of gender on the students' achievement in Science. Therefore, the null hypothesis, namely, "there is no significant effect of gender on the students' achievement in Science", is not rejected. Thus, it can be inferred that achievement in Science is independent of gender.

Further, table 4.7 shows that the mean scores of achievement in Science of boys and girls are 60.78 and 63.94, respectively. The SD of the achievement in Science of boys and girls are 14.35 and 18.74, respectively. It signifies that girls scored more than the boys. But, the variations are more among the girls than the boys. But, the difference in mean between the boys and girls is not significant. So, it can be concluded that there is no significant effect of the gender on the students' achievement in Science.

Finding: There is no significant effect of gender on students' achievement in Science.

4.5.2 Effect of Intelligence on the Students' Achievement in Science

Table 4.6 indicates that the F-value of achievement in Science for intelligence (34.94), with df equal to 1/34, is significant at 0.01 level. It signifies that there is a significant effect of intelligence on the students' achievement in Science. Therefore, the null hypothesis, namely, "there is no significant effect of intelligence on the students' achievement in Science", is rejected. Thus, it can be inferred that achievement in Science is dependent on intelligence.

Further, table 4.7 also shows that the mean scores of achievement in Science of high intelligent and average intelligent are 72.79 and 49.88, respectively. The SD of the achievement in Science of high intelligent and average intelligent is 13.07 and 10.42, respectively. It shows that the variations are large among the high intelligent than the average intelligent. The difference in the mean achievement scores of

high intelligent and average intelligent is significant. Thus, it can be said that there is a significant effect of intelligence on students' achievement in Science.

Finding: There is a significant effect of intelligence on the students' achievement in Science.

4.5.3 Interactional Effect of Gender and Intelligence on the Students' Achievement in Science

Table 4.6 indicates that the F-value of achievement in Science for interaction of gender and intelligence (2.92), 0.01 with df equal to 1/34, is not significant at 0.05 level. It signifies that there is no significant interactional effect of gender and intelligence on students' achievement in Science. Therefore, the null hypothesis, namely, "there is no significant interactional effect of gender and intelligence on the students' achievement in Science", is not rejected. Thus, it can be inferred that achievement in Science is independent of the interactional effect of gender and intelligence.

Further, table 4.7 indicates that the mean scores of achievement in Science of high intelligent boys and girls are 68.10 and 78, respectively. The SD of the achievement in Science of high intelligent boys and girls are 11.68 and 13.14, respectively. The mean scores of achievement in Science of average intelligent boys and girls are 51.62 and 48.12, respectively. The SD of the achievement in Science of average intelligent boys and girls are 12.34 and 8.09, respectively. It shows that the variations are large among the high intelligent girls than the high intelligent boys. In case average intelligent students, the variations are large among the boys than the girls. So far as levels of intelligent are

concerned, the variations are large among the high intelligent students (13.07) than the average intelligent students (10.24). Thus, it can be inferred that there is no interactional effect of gender and intelligence on the students' achievement in Science.

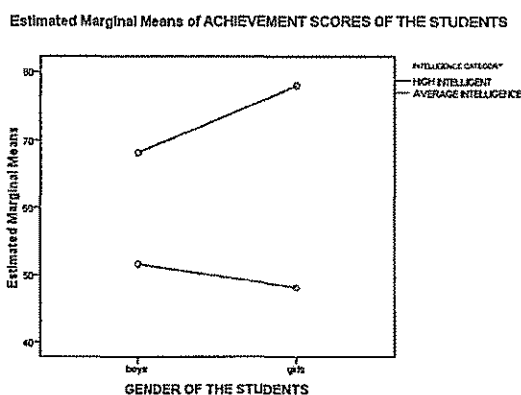


Fig. 4.2: Interaction between Gender and Intelligence on achievement in Science

Gender: 1= Boys 2= Girls **Intelligence:** 1= High Intelligent
2= Average Intelligent

Finding: There is no significant interactional effect of gender and intelligence on the students' achievement in Science.

4.6.0 EFFECT OF GENDER, PERSONALITY AND THEIR INTERACTION ON THE STUDENTS' ACHIEVEMENT IN SCIENCE

The sixth objective of the investigation was to study the effect of gender, personality and their interaction on the students' achievement in Science. For this purpose, only the scores of achievement in Science and personality of the experimental group were taken into consideration. The control group score were not taken for the analysis. Only, the effect of gender, personality and their interaction on the achievement in Science of the experimental group was studied. Gender has two levels,

i.e., boys and girls. Personality has two levels, such as, extrovert and introvert. Achievement in Science was measured with the help of the different alternative techniques of assessment. The data related to personality were collected with the help of a standardized tool developed by Pandey (1999). Data were analysed with the help of the 2 X 2 Factorial Design ANOVA of unequal Cell Size. The results and its interpretations are given in table 4.8 and 4.9. The interpretations related to the gender, intelligence and their interactions are presented in caption 4.6.1, 4.6.2 and 4.6.3, separately.

Table- 4.8: Summary of 2 X 2 Factorial Design ANOVA for Achievement in Science

Sources of Variance	Degree of Freedom	Sum of Squares	Mean Sum of Square	F-Value
Personality	1	5491.04	5491.04	53.68**
Gender	1	2.71	2.71	0.03
Intelligence X Gender	1	118.12	118.124	1.16
Error	31	3171.28	102.29	
Total	34	8783.15		

**** Significant at 0.01 level**

Table-4.9: Mean and S.D. for Achievement in Science of Extrovert and Introvert Boys and Girls

Gender	Extrovert			Introvert			Total		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Boys	04	79.25	9.29	14	55.50	10.69	18	60.78	14.35
Girls	07	82.71	10.66	10	50.80	9.102	17	63.94	18.74
Total	11	81.45	9.85	24	53.54	10.13	35	62.31	16.46

4.6.1 Effect of Gender on the Students' Achievement in Science

The interpretation is given in caption 4.5.1.

4.6.2 Effect of Personality on the Students' Achievement in Science

Table 4.8 indicates that the F-value of achievement in Science for personality, with df equal to 1/34, is 53.68. It is significant at

0.01 level. It signifies that there is a significant effect of personality on the students' achievement in Science. Therefore, the null hypothesis, namely, "there is no significant effect of personality on the students' achievement in Science", is rejected. Thus, it can be inferred that achievement in Science is influenced by the personality of the learner.

Further, table 4.9, also, shows that the mean scores of achievement in Science extrovert and introvert are 81.45 and 53.454, respectively. The SD of the achievement in Science extroverts and introverts are 9.85 and 10.13, respectively. It shows that the variations are large among the introverts than the extroverts. The difference in the mean achievement scores of extrovert and introvert is significant. Thus, it can be said that there is a significant effect of personality on the students' achievement in Science.

Finding: There is a significant effect of personality on the students' achievement in Science.

4.6.3 Interactional Effect of Gender and Personality on the Students' Achievement in Science

Table 4.6 indicates that the F-value of achievement in Science for interaction of gender and personality, with df equal to 1/34, is 1.16. It is not significant at 0.05 level. It signifies that there is no significant interactional effect of gender and personality on the students' achievement in Science. Therefore, the null

hypothesis, namely, “there is no significant interactional effect of gender and personality on the students’ achievement in Science”, is not rejected. Thus, it can be inferred that achievement in Science is independent of the interactional effect of gender and personality.

Further, table 4.9 indicates that the mean scores of achievement in Science of extrovert boys and girls are 79.25 and 82.45, respectively. The SD of the achievement in Science of Extrovert boys and girls are 9.29 and 10.66, respectively. The mean scores of achievement in Science of introvert boys and girls are 55.50 and 50.80, respectively. The SD of the achievement in Science of introvert boys and girls are 10.69 and 9.10, respectively. It shows that the variations are large among the introvert boys than the extrovert boys. In case of girls, the variations are large among the extrovert than the introvert. So far as levels of personality are concerned, the variations are large among the extrovert girls than the introvert girls. But, there are little variations among the introvert boys and girls. Thus, it can be concluded that there is no significant interactional effect of gender and personality on the students’ achievement in Science.

Finding: There is no significant interactional effect of gender and personality on the students’ achievement in Science.

Estimated Marginal Means of ACHIEVEMENT SCORES OF THE STUDENTS

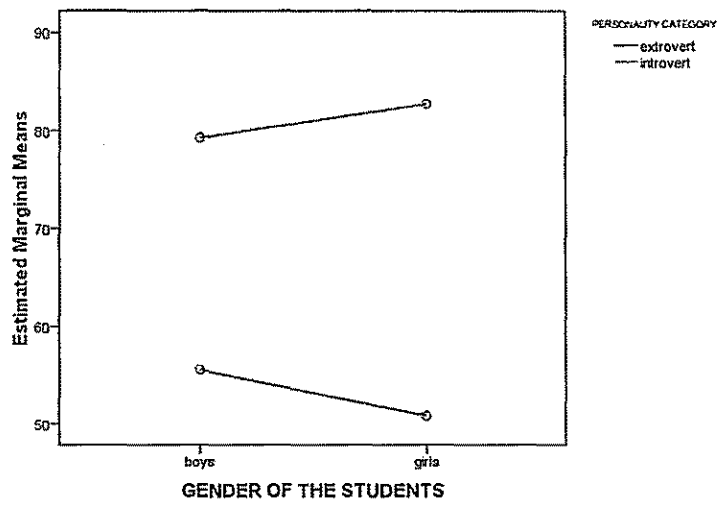


Fig. 4.2: Interaction between Gender and Personality on Achievement in Science

Gender: 1= Boys 2= Girls **Personality:** 1= Extrovert
2= Introvert