# CHAPTER IV

# DATA ANALYSIS, MAJOR FINDINGS, DISCUSSION AND CONCLUSION

## 4.1.0 INTRODUCTION

The present chapter deals with the analysis and interpretation of collected data. Any raw data does not provide any answer. It has to be analyzed first and then interpreted. For this, identification of appropriate analysis techniques is extremely important. An analysis helps the data to be reduced in understandable and interpretable form. Its basic purpose was to summarize the complete observations in such a manner that they yield answers to the research problems and the purpose of interpretation was to search for broader meaning of these answers. Thus, data analysis and interpretation become an important aspect of research.

As it is a Quasi experimental study, the data analysis for the present study was done both quantitatively and qualitatively. The quantitative analysis was done with the help of both descriptive statistics and non-parametric statistics. The descriptive statistical techniques like, mean, standard deviation, standard error of mean, Intensity Index and for the non-parametric statistics, Mann-Whitney U-test were used during the process of the data analysis. The researcher preferred to use Mann-Whitney U-test as the sample was taken purposively and the assumptions of parametric statistics did not match for the present data.

## 4.2.0 EFFECTIVENESS OF THE INTERVENTION PROGRAMME FOR VALUE INCULCATION

To achieve objective III of the present study i.e. “To study the effectiveness of the intervention programme on integrated approach for value inculcation in teaching science and technology in terms of conceptual knowledge of values, value perception and value practice along with the achievement in science” 23 null hypotheses were framed. To test 23 null hypotheses of the present study, data were collected through the value conceptual knowledge test, value perception test and Science achievement test. The collected data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given and discussed in table 4.1 and table 4.46.

The conceptual knowledge of values among the standard IX students is measured through the value conceptual knowledge test of 100 marks prepared by the investigator based on the ten values selected. The score obtained for each value (i.e. from 10 marks assigned to each value) counted. Hence, the analysis related to the achievement of students of experimental and control group in value conceptual knowledge test is done each value wise and as a whole in the following table 1 to table 22.

### 4.2.1 Value Conceptual Knowledge of the Value 'Cooperation' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$1: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Cooperation" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.1 and table 4.2 and discussed thereafter.

**Table 4.1: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Cooperation**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 6.24 | 1.234 | 0.247 |
| **Control** | 25 | 3.16 | 0.987 | 0.197 |

From the table 4.1, it was found that the mean value conceptual knowledge score of the value 'Cooperation' of the experimental and control group were 6.24 and 3.16 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Cooperation' were found to be 1.234 and 0.987 respectively for the experimental and control group students with Standard Error of Means of 0.247 and 0.197 for the respective groups. Observing the mean value conceptual knowledge scores in Cooperation, it was found that the experimental group did well scoring more than 60% marks in the value conceptual knowledge in

Cooperation. Further, it was also found that the Mean value conceptual knowledge in Cooperation of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value conceptual knowledge in Cooperation in comparison to their counterpart. To find whether the difference in the mean value conceptual knowledge scores of the value 'Cooperation' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$1 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Cooperation" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.2 followed by analysis.

**Table 4.2: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of value 'Cooperation' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 936.5 | 13.5 | -5.890 | 0.00003 |
| **Control** | 25 | 338.5 | | | |

From table 4.2, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Cooperation' were 936.5 and 338.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 13.5 and -5.890 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.890, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho1 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of cooperation' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'cooperation'. From table

4.1 it was also found that the mean score of experimental group in value conceptual knowledge in 'Cooperation' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Cooperation'.

### 4.2.2 Value Conceptual Knowledge of the Value 'Dignity of Labour' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$2: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Dignity of Labour" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.3 and table 4.4 and discussed thereafter.

**Table 4.3: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Dignity of Labour**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 5.36 | 0.638 | 0.128 |
| **Control** | 25 | 2.52 | 0.770 | 0.154 |

From the table 4.3, it was found that the mean value conceptual knowledge score of the value 'Dignity of Labour' of the experimental and control group were 5.36 and 2.52 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Dignity of Labour' were found to be 0.638 and 0.770 respectively for the experimental and control group students with Standard Error of Means of 0.128 and 0.154 for the respective groups. Observing the mean value conceptual knowledge scores in dignity of labour, it was found that the experimental group did well scoring more than 50% marks in the value conceptual knowledge in Dignity of Labour. Further, it was also found that the Mean value conceptual knowledge in dignity of labour of the Experimental Group was quite

higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Dignity of Labour. To find whether the difference in the mean value conceptual knowledge scores of the value 'Dignity of Labour' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$2 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Dignity of Labour" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.4 followed by analysis.

**Table 4.4: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Dignity of Labour' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 950 | 0.000 | -6.327 | 0.00003 |
| **Control** | 25 | 325 | | | |

From table 4.4, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Dignity of Labour' were 950 and 325 respectively with 25 students in both the groups. The U-value and z-value were found to be 0.000 and -6.327 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 6.327, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho2 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Dignity of Labour' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Dignity of

Labour'. From table 4.3 it was also found that the mean score of experimental group in value conceptual knowledge in 'Dignity of Labour' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Dignity of Labour'.

### 4.2.3 Value Conceptual Knowledge of Value 'Equality' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$3: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Equality" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.5 and table 4.6 and discussed thereafter.

**Table 4.5: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Equality**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 7.08 | 1.187 | 0.237 |
| **Control** | 25 | 3.84 | 1.281 | 0.256 |

From the table 4.5, it was found that the mean value conceptual knowledge score of the value 'Equality' of the experimental and control group were 7.08 and 3.84 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Equality' were found to be 1.187 and 1.281 respectively for the experimental and control group students with Standard Error of Means of 0.237 and 0.256 for the respective groups. Observing the mean value conceptual knowledge scores in Equality, it was found that the experimental group did well scoring more than 70% marks in the value conceptual knowledge in Equality. Further, it was also found that the Mean value conceptual knowledge in

Equality of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Equality. To find whether the difference in the mean value conceptual knowledge scores of the value 'Equality' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$3 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Equality" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.6 followed by analysis.

**Table 4.6: Summary of Mann-Whitney U-test for Equality Value Conceptual Knowledge of Value 'Equality' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 923.5 | 28.5 | -5.609 | 0.00003 |
| **Control** | 25 | 351.5 | | | |

From table 4.6, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Equality' were 923.5 abd 351.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 28.5 and -5.609 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.609, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho3 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Equality' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Equality'. From table 4.5 it

was also found that the mean score of experimental group in value conceptual knowledge in 'Equality' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Equality'.

### 4.2.4 Value Conceptual Knowledge of Value 'Team Work' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$4: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Team Work" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.7 and table 4.8 and discussed thereafter.

**Table 4.7: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Team Work**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 7.16 | 1.313 | 0.263 |
| **Control** | 25 | 4.12 | 1.364 | 0.273 |

From the table 4.7, it was found that the mean value conceptual knowledge score of the value 'Team Work' of the experimental and control group were 7.16 and 4.12 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Team Work' were found to be 1.313 and 1.364 respectively for the experimental and control group students with Standard Error of Means of 0.263 and 0.273 for the respective groups. Observing the mean value conceptual knowledge scores in cooperation, it was found that the experimental group did well scoring more than 70% marks in the value conceptual knowledge in Team Work. Further, it was also found that the Mean value conceptual knowledge in

Team Work of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Team Work. To find whether the difference in the mean value conceptual knowledge scores of the value 'Team Work' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$4"There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Team Work" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.8 followed by analysis.

**Table 4.8: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Team Work' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 918 | 32 | -5.504 | 0.00003 |
| **Control** | 25 | 357 | | | |

From table 4.8, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Team Work' were 918 and 357 respectively with 25 students in both the groups. The U-value and z-value were found to be 32 and -5.504 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.504, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho4 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Team Work' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Team Work'. From table

4.7 it was also found that the mean score of experimental group in value conceptual knowledge in 'Team Work' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Team Work'.

### 4.2.5 Value Conceptual Knowledge of Value 'Discipline' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$5: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Discipline" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.9 and table 4.10 and discussed thereafter.

**Table 4.9: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Discipline**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 6.76 | 1.128 | 0.226 |
| **Control** | 25 | 3.20 | 1.258 | 0.252 |

From the table 4.9, it was found that the mean value conceptual knowledge score of the value 'Discipline' of the experimental and control groups were 6.76 and 3.20 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Discipline' were found to be 1.128 and 1.258 respectively for the experimental and control group students with Standard Error of Means of 0.226 and 0.252 for the respective groups. Observing the mean value conceptual knowledge scores in Discipline, it was found that the experimental group did well scoring more than 60% marks in the value conceptual knowledge in Discipline. Further, it was also found that the Mean value conceptual knowledge in

Discipline of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Discipline. To find whether the difference in the mean value conceptual knowledge scores of the value 'Discipline' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$5 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Discipline" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.10 followed by analysis.

**Table 4.10: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Discipline' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 927.5 | 22.5 | -5.762 | 0.00003 |
| **Control** | 25 | 347.5 | | | |

From table 4.10, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Discipline' were 927.5 and 347.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 22.5 and -5.762 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.762, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho5 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Discipline' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Discipline'.

From table 4.9 it was also found that the mean score of experimental group in value conceptual knowledge in 'Discipline' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Discipline'.

### 4.2.6 Value Conceptual Knowledge of Value 'Determination' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$6: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Determination" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.11 and table 4.12 and discussed thereafter.

**Table 4.11: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Determination**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 5.56 | 0.712 | 0.142 |
| **Control** | 25 | 2.64 | 1.075 | 0.215 |

From the table 4.11, it was found that the mean value conceptual knowledge score of the value 'Determination' of the control group and the experimental group were 5.56 and 2.64 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Determination' were found to be 0.712 and 1.075 respectively for the experimental and control group students with Standard Error of Means of 0.142 and 0.215 for the respective groups. Observing the mean value conceptual knowledge scores in Determination, it was found that the experimental group did well scoring more than 55% marks in the value conceptual knowledge in Determination. Further, it was also found that the Mean value

conceptual knowledge in Determination of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value conceptual knowledge in Determination in comparison to their counterpart. To find whether the difference in the mean value conceptual knowledge scores of the value 'Determination' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$6 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Determination" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.12 followed by analysis.

**Table 4.12: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Determination' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 926.5 | 23.5 | -5.765 | 0.00003 |
| **Control** | 25 | 348.5 | | | |

From table 4.12, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Determination' were 926.5 and 348.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 23.5 and -5.765 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.765, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho6 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Determination' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value

'Determination'. From table 4.11 it was also found that the mean score of experimental group in value conceptual knowledge in 'Determination' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Determination'.

### 4.2.7 Value Conceptual Knowledge of Value 'Simplicity' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$7: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Simplicity" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.13 and table 4.14 and discussed thereafter.

**Table 4.13: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Simplicity**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 6.08 | 1.115 | 0.223 |
| **Control** | 25 | 3.64 | 1.469 | 0.294 |

From the table 4.13, it was found that the mean value conceptual knowledge score of the value 'Simplicity' of the control group and the experimental group were 6.08 and 3.64 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Simplicity' were found to be 1.115 and 1.469 respectively for the control group and the experimental group students with Standard Error of Means of 0.223 and 0.294 for the respective groups. Observing the mean value conceptual knowledge scores in Simplicity, it was found that the experimental group did well scoring more than 60% marks in the value conceptual knowledge in Simplicity. Further, it was also found that the Mean value conceptual

knowledge in Simplicity of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Simplicity. To find whether the difference in the mean value conceptual knowledge scores of the value 'Simplicity' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$7 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Simplicity" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.14 followed by analysis.

**Table 4.14: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Simplicity' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 880.5 | 69.5 | -4.814 | 0.00003 |
| **Control** | 25 | 394.5 | | | |

From table 4.14, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Simplicity' were 880.5 and 394.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 69.5 and -4.814 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 4.814, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho7 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Simplicity' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Simplicity'.

From table 4.13 it was also found that the mean score of experimental group in value conceptual knowledge in 'Simplicity' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Simplicity'.

### 4.2.8 Value Conceptual Knowledge of Value 'Honesty' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$8: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Honesty" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.15 and table 4.16 and discussed thereafter.

**Table 4.15: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Honesty**

| Group | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 7.24 | 1.393 | 0.279 |
| **Control** | 25 | 4.28 | 1.595 | 0.319 |

From the table 4.15, it was found that the mean value conceptual knowledge score of the value 'Honesty' of the experimental and control group were 7.24 and 4.28 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Honesty' were found to be 1.393 and 1.595 respectively for the control group and the experimental group students with Standard Error of Means of 0.279 and 0.319 for the respective groups. Observing the mean value conceptual knowledge scores in Honesty, it was found that the experimental group did well scoring more than 70% marks in the value conceptual knowledge in Honesty. Further, it was also found that the Mean value conceptual

knowledge in Honesty of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Honesty. To find whether the difference in the mean value conceptual knowledge scores of the value 'Honesty' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$8 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Honesty" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.16 followed by analysis.

**Table 4.16: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Honesty' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 894 | 56 | -5.681 | 0.00003 |
| **Control** | 25 | 381 | | | |

From table 4.16, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Honesty' were 894 and 381 respectively with 25 students in both the groups. The U-value and z-value were found to be 56 and -5.681 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.681, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho8 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Honesty' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Honesty'. From table 4.16 it

was also found that the mean score of experimental group in value conceptual knowledge in 'Honesty' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Honesty'.

### 4.2.9 Value Conceptual Knowledge of Value 'Common Goal' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$9: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Common Goal" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.17 and table 4.18 and discussed thereafter.

**Table 4.17: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Common Goal**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 6 | 1.225 | 0.245 |
| **Control** | 25 | 2.8 | 1.115 | 0.231 |

From the table 4.17, it was found that the mean value conceptual knowledge score of the value 'Common Goal' of the control group and the experimental group were 6 and 2.8 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Common Goal' were found to be 1.225 and 1.115 respectively for the control group and the experimental group students with Standard Error of Means of 0.245 and 0.231 for the respective groups. Observing the mean value conceptual knowledge scores in Common Goal, it was found that the experimental group did well scoring 60% marks in the value conceptual knowledge in Common Goal. Further, it was also found that the Mean value

conceptual knowledge in Common Goal of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value conceptual knowledge in Common Goal. To find whether the difference in the mean value conceptual knowledge scores of the value 'Common Goal' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$9 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Common Goal" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.18 followed by analysis.

**Table 4.18: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value 'Common Goal' Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 922.5 | 27.5 | -5.681 | 0.00003 |
| **Control** | 25 | 352.5 | | | |

From table 4.18, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Common Goal' were 922.5 and 352.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 27.5 and -5.681 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.681, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho9 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Common Goal' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value conceptual knowledge in the value 'Common

Goal'. From table 4.17 it was also found that the mean score of experimental group in value conceptual knowledge in 'Common Goal' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Common Goal'.

### 4.2.10 Value Conceptual Knowledge of value 'Loyalty of Duty' of Experimental and Control Group

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$10: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Loyalty of Duty" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.19 and table 4.20 and discussed thereafter.

**Table 4.19: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in the Value of Loyalty of Duty**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 6.08 | 1.256 | 0.251 |
| **Control** | 25 | 2.76 | 0.970 | 0.194 |

From the table 4.19, it was found that the mean value conceptual knowledge score of the value 'Loyalty of Duty' of the control group and the experimental group were 6.08 and 2.76 respectively out of the total mark of 10. The standard deviations from the means for the value conceptual knowledge for the value 'Loyalty of Duty' were found to be 1.256 and 0.970 respectively for the control group and the experimental group students with Standard Error of Means of 0.251 and 0.194 for the respective groups. Observing the mean value conceptual knowledge scores in Loyalty of Duty, it was found that the experimental group did well scoring more than 60% marks in the value conceptual knowledge in Loyalty of Duty. Further, it was also found that the

Mean value conceptual knowledge in Loyalty of Duty of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value conceptual knowledge in Loyalty of Duty in comparison to their counterpart. To find whether the difference in the mean value conceptual knowledge scores of the value 'Loyalty of Duty' the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$10 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Loyalty of Duty" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.20 followed by analysis.

**Table 4.20: Summary of Mann-Whitney U-test for Value Conceptual Knowledge of Value of 'Loyalty of Duty' Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 939 | 11 | -5.972 | 0.00003 |
| **Control** | 25 | 336 | | | |

From table 4.20, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of the value 'Loyalty of Duty' were 939 and 336 respectively with 25 students in both the groups. The U-value and z-value were found to be 11 and -5.972 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.972, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho10 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Loyalty of Duty' is rejected and it can be said that experimental group and control group students differ stochastically

(significantly) in terms of their value conceptual knowledge in the value 'Loyalty of Duty'. From table 4.19 it was also found that the mean score of experimental group in value conceptual knowledge in 'Loyalty of Duty' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in the value 'Loyalty of Duty'.

### 4.2.11 Value Conceptual Knowledge of Experimental and Control Group in All the Values

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$11: "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in all the values" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.21 and table 4.22 and discussed thereafter.

**Table 4.21: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Conceptual Knowledge Score of Standard IX Students in all the Ten Value**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 63.56 | 4.204 | 0.841 |
| **Control** | 25 | 32.96 | 3.646 | 0.729 |

From the table 4.21, it was found that the mean value conceptual knowledge score of all the ten values of the experimental and control group were 63.56 and 32.96 respectively out of the total mark of 100. The standard deviations from the means for the value conceptual knowledge for all the ten values were found to be 4.204 and 3.646 respectively for the experimental and control group students with Standard Error of Means of 0.841 and 0.729 for the respective groups. Observing the mean value conceptual knowledge scores in all the ten values, it was found that the experimental group did well scoring more than 60% marks in the value conceptual

knowledge in all the ten values. Further, it was also found that the Mean value conceptual knowledge in all the ten values of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value conceptual knowledge in all the ten values in comparison to their counterpart. To find whether the difference in the mean value conceptual knowledge scores of all the ten values the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$11 "There will be no significant differences between the mean post-test value conceptual knowledge score of standard IX students studying through the value integrated approach and those studying through traditional approach in all the ten values" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.22 followed by analysis.

**Table 4.22: Summary of Mann-Whitney U-test for Value Conceptual Knowledge Scores in All Ten values of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 950 | 0.000 | -6.112 | 0.00003 |
| **Control** | 25 | 325 | | | |

From table 4.22, it was observed that the Sum of Ranks of the experimental and control groups for the value conceptual knowledge of all the ten values were 950 and 325 respectively with 25 students in both the groups. The U-value and z-value were found to be 0.000 and -6.112 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 6.112, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho11 'There will be no significant difference between the mean post-test value conceptual knowledge scores of standard IX students studying Science through value integrated approach and those studying through traditional method in all the ten values' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in

terms of their value conceptual knowledge in all the ten values. From table 4.21 it was also found that the mean score of experimental group in value conceptual knowledge in all the ten values was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value conceptual knowledge of students in all the ten values.

The value perception of the standard IX students is measured through the value perception test of 200 marks prepared by the investigator based on the ten values selected. The score obtained for each value (i.e. out of 20 marks for each value) counted. Hence, the analysis related to the achievement of students of experimental and control group in value perception test is done each value wise and as a whole in the following table 23 to table 44.

### 4.2.12 Value Perception of Experimental and Control Group for the value 'Cooperation'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$12: "There will be no significant differences between the mean post-test value perception of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Cooperation" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.23 and table 4.24 and discussed thereafter.

**Table 4.23: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception of Standard IX Students in the Value of Cooperation**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.84 | 2.192 | 0.438 |
| **Control** | 25 | 10.4 | 2.449 | 0.490 |

From the table 4.23, it was found that the mean value perception score of the value 'Cooperation' of the experimental group and the control group were 14.84 and 10.4

respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Cooperation' were found to be 2.192 and 2.449 respectively for the experimental and control group students with Standard Error of Means of 0.438 and 0.490 for the respective groups. Observing the mean value perception scores in Cooperation, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Cooperation. Further, it was also found that the Mean value perception of the Cooperation of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value perception in Cooperation. To find whether the difference in the mean value perception scores of the value 'Cooperation' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$12 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Cooperation" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.24 followed by analysis.

**Table 4.24: Summary of Mann-Whitney U-test for Value Perception of value 'Cooperation' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 899.5 | 50.5 | -5.127 | 0.00003 |
| **Control** | 25 | 375.5 | | | |

From table 4.24, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Cooperation' were 899.5 and 375.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 50.5 and -5.127 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.127, the two

tailed probability was found to be 0.00003 which is less than our decided significance level ($\alpha$) i.e. 0.01. Hence, the null hypothesis Ho12 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of cooperation' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'cooperation'. Further referring table 4.23, it was found that the mean score of experimental group in value perception in 'Cooperation' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Cooperation'.

### 4.2.13 Value Perception of Experimental and Control Group for the Value 'Dignity of Labour'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$13: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Dignity of Labour" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.25 and table 4.26 and discussed thereafter.

**Table 4.25: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception of Standard IX Students in the Value of Dignity of Labour**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 15.32 | 2.561 | 0.512 |
| **Control** | 25 | 10.92 | 1.579 | 0.316 |

From the table 4.25, it was found that the mean value perception score of the value 'Dignity of Labour' of the experimental group and the control group were 15.32 and 10.92 respectively out of the total mark of 20. The standard deviations from the means

for the value perception score for the value 'Dignity of Labour' were found to be 2.561 and 1.579 respectively for the experimental and control group students with Standard Error of Means of 0.512 and 0.316 for the respective groups. Observing the mean value perception scores in Dignity of Labour, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Dignity of Labour. Further, it was also found that the Mean value perception of the Dignity of Labour of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Dignity of Labour in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Dignity of Labour' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$13 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Dignity of Labour" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.26 followed by analysis.

**Table 4.26: Summary of Mann-Whitney U-test for Value Perception of value 'Dignity of Labour' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 895.5 | 54.5 | -5.046 | 0.00003 |
| **Control** | 25 | 379.5 | | | |

From table 4.26, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Dignity of Labour' were 895.5 and 379.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 54.5 and -5.046 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 5.046, the two

tailed probability was found to be 0.00003 which is less than our decided significance level ($\alpha$) i.e. 0.01. Hence, the null hypothesis Ho13 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Dignity of Labour' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Dignity of Labour'. Further referring table 4.25, it was found that the mean score of experimental group in value perception in 'Dignity of Labour' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Dignity of Labour'.

### 4.2.14 Value Perception Score of Experimental and Control Group for the Value 'Equality'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$14: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Equality" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.27 and table 4.28 and discussed thereafter.

**Table 4.27: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Equality**

| Group | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.64 | 2.139 | 0.428 |
| **Control** | 25 | 11.12 | 1.563 | 0.313 |

From the table 4.27, it was found that the mean value perception score of the value 'Equality' of the experimental group and the control group were 14.64 and 11.12

respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Equality' were found to be 2.139 and 1.563 respectively for the experimental and control group students with Standard Error of Means of 0.428 and 0.313 for the respective groups. Observing the mean value perception scores in Equality, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Equality. Further, it was also found that the Mean value perception of the Equality of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Equality in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Equality' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$14 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Equality" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.28 followed by analysis.

**Table 4.28: Summary of Mann-Whitney U-test for Value Perception of value 'Equality' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 883 | 67 | -4.797 | 0.00003 |
| **Control** | 25 | 392 | | | |

From table 4.28, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Equality' were 883 and 392 respectively with 25 students in both the groups. The U-value and z-value were found to be 67 and -4.797 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<4.797, the two tailed probability

was found to be 0.00003 which is less than our decided significance level ($\alpha$) i.e. 0.01. Hence, the null hypothesis Ho14 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Equality' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Equality'. Further referring table 4.27, it was found that the mean score of experimental group in value perception in 'Equality' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Equality'.

### 4.2.15 Value Perception of Experimental and Control Group for the Value 'Team Work'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$15: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Team Work" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.29 and table 4.30 and discussed thereafter.

**Table 4.29: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Team Work**

| Group | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 15.12 | 2.619 | 0.524 |
| **Control** | 25 | 10.52 | 1.418 | 0.284 |

From the table 4.29, it was found that the mean value perception score of the value 'Team Work' of the experimental group and the control group were 15.12 and 10.52 respectively out of the total mark of 20. The standard deviations from the means for

the value perception score for the value 'Team Work' were found to be 2.619 and 1.418 respectively for the experimental and control group students with Standard Error of Means of 0.524 and 0.284 for the respective groups. Observing the mean value perception scores in Team Work, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Team Work. Further, it was also found that the Mean value perception of the Team Work of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Team Work in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Team Work' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$15 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Team Work" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.30 followed by analysis.

**Table 4.30: Summary of Mann-Whitney U-test for Value Perception of value 'Team Work' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 906.5 | 43.5 | -5.257 | 0.00003 |
| **Control** | 25 | 368.5 | | | |

From table 4.30, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Team Work' were 906.5 and 368.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 43.5 and -5.257 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<5.257, the two tailed probability was found to be 0.00003 which is less than our decided significance

level ($\alpha$) i.e. 0.01. Hence, the null hypothesis Ho15 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Team Work' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Team Work'. Further referring table 4.29, it was found that the mean score of experimental group in value perception in 'Team Work' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Team Work'.

### 4.2.16 Value Perception of Experimental and Control Group for the Value 'Discipline'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$16: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Discipline" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.31 and table 4.32 and discussed thereafter.

**Table 4.31: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Discipline**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.72 | 2.264 | 0.453 |
| **Control** | 25 | 10.32 | 1.773 | 0.355 |

From the table 4.31, it was found that the mean value perception score of the value 'Discipline' of the experimental group and the control group were 14.72 and 10.32 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Discipline' were found to be 2.264 and 1.773

respectively for the experimental and control group students with Standard Error of Means of 0.453 and 0.355 for the respective groups. Observing the mean value perception scores in Discipline, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Discipline. Further, it was also found that the Mean value perception of the Discipline of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Discipline in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Discipline' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$16 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Discipline" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.32 followed by analysis.

**Table 4.32: Summary of Mann-Whitney U-test for Value Perception of Value 'Discipline' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 904.5 | 45.5 | -5.214 | 0.00003 |
| **Control** | 25 | 370.5 | | | |

From table 4.30, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Discipline' were 904.5 and 370.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 45.5 and -5.214 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<5.214, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho16 'There will be no significant difference

between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Discipline' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Discipline'. Further referring table 4.31, it was found that the mean score of experimental group in value perception in 'Discipline' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Discipline'.

### 4.2.17 Value Perception Score of Experimental and Control Group for the Value 'Determination'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$17: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Determination" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.33 and table 4.34 and discussed thereafter.

**Table 4.33: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Determination**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.60 | 2.872 | 0.574 |
| **Control** | 25 | 10.88 | 0.971 | 0.194 |

From the table 4.33, it was found that the mean value perception score of the value 'Determination' of the experimental group and the control group were 14.60 and 10.88 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Determination' were found to be 2.872 and 0.971 respectively for the experimental and control group students with Standard

Error of Means of 0.574 and 0.194 for the respective groups. Observing the mean value perception scores in Determination, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Determination. Further, it was also found that the Mean value perception of the Determination of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Determination in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Determination' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$17 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Determination" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.34 followed by analysis.

**Table 4.34: Summary of Mann-Whitney U-test for Value Perception of Value 'Determination' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Group | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 865 | 85 | -4.482 | 0.00003 |
| **Control** | 25 | 410 | | | |

From table 4.34, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Determination' were 865 and 410 respectively with 25 students in both the groups. The U-value and z-value were found to be 85 and -4.482 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<4.482, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho17 'There will be no significant difference between the mean post-test value perception scores of standard IX students

studying Science through value integrated approach and those studying through traditional method in the value of Determination' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Determination'. Further referring table 4.33, it was found that the mean score of experimental group in value perception in 'Determination' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Determination'.

### 4.2.18 Value Perception Score of Experimental and Control Group for the Value 'Simplicity'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$18: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Simplicity" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.35 and table 4.36 and discussed thereafter.

**Table 4.35: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Simplicity**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 15.56 | 2.501 | 0.500 |
| **Control** | 25 | 10.40 | 2.000 | 0.400 |

From the table 4.35, it was found that the mean value perception score of the value 'Simplicity' of the experimental group and the control group were 15.56 and 10.40 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Simplicity' were found to be 2.501 and 2.000 respectively for the experimental and control group students with Standard Error of

Means of 0.500 and 0.400 for the respective groups. Observing the mean value perception scores in Simplicity, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Simplicity. Further, it was also found that the Mean value perception of the Simplicity of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value perception in Simplicity. To find whether the difference in the mean value perception scores of the value 'Simplicity' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$18 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Simplicity" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.36 followed by analysis.

**Table 4.36: Summary of Mann-Whitney U-test for Value Perception of Value 'Simplicity' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 917.5 | 32.5 | -5.456 | 0.00003 |
| **Control** | 25 | 357.5 | | | |

From table 4.36, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Simplicity' were 917.5 and 357.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 32.5 and -5.456 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<5.456, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho18 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional

method in the value of Simplicity' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Simplicity'. Further referring table 4.35, it was found that the mean score of experimental group in value perception in 'Simplicity' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Simplicity'.

### 4.2.19 Value Perception Score of Experimental and Control Group for the Value 'Honesty'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$19: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Honesty" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.37 and table 4.38 and discussed thereafter.

**Table 4.37: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Honesty**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.24 | 2.350 | 0.470 |
| **Control** | 25 | 11 | 2.160 | 0.432 |

From the table 4.37, it was found that the mean value perception score of the value 'Honesty' of the experimental group and the control group were 14.24 and 11 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Honesty' were found to be 2.350 and 2.160 respectively for the experimental and control group students with Standard Error of Means of 0.470 and 0.432 for the respective groups. Observing the mean value perception scores in Honesty, it was found that both the experimental and control

groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Honesty. Further, it was also found that the Mean value perception of the Honesty of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value perception in Honesty. To find whether the difference in the mean value perception scores of the value 'Honesty' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$19 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Honesty" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.38 followed by analysis.

**Table 4.38: Summary of Mann-Whitney U-test for Value Perception of Value 'Honesty' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 863 | 87 | -4.423 | 0.00003 |
| **Control** | 25 | 412 | | | |

From table 4.38, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Honesty' were 863 and 412 respectively with 25 students in both the groups. The U-value and z-value were found to be 87 and -4.423 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<4.423, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho19 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Honesty' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Honesty'. Further referring table 4.37, it was found that the

mean score of experimental group in value perception in 'Honesty' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Honesty'.

### 4.2.20 Value Perception Score of Experimental and Control Group for the Value 'Common Goal'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$20: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Common Goal" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.39 and table 4.40 and discussed thereafter.

**Table 4.39: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Common Goal**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 15.04 | 2.590 | 0.518 |
| **Control** | 25 | 10.12 | 1.740 | 0.348 |

From the table 4.39, it was found that the mean value perception score of the value 'Common Goal' of the experimental group and the control group were 15.04 and 10.12 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Common Goal' were found to be 2.590 and 1.740 respectively for the experimental and control group students with Standard Error of Means of 0.518 and 0.348 for the respective groups. Observing the mean value perception scores in Common Goal, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Common Goal. Further, it was also found that the Mean value perception of the Common Goal of the Experimental Group was quite

higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perceptions in Common Goal in comparison to their counterpart. To find whether the difference in the mean value perception scores of the value 'Common Goal' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$15 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Common Goal" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.40 followed by analysis.

**Table 4.40: Summary of Mann-Whitney U-test for Value Perception of Value 'Common Goal' Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 920 | 30 | -5.506 | 0.00003 |
| **Control** | 25 | 355 | | | |

From table 4.40, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Common Goal' were 920 and 355 respectively with 25 students in both the groups. The U-value and z-value were found to be 30 and -5.506 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<5.506, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho20 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Common Goal' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Common Goal'. Further referring table 4.39, it was found that the mean score of experimental group in value perception in 'Common Goal' was more than that of the control group which may be due to

teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Common Goal'.

### 4.2.21 Value Perception Score of Experimental and Control Group for the Value 'Loyalty of Duty'

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$21: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Loyalty of Duty" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.41 and table 4.42 and discussed thereafter.

**Table 4.41: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in the Value of Loyalty of Duty**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 14.48 | 1.806 | 0.361 |
| **Control** | 25 | 10.48 | 1.558 | 0.312 |

From the table 4.41, it was found that the mean value perception score of the value 'Loyalty of Duty' of the experimental group and the control group were 14.48 and 10.48 respectively out of the total mark of 20. The standard deviations from the means for the value perception score for the value 'Loyalty of Duty' were found to be 1.806 and 1.558 respectively for the experimental and control group students with Standard Error of Means of 0.361 and 0.312 for the respective groups. Observing the mean value perception scores in Loyalty of Duty, it was found that both the experimental and control groups did well scoring more than 70% and 50% marks respectively in the value perception of the value of Loyalty of Duty. Further, it was also found that the Mean value perception of the Loyalty of Duty of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard

Error of Means of both the groups, it was also observed that both the Experimental and control groups were equally scattered in terms of their value perception in Loyalty of Duty. To find whether the difference in the mean value perception scores of the value 'Loyalty of Duty' of the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$21 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in the value of Loyalty of Duty" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.42 followed by analysis.

**Table 4.42: Summary of Mann-Whitney U-test for Value Perception of Value 'Loyalty of Duty' of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 934.5 | 15.5 | -5.810 | 0.00003 |
| **Control** | 25 | 340.5 | | | |

From table 4.42, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of the value 'Loyalty of Duty' were 934.5 and 340.5 respectively with 25 students in both the groups. The U-value and z-value were found to be 15.5 and -5.810 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<5.810, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho21 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in the value of Loyalty of Duty' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in the value 'Loyalty of Duty'. Further referring table 4.41, it was found that the mean score of experimental group in value perception in 'Loyalty of Duty' was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the

implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in the value 'Loyalty of Duty'.

### 4.2.22 Value Perception Score of Experimental and Control Group for All the Ten Values

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$22: "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in all the values" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.43 and table 4.44 and discussed thereafter.

**Table 4.43: Mean, Standard Deviation and Standard Error of Mean wise distribution of Value Perception Score of Standard IX Students in All the Ten Values**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 148.56 | 9.464 | 1.887 |
| **Control** | 25 | 106.16 | 6.625 | 1.325 |

From the table 4.43, it was found that the mean value perception score of all the ten values of the experimental and control group were 148.56 and 106.16 respectively out of the total mark of 200. The standard deviations from the means for the value perception for all the ten values were found to be 9.464 and 6.625 respectively for the experimental and control group students with Standard Error of Means of 1.887 and 1.325 for the respective groups. Observing the mean value perception scores in all the ten values, it was found that the experimental group did well scoring more than 70% marks in the value perception in all the ten values. Further, it was also found that the Mean value perception in all the ten values of the Experimental Group was quite higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that the students of the Experimental Group were more homogeneous in terms of their value perception in all the ten values in comparison to their counterpart. To find whether the difference in

the mean value perception scores of all the ten values the control group and the experimental group was significant or by chance and to test the null hypothesis, $H_0$22 "There will be no significant differences between the mean post-test value perception score of standard IX students studying through the value integrated approach and those studying through traditional approach in all the ten values" Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.44 followed by analysis.

**Table 4.44: Summary of Mann-Whitney U-test for Value Perception of All the Ten values of Experimental and Control group students with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Control** | 25 | 950 | 0.000 | -6.066 | 0.00003 |
| **Experimental** | 25 | 325 | | | |

From table 4.44, it was observed that the Sum of Ranks of the experimental and control groups for the value perception of all the ten values were 950 and 325 respectively with 25 students in both the groups. The U-value and z-value were found to be 0.000 and -6.066 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z<6.066, the two tailed probability was found to be 0.00003 which is less than our decided significance level $(\alpha)$ i.e. 0.01. Hence, the null hypothesis Ho22 'There will be no significant difference between the mean post-test value perception scores of standard IX students studying Science through value integrated approach and those studying through traditional method in all the ten values' is rejected and it can be said that experimental group and control group students differ stochastically (significantly) in terms of their value perception in all the ten values. From table 4.43 it was also found that the mean score of experimental group in value perception in all the ten values was more than that of the control group which may be due to teaching Science through value integrated approach. Hence, it can be said that the implemented value integrated approach for teaching Science was found to stochastically effective in terms of enhancing value perception of students in all the ten values.

### 4.2.23 Overall Mean Post-Test Achievement of Experimental and Control Group in Science

To achieve a part of the objective III of the present study and to test the null hypothesis of the present study $H_0$23: "There will be no significant difference in overall mean post-test achievement in Science of standard IX students studying through value integrated approach and those studying through traditional approach" data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given in table 4.45 and table 4.46 and discussed thereafter.

**Table 4.45: Mean, Standard Deviation and Standard Error of Mean wise distribution of Achievement in Science of Experimental and Control Group Students**

| Groups | N | Mean | Standard Deviation | Standard Error of Mean |
|---|---|---|---|---|
| **Experimental** | 25 | 48.76 | 5.688 | 1.138 |
| **Control** | 25 | 47.80 | 5.091 | 1.018 |

From the table 4.45, it was found that the overall mean Science achievement score of experimental and control group were 48.76 and 47.80 respectively out of total marks of 60. The standard deviations from the means for the overall Science achievement score were found to be 5.688 and 5.091 respectively for the experimental and control group students with Standard Error of Means of 1.138 and 1.018 for the respective groups. Comparing the overall mean achievement scores in Science, it was found that both the groups did quite well in the overall science achievement and the Mean science achievement of the Experimental Group was found little higher than that of the Control Group. From the Standard Deviations and Standard Error of Means of both the groups, it was also observed that both the groups were scattered very equally around the mean with more or less similar standard error. To find whether the difference in the mean achievement in Science was significant or by chance and to test the null hypothesis, Mann-Whitney U-test was used as the sample was taken purposively. The summary of the Mann-Whitney U-test is given in table 4.46 followed by analysis.

**Table 4.46: Summary of Mann-Whitney U-test for Overall Science Achievement of Experimental and Control group students in Science with the Number of sample, Sum of Ranks, U-value, z-value and Probability**

| Groups | N | Sum of Ranks | U-value | z-value | Probability (p) |
|---|---|---|---|---|---|
| **Experimental** | 25 | 682 | 268 | -0.866 | 0.19 |
| **Control** | 25 | 593 | | | |

From table 4.46, it was observed that the Sum of Ranks of the experimental and control group were 682 and 593 respectively with 25 students in both the groups. The U-value and z-value were found to be 268 and -0.866 respectively. Referring Table for normal probability (Table A of Siegel, 1956) under null hypothesis $(H_o)$ of z, for z < 0.866, the two tailed probability was found to be 0.19 which was found to be quite higher than our decided significance level $(\alpha)$ i.e. 0.01. Hence the null hypothesis i.e. 'There will be no significant difference between the overall mean post-test achievement scores of standard IX students studying Science through value integrated approach and those studying through traditional method' is retained and it can be said that experimental group and control group students did not differ stochastically in terms of their achievement in Science. Further referring table 4.45 it was found that the mean achievement of experimental group in Science is little more than the mean achievement of control group in Science which is only due to chance. Hence, it can be said that the implemented value integrated approach in teaching science had no negative impact on the science achievement of students of the experimental group. So it can be concluded that the teaching Science through value integrated approach was found equally effective like the traditional approach of teaching science in enhancing the achievement of standard IX students.

## 4.3.0 EFFECTIVENESS OF THE DEVELOPED INTERVENTION PROGRAMME IN TERMS OF STUDENTS' REACTIONS

To achieve objective IV of the present study i.e. `To study the reaction of students towards the intervention programme on integrated approach for value inculcation in teaching science and technology'. A reaction scale was developed with 25 statements those representing different components of development and implementation of the

intervention programme which is given in appendix. The data related to the reaction scale presented in the table 4.47, is analyzed in terms of frequencies of reactions of standard IX students for different degree along with the intensity index which is given in table 47 which are followed by discussion.

**Table 4.47: Summary of the reactions of the students towards the statements related to the developed intervention programme in Frequency and Intensity Index (II)**

| Sr. No | Statements | SA | A | UD | D | SD | II |
|---|---|---|---|---|---|---|---|
| 1 | Teaching science was interesting in this approach. | 02 | 22 | 01 | 00 | 00 | 4.0 |
| 2 | I understood the concepts taught in science through this approach. | 05 | 16 | 02 | 00 | 02 | 3.9 |
| 3 | I like the way the examples and illustrations were given in the subject of science while teaching through this approach. | 11 | 08 | 03 | 00 | 03 | 3.9 |
| 4 | The explanation given for each topic in science was clear to me while teaching through this approach. | 11 | 08 | 04 | 01 | 01 | 4.08 |
| 5 | The activities conducted for explaining the topics in science was interesting while teaching through this approach. | 03 | 17 | 03 | 01 | 01 | 3.8 |
| 6 | I likes the way the active participation of students was found while learning through this approach. | 05 | 12 | 05 | 02 | 01 | 3.7 |
| 7 | The active participation of students through this approach helped us for better understanding of science subject. | 05 | 16 | 03 | 01 | 00 | 4.08 |
| 8 | Teaching aids used by the teacher while teaching through this approach was helped us to understand the concepts easily. | 10 | 09 | 04 | 02 | 00 | 4.2 |

| Sr. No | Statements | SA | A | UD | D | SD | II |
|---|---|---|---|---|---|---|---|
| 9 | Teaching aids used by the teacher while teaching through this approach was interesting for us. | 12 | 12 | 01 | 00 | 00 | 4.4 |
| 10 | I likes the way teacher was finding and quoting different values while teaching the concepts of science. | 08 | 14 | 01 | 01 | 01 | 4.08 |
| 11 | We also learned about some values while teacher was teaching science in time following this approach. | 11 | 07 | 07 | 00 | 00 | 4.1 |
| 12 | I likes the way teacher was finding and quoting different values while teaching the concepts of science. | 03 | 12 | 08 | 02 | 00 | 3.6 |
| 13 | I likes the way teacher was giving examples related to values while teacher science through this approach. | 05 | 16 | 04 | 00 | 00 | 4.04 |
| 14 | I came to know about different values while learning science through this approach. | 07 | 08 | 06 | 03 | 01 | 3.6 |
| 15 | I understand different values while learning science through this approach. | 09 | 09 | 04 | 03 | 00 | 4.3 |
| 16 | I likes the way teacher telling small stories related to values while teaching science through this approach. | 11 | 07 | 05 | 01 | 01 | 4.04 |
| 17 | I liked the values taken by teacher while teaching science through this approach. | 12 | 12 | 01 | 00 | 00 | 4.4 |
| 18 | I realized the importance of values while learning through this approach. | 11 | 12 | 02 | 00 | 00 | 4.3 |
| 19 | I am also practicing some values those were taught through this approach while teaching science. | 12 | 08 | 03 | 02 | 00 | 4.2 |

| Sr. No | Statements | SA | A | UD | D | SD | II |
|---|---|---|---|---|---|---|---|
| 20 | I was participating in the discussion related to values while the teacher was teaching science through this approach. | 14 | 08 | 03 | 00 | 00 | 4.4 |
| 21 | I found it very easy for students to learn about values through this integrated approach. | 08 | 12 | 03 | 02 | 00 | 4.04 |
| 22 | Teaching about values through integrated approach while teaching science will not affect in the students' learning about science. | 04 | 04 | 04 | 08 | 05 | 2.7 |
| 23 | I liked this approach of imparting values while teaching curricular subjects like science. | 06 | 17 | 02 | 00 | 00 | 4.1 |
| 24 | This type of approach of imparting values should be used while teaching other subjects. | 06 | 16 | 03 | 00 | 00 | 4.0 |
| 25 | I liked the teaching of science through value integrated approach. | 12 | 08 | 01 | 02 | 02 | 4.04 |
| **Total** | | **392** | **410** | **152** | **36** | **28** | **3.95** |

- In terms of the reaction of the students towards the statement no1 ` Teaching science was interesting in this approach', 2, 22 and 1 of them reacted strongly agree, agree, and undecided respectively. The intensity index of 4.0 showed favorable reaction of students towards the teaching science through the integrated approach.

- For the statement no2 'I understood the concepts taught in science through this approach', 5. 16 and 2 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.9 showed favorable reaction of

students towards the understanding the concepts taught in science through the integrated approach.

- For the statement no3 ‘I like the way the examples and illustrations were given in the subject of science while teaching through this approach’, 11, 8 and 3 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.9 showed favorable reaction of students towards their liking the way the examples and illustrations were given in the subject of science while teaching through this approach.

- In terms of the reaction of the students towards the statement no4 ‘The explanation given for each topic in science was clear to me while teaching through this approach’, 11, 8, and 4 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.08 showed favorable reactions of them for the explanation given for each topic in science was clear to them while teaching through this approach.

- For the statement no5 ‘The activities conducted for explaining the topics in science was interesting while teaching through this approach’, 3, 17, and 3 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.8 showed that the students were favourable with the interested activities conducted for explaining the topics in science through the integrated approach.

- In terms of the reaction of the students towards the statement no6 ‘I likes the way the active participation of students was found while learning through this approach’, 5, 12 and 5 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.7 showed favorable reactions of students for the statement.

- In terms of the reaction of the students towards the statement no7 ‘The active participation of students through this approach helped us for better understanding of science subject’, 5, 16 and 3 of them gave their reaction in

strongly agree, agree and undecided respectively. The intensity index 4.08 showed favorable reactions of students for better understanding of science subject through the active participation due to integrated approach.

- For the statement no 8 ‘Teaching aids used by the teacher while teaching through this approach was helped us to understand the concepts easily’, 10, 9 and 4 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.2 showed favorable reactions of students for the statement which means that the teaching aids used by the teacher while teaching through the integrated approach helped them to understand the concepts easily.

- In terms of the reaction of the students towards the statement no9 ‘Teaching aids used by the teacher while teaching through this approach was interesting for us’, 12, 12 and 1 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.4 showed favorable reactions of students which means that the teaching aids used by the teacher while teaching through integrated approach was interesting for them.

- For the statement no10 ‘I likes the way teacher was finding and quoting different values while teaching the concepts of science’, 8, 14 and 1 students gave their reaction in strongly agree and undecided respectively. The intensity index 4.08 showed highly favourable responses to the statement which showed that they liked the way teacher was finding and quoting different values while teaching the concepts of science.

- In terms of the reaction of the students towards the statement no11 ‘We also learned about some values while teacher was teaching science in time following this approach’, 11, 7 and 7 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.1 showed they agreed to the statement, which means they also learnt about some valued while teacher was teaching science in time following the integrated approach.

- For the statement no12 I likes the way teacher was finding and quoting different values while teaching the concepts of science', 3, 12 and 8 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.6 showed favorable reactions of the statement.

- For the statement no13 'I likes the way teacher was giving examples related to values while teaching science through this approach', 5, 16 and 4 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.04 showed that they liked the way teacher gave examples related to values while teaching science through the integrated approach.

- In terms of the reaction of the students towards the statement no14 'I came to know about different values while learning science through this approach', 7, 8 and 6 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 3.6 showed their favourable reactions to the statement.

- In terms of the reaction of the students towards the statement no15 'I understand different values while learning science through this approach', 9, 9 and 4 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.3 showed that they gave favorable reactions to it and they understood different values while learning science through the integrated approach.

- For the statement no16 'I likes the way teacher telling small stories related to values while teaching science through this approach', 11, 7 and 5 students gave their reactions in strongly agree, agree and undecided respectively. The intensity index 4.04 showed their favorable reactions towards the way teacher telling small stories related to values while teaching science through integrated approach.

- In terms of the reaction of the students towards the statement no17 'I liked the values taken by teacher while teaching science through this approach', 12, 12

and 1 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.4 showed that they were agreed to the statement which showed that they liked the values taken by teacher while teaching science through integrated approach.

- In terms of the reaction of the students towards the statement no18 ‘I realized the importance of values while learning through this approach’, 11, 12 and 2 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.3 showed their highly favorable reactions for the statement which showed that they realized the importance of values while learning through the integrated approach.

- For the statement no19 ‘I am also practicing some values those were taught through this approach while teaching science’, 12, 8 and 3 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.2 showed the favorable reactions for the statement which showed they also practiced some valued taught through the integrated approach.

- In terms of the reaction of the students towards the statement no20 ‘I was participating in the discussion related to values while the teacher was teaching science through this approach’, 14, 8 and 3 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.4 showed their favorable reactions for the statement which showed that they participated in the discussion related to values while science teaching through the integrated approach.

- In terms of the reaction of the students towards the statement no21 ‘I found it very easy for students to learn about values through this integrated approach’, 8, 12 and 3 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.04 showed their favorable reactions for the statement which showed that they found it very easy to learn about values through integrated approach.

- In terms of the reaction of the students towards the statement no22 ‘Teaching about values through integrated approach while teaching science will not affect in the students’ learning about science’, 4, 4 and 4 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 2.7 showed their undecided reactions for the statement.

- For the statement no23 ‘I liked this approach of imparting values while teaching curricular subjects like science’, 6, 17 and 2 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.1 showed agreed responses about their liking to the integrated approach of imparting values.

- In terms of the reaction of the students towards the statement no24 ‘This type of approach of imparting values should be used while teaching other subjects’, 6, 16 and 2 of them gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.0 showed their highly favourable reactions to the statement.

- For the statement no25 ‘I liked the teaching of science through value integrated approach’, 12, 8 and 1 students gave their reaction in strongly agree, agree and undecided respectively. The intensity index 4.04 showed favorable reactions of the students towards the statement which showed their liking to the teaching of science through value integrated approach.

### 4.4.0 OBSERVATIONS DURING THE EXPERIMENT

During the experiment, the researcher keenly observed the behaviour of students related to the learning of science with the help of the developed intervention programme on value integrated approach. Some of the main observations were as follows:

- Students were very active in learning science in value integrated approach. This indicates that they liked to learn science through the value integrated approach.

- Students were eager to know more about the values which showed their interest in learning science through value integrated approach.

- During the experiment it was also found that students were helping each other while interacting during the intervention programme. The researcher noticed that the students were discussing their knowledge and ideas about the different values with their peers and trying to understand the concept of values by themselves. They were found working in small groups. It indicates that learning with value integrated approach inspired the students to work in group and to have cooperative learning.

- It was also noticed that most of the students went through the value integrated approach. This showed that the developed programme inspired the students to imbibe the values in their study activities.

- Most of the students were found interested in the story, materials and different activities given in the value integrated approach. With the help of story and activities, they tried to link their theory knowledge of values with the practical.

- It was noticed that the students were trying value integration in other subjects too. In this way, the students tried to inculcate values themselves.

- The students were found approaching the teacher (researcher) while learning Science with the value integrated approach. They also showed the teachers the way they had completed the exercises and expressed their feelings about the contents. They also expressed their positive feelings about the value inculcation, activities, extra reading material for teaching-learning Science.

- It was also found that the students were practicing with the help of value integration in their daily living activities.

- The students were inculcating different values themselves with the help of value integration in their different activities. They were also found very much eager to know their result. In case of poor result, they were found repeating again and again to learn more about the values.

- The overall observation of the researcher shows that the students were enjoying the learning with the developed intervention programme on teaching science through value integrated approach.

### 4.5.0 MAJOR FINDINGS OF THE STUDY

Following Major findings were drawn for the present study on the basis of analysis and interpretation of the data.

1. The developed intervention programme on value based integrated approach for teaching science and technology was found to be stochastically (significantly) effective in terms of enhancing students' knowledge and perceptions about the values to the traditional approach.

2. The achievement of students of both experimental and control groups did not differ stochastically in terms of their achievement in Science and Technology. However, the mean achievement of experimental group in Science and Technology was found little more than the mean achievement of control group in Science and Technology which is only due to chance. Hence, the implemented value integrated approach in teaching science and technology had no negative impact on the science and technology achievement of students of the experimental group.

3. Teaching Science and Technology through value integrated approach was found equally effective like the traditional approach of teaching science and technology in enhancing the achievement of standard IX students.

4. The developed intervention programme on value integrated approach to teach science and technology was also found to be effective in terms of the reaction of students towards the programme as most of the students showed favorable reaction towards most of the components of value integrated approach for learning science and technology as a whole.

5. The developed intervention programme on value integrated approach for teaching science and technology was found to make the students interested in learning science and technology, having inculcation of values among students

and considering the value integrated approach in learning science and technology.

### 4.6.0 DISCUSSION

Only content teaching is not enough to make the students well citizens of the country. They need to inculcate values for being better citizens and for better understanding about the culture of our society. It is difficult for the teachers to teach value education as a separate subject as they have to complete the syllabus of their subject along with other duties within the stipulated time. Thus due to lack of time, the teachers rarely gets time to provide education of other subjects like value education. The condition of teaching-learning of Science in the GSHSEB elementary schools is good however considering the need of value education in the present era the researcher developed an intervention programme on value integrated Science teaching for the standard IX students of GSHSEB school and tried to measure effectiveness of the developed programme for Science teaching-learning process and for enhancing achievement of the students in Science. The researcher developed the intervention programme by selecting ten values viz. Equality, Co-operation, Simplicity, Dignity of Labour, Determination, Honesty, Common goal, Discipline, Loyalty to duty, and Team work identified in the standard IX Science syllabus. Content analysis and systematization of the lesson plans were done at the beginning before developing the intervention programme. The present study focused on students' achievement in Science through the value integrated Science teaching. It also focused on the effectiveness of the developed programme in terms of the students' knowledge and perceptions towards the selected ten values. While reviewing the available literature, it was revealed that not much work has been conducted at secondary school level for value inculcation. Also the science subject has been neglected from the value inculcation. The reviewed studies also reveal that the very few studies have been conducted on integrated approach of value education. The investigator found a gap in terms of unavailability of sufficient research in the area of value education among the secondary science students through integrated approach. Therefore the study has its own significance.

The studies of Zamen (1982), Chauhan (1988), Das (1991), Diwakar (1995), Kapur (1995), Skinner (1999), Biswal and Srivastava (2005), Thakkar (2005), Biswal (2006) revealed that value can be taught to the students by some approaches and the present study was an attempt in this direction to teach values along with the subject i.e. Science through integrated approach. The findings of the present study supports that the value education through some model (Singh and Singh, 1986; Dhand et al., 1993) and strategies (Chauhan, 1988; Nagar, 1990) and approaches are the most effective ways for teaching values. The findings of the present study reveals that the developed intervention programme on value based integrated approach for teaching Science was found effective to the traditional approach be stochastically (significantly) more effective than traditional method in terms of enhancing students' knowledge and perceptions about the values. The achievement of students of both experimental and control groups did not differ stochastically in terms of their achievement in Science. However, the mean achievement of experimental group in Science was found little more than the mean achievement of control group in Science which is only due to chance. Hence, the implemented value integrated approach in teaching science had no negative impact on the science achievement of students of the experimental group. Teaching Science through value integrated approach was found equally effective like the traditional approach of teaching science in enhancing the achievement of standard IX students. However, the students were interested more in value integrated science teaching. It may be due to the fact that the teaching through traditional method does not take care of value education, needed foundation of students in value education and the required context needed for better understanding of values through the teaching-learning activities by the students. In traditional methods, students are remaining just passive listeners in the classroom teaching and they do not getting chance for receiving value education. Other reason could be that the students have to learn whatever the teacher teaches to them in the class, though they are interested or not but here the value integrated approach has many interested activities like story-telling, group learning, practical, net search and other activities that create interest among the students. The students might have made use of their understanding the values through their practice in daily life activities through the coordination of the learnt values with different contexts. The other benefit was that the students could learn the values of their own interest through its practicing in school and at home which might have helped for better learning of the Science in general and values in particular. Thus the

overall effect of the value integrated approach in comparison to traditional method was found to be more effective. The result also indicated that there was no role of individual differences in learning with the value integrated approach so this approach can be used by all type and level of students as far as the Science subject teaching is concerned.

The developed intervention programme on value integrated approach to teach science was also found to be effective in terms of the reaction of students towards the programme as most of the students showed favorable reaction towards most of the components of value integrated approach for learning science as a whole. This may be due to the fact that the programme allowed the students a lot of freedom to learn and practice the values with little or no involvement of the teacher. The students themselves revealed that the programme was a new experience for them and it was joyful for them to learn the values during the learning of Science through the value integrated approach. This result is supported by the findings reported by Amin (2011), Das (1994), Joyce (1988), Haver (2007), Rao (1985), Umashree (1999), Muddu (1978), Deopuria (1984) and Dighal (1985) found that the experimental group students were generally positive towards the learning Science than the control group students if some methods, strategies or approaches used in Science teaching. The reasons behind that may also be the difference in teaching-learning process itself, use of value integrated approach, relevance of the activities and programme with their learning needs, usability of the learnt values in daily life through its practice, freedom of learning, practice of the values in their daily life activities, and clarity of explanation during the teaching Science in the package. Even the students of this level like the value integrated nature of the Science content which might have developed their liking for the programme. These can be gauged from the findings that the developed intervention programme on value integrated approach for teaching science was found to make the students interested in learning science, having inculcation of values among students and considering the value integrated approach in learning science.

### 4.8.0 IMPLICATIONS OF THE PRESENT STUDY

The value education should be given through integrating it with different school subjects as the present time demands value based education. Presently, there are lots

of crisis, issues, corruptions, scandals and other problems all over the globe. As a developing country, India needs to produce better future citizens with sound mind who can cope with the real life difficulties and also can maintain their culture. The present study is an effort to integrate values in teaching Science and the effect of the value integrated approach on the learning of the students. It was just an attempt to find out an innovative way of teaching Science and to check the effectiveness. The following are some of the suggested implications of the present study on the basis of the major findings.

- To produce effective manpower with cultured citizens from the schools teachers should integrated values in their teaching-learning process so that students will practice the values in their daily life.

- Not only the topics which were taught through the value integrated approach by the researcher but other topics of the Science and other subjects also should be taught with the help of value integrated approach.

- The teaching through the value integrated approach affects more senses of the students and they make use of the learnt concepts of values in their real life.

- Value integrated approach shows the innovative way of providing value education and makes teaching-learning more fruitful and interesting.

- Use of value integrated approach for teaching Science has showed positive result as well as favourable views of students but it can be used with practical activities and discussion for better understanding of the students.

- Value integrated approach proved to be reducing the burden of the student as well as the teachers by making the teaching-learning process more joyful.

### 4.7.0 CONCLUSION

The value integrated approach for teaching Science and Technology to standard IX students of GSHSEB was found equally effective like the traditional approach of teaching science in enhancing the achievement of standard IX students and the implemented value integrated approach in teaching science had no negative impact on the science achievement of students of the experimental group. The developed value

integrated intervention programme was found to be effective in enhancing students' knowledge and perceptions about the values in comparison to the traditional method of teaching. The developed intervention programme on value integrated Science teaching was also found effective in terms of the liking of students towards the programme that was revealed form of value integration for the teaching of Science. The values are very important in today's world as different school boards also emphasizing value education for school going children. However, teachers find it difficult to teach value education as a separate subject due to teaching and other assignments of compulsory subjects. Thus the value integrated approach proves effective one for providing value education with the subject teaching. Value integrated approach is also useful for the students in imbibing different values through its practices in their convenient time and this minimizes the issues related to the behaviours of the students in schools. Now there is a need to prepare such type of value integrated programmes or packages in different areas of Science and also in different subjects to provide the value education to the students of different board schools. Technology based value education packages also could be prepared for excelling the students in Science as well as in different subjects. Technology blended value education in teaching different subjects will create the better future of students by the way of imbibing different values during the teaching-learning.