DATA ANALYSIS
AND
INTERPRETATION

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

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CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

In the previous chapter a complete account of the approach to study the main theme of the present investigation was elucidated. Both, the process of data collection and the methods to be applied in analysing and interpreting the data collected through various research tools were described and discussed at length. The present chapter is devoted to the analysis and interpretation of the data according to the eighteen hypotheses as formulated in the previous chapter.

The major concern of the present investigation, as described in the previous chapter, is the study of scientific attitude and its correlates among secondary school students of Baroda. To study the scientific attitude of secondary school students of Baroda, a scientific attitude scale was constructed and standardized by following Likerts' Summated Rating Technique. Scientific attitude of students was measured with the help of the constructed scale. Further, the correlates of scientific attitude were studied with variables like gender, location of school, SES,

achievement in science and general achievement of students. These facets of the present investigation of scientific attitude were organised under certain hypotheses.

In the present chapter, the nature of distribution of scientific attitude has been studied and the hypotheses have been tested through employing various statistical techniques and the pertinent results will be analysed and interpreted.

4.2 DISTRIBUTION OF SCIENTIFIC ATTITUDE

The nature of distribution of scientific attitude was studied in terms of students' scientific attitude score. As mentioned in Chapter III (3.13) mean, standard deviation, skewness, kurtosis and percentiles were calculated separately for the entire sample, Boys and Girls, and Urban and Rural students. The results have been presented in Table 4.1.

Table 4.1

Mean, Standard Deviation, Skewness, Kurtosis and Percentiles of Scientific Attitude Score of the Students.

|	The Entire Sample	Boys	Girls	Urban Students	Rural Students
Mean	257.76	254.10	262.42	275.31	239.43
SD	31.3855	30.8286	31.4685	25.5893	25.9310
P 10	217.00	214.40	221.00	242.50	210.00
P 20	226.00	223.00	230.00	253.00	218.00
P 30	236.00	234.00	242.00	261.00	222.00
P 40	247.80	244.00	252.20	268.00	229.00
P 50	258.00	252.00	263.00	277.00	234.00
P 60	267.00	262.00	272.80	283.00	242.00
P 70	277.00	271.00	281.00	289.00	249.40
P 80	287.00	283.00	292.00	297.00	262.00
P 90	301.00	295.00	303.00	306.50	275.00
Skewness	1.0000	2.7000	−1.0000	−2.5000	8.5000
Kurtosis	0.2976	0.3009	0.3171	0.2813	0.2769
	*	*	*	*	*

* Platykurtic

It can be seen from the table 4.1 that the average scientific attitude of the entire sample was 257.76. In order to understand better the distribution of scientific attitude of the sample, coefficient of skewness was

computed. The coefficient of skewness was found to be 1.0
This means that distribution of scientific attitude is
positively skewed. The kurtosis of the distribution is
0.2976. This means that the distribution is flatter than
the normal i.e. it is platykurtic in nature. Looking to
the percentiles, it may be noted that 50 percent of
students have obtained either 258.00 or more score on
scientific attitude. This score is nearly same as the
mean scientific attitude of the entire sample. Moreover,
10 percent students of the sample have scored either
301.00 or more than it (see figure 4.1).

From the table 4.1, it is observed that the average
scientific attitude of girls is more than that of boys.
Scientific attitude is negatively skewed in the case of
girls whereas it is positively skewed for boys. This
means that the score of more than 50 percent of boys on
scientific attitude is less than the average score of
boys and the score of more than 50 percent of girls on
scientific attitude is more than the average score of
girls. The value of percentile 90 of boys and girls is
295.0 and 303.0 respectively. This means that 10 percent
of boys have obtained more than 295.0 and 10 percent of
girls have obtained more than 303.0 on scientific
attitude. From the values of Kurtosis of both boys and
girls distribution, it can be observed that both the
distributions are plutocratic in nature.

Figure 4.1

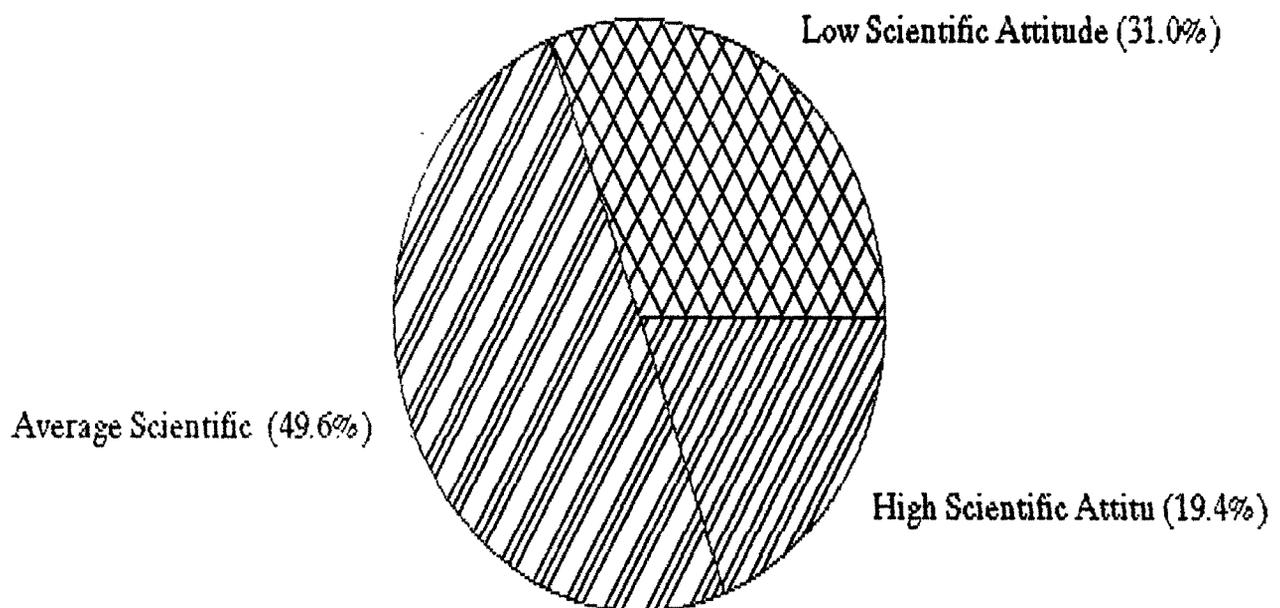Mean Scientific Attitude of Sample taken for the Study.
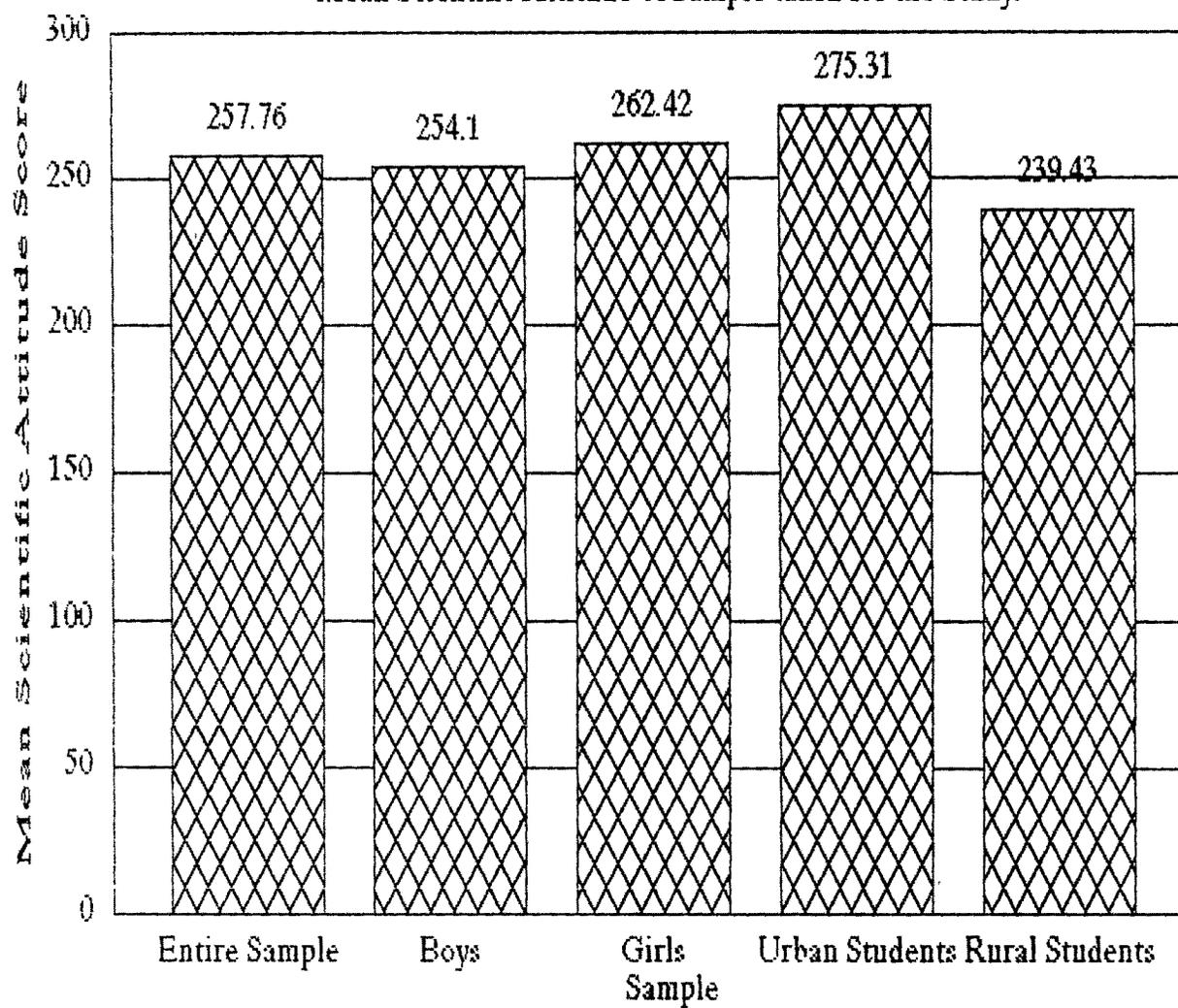
With respect to urban and rural students classification from the table 4.1, it can be observed that their average scientific attitude score is 275.31 and 239.43 respectively. This means that the average scientific attitude of urban students is more than the average scientific attitude of the entire sample and the average scientific attitude of rural students is less than that of the entire sample. It is also obvious that scientific attitude of urban students is more than that of rural students. The coefficients of skewness suggest that urban students' distribution is negatively skewed while rural students distribution is positively skewed. Looking to the percentile, it is observed that only 40 percent of the rural students have scored 242.0 and more on scientific attitude while 90 percent of the urban students have scored 242.50 and more on scientific attitude. There are only 10 percent of rural students who have scored 275.0 and more on scientific attitude whereas 50 percent of urban students have scored 277.0 and more on scientific attitude. This means that acquisition of scientific attitude of urban students is more than their counterparts. This may be due to the availability of educational facilities to the urban students whereas the rural students are deprived of the same to the same extent as the urban students.

Moreover, it was found that the lowest scientific attitude score was 187 against the lowest possible score of 072 and the highest scientific attitude score obtained was 337 against the highest possible score of 360. It was found that 30.99% of the students had low scientific attitude, 49.58% of the students had average scientific attitude and only 19.43% of the students possessed high scientific attitude (see figure 4.2).

With respect of the comparison of scientific attitude of the students with the norms of the constructed scientific attitude scale, it has been observed that the mean scientific attitude of the students is little more than the norms. The skewness of only the entire sample is positive whereas that of the norms is negative. For the rest of the groups i.e. boys, girls, urban and rural students the skewness trend is similar to the norms. As far as the kurtosis is concerned, only except the urban and rural students group, it is same as the norms (see figure 4.3).
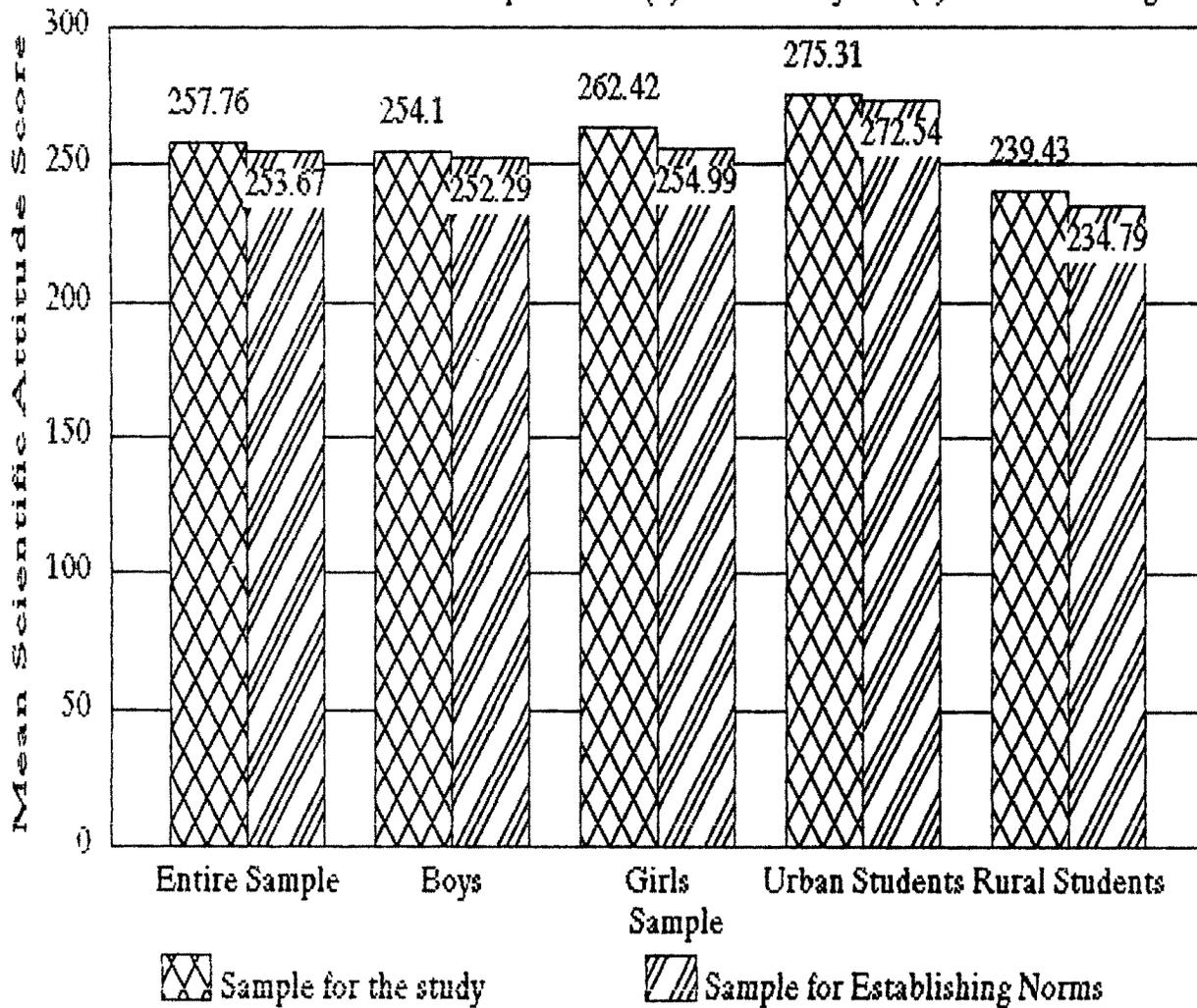
`Figure 4.2

Percentage of High, Average and Low Scientific Attitude of the Sample for the Study.

Low Scientific Attitude (31.0%)

Average Scientific (49.6%)

High Scientific Attitu (19.4%)

Figure 4.3

Mean Scientific Attitude of Samples taken (1)for the Study and (2) for Establishing Norms.

4.3   RELATIONSHIP OF SCIENTIFIC ATTITUDE WITH SES, ACHIEVEMENT IN SCIENCE AND GENERAL ACHIEVEMENT OF STUDENTS.

For the purpose of studying the relationship of scientific attitude with other variables, the following null hypotheses were formulated.

Ho 1   : There will be no significant relationship between the scientific attitude and socio economic status (SES) of students.

Ho 2   : There will be no significant relationship between the scientific attitude and achievement of students in science.

Ho 3   : There will be no significant relationship between the scientific attitude and general achievement of students.

To test these hypothesis, Pearson's Product Moment Coefficient of Correlation between scientific attitude scores and respective scores on SES, achievement in science and general achievement were computed which have been presented in the table 4.2.

Table 4.2

Coefficient of correlation of Scientific Attitude with SES, Achievement in Science and General Achievement of students.

	SES of Students	Achievement of Students in Science	General Achievement of Students
Scientific Attitude	0.4853 *	0.5409 *	0.5426 *

* Significant at 0.01 level with df=594

From the table 4.2, it is observed that coefficient of correlation of scientific attitude with SES, achievement in science and general achievement of students is significant at 0.01 level with df 594. Therefore, all the three null hypotheses have been rejected. So, it can be concluded that scientific attitude is correlated with SES, achievement in science, and general achievement of students. Moreover, though there is not much difference in the value of coefficient of correlation of scientific attitude with SES, achievement in science and general achievement of students, its value is maximum with general achievement and minimum with SES of the students.

4.4 SIGNIFICANCE OF DIFFERENCE IN THE MEAN SCIENTIFIC ATTITUDE OF DIFFERENT GROUPS.

To study the difference in the mean scientific

attitude of two different groups viz. boys and girls, and urban and rural students, the following null hypotheses were formulated.

Ho4 : There will be no significant difference between the mean scientific attitude of boys and girls.

Ho5 : There will be no significant difference between the mean scientific attitude of urban and rural students.

To test these hypotheses, t-values were calculated on scientific attitude scores of boys and girls, and urban and rural students. The calculated t-values have been presented in the following tables.

4.4.1 Boys and Girls

Table 4.3

The Mean, SD and t-value of Scientific Attitude of Boys and Girls.

Scientific Attitude of	Mean	SD	t-value	N
Boys	254.10	30.8286	3.2383 *	334
Girls	262.42	31.4685		262

* Significant at 0.01 level

It is observed from the table 4.3 that the calculated t-value is significant at 0.01 level. Hence, the null hypotheses Ho4 : " There will be no significant

difference between the mean scientific attitude of boys and girls" is rejected. So, it can be concluded that there is a significant difference in the mean scientific attitude of boys and girls. It can be also observed from the table 4.3 that mean scientific attitude of girls is more than that of boys.

4.4.2 Urban and Rural Students

Table 4.4

The Mean, SD and t-value of Scientific Attitude of Urban and Rural Students.

Scientific Attitude of	Mean	SD	t-value	N
Urban Students	275.31	25.5893	17.0076 *	304
Rural Students	239.43	25.9310		292

* Significant at 0.01 level

It is observed from the table 4.4 that the calculated t-value is significant at 0.01 level. Hence, the null hypotheses Ho5: " There will be no significant difference between the mean scientific attitude of urban and rural students" is rejected. So, it can be concluded that there is a significant difference in the mean scientific attitude of urban and rural students. It is also

observed from the table 4.4 that mean scientific attitude
of urban students is more than their counterparts.

4.4.3 Different Levels of SES of Students

To study the scientific attitude of students belonging
to different levels of SES, achievement in science and
general achievement, the following null hypotheses were
formulated.

Ho 6 : There will be no significant difference between the
mean scientific attitude of high socio economic
status (SES) students, average social economic
status (SES) students and low social economic
status (SES) students.

Ho 7 : There will be no significant difference between the
mean scientific attitude of high achievers in
science, average achievers in science and low
achievers in science.

Ho 8 : There will be no significant difference between the
mean scientific attitude of high general
achievers, average general achievers and low
general achievers.

In order to understand scientific attitude of students
belonging to different levels of SES, achievement in
science, and general achievement, the students were

divided into three groups, viz., high, average and low based on their scores on SES, achievement in science and general achievement. The procedure followed for forming three groups was as follows :

High SES, Average SES and Low SES groups.
Score on SES was the base.

Step-1 : Range of the score was calculated.

Step-2 : Range was divided by 3 as three groups were to be formed. A definite value was obtained (Say X).

Step-3 : Thus obtained Value i.e. X was added to the lowest score. This became the upper limit of the low SES group. Hence, all the students whose SES score was between the lowest score and thus calculated upper limit score formed the low SES group.

Step-4 : Upper limit of the low SES group was added with 0.1. This became the lower limit of the average SES group. To find out upper limit of average SES group, the value X was added to upper limit of low SES group. Hence all the students whose SES score was between thus calculated Lower limit and upper limit for the average SES group formed the average SES group.

Step-5: To obtain the lower limit of the high SES group 0.1 was added to the upper limit of the average SES group. so, all those students whose SES score was between thus obtained lower limit of the high SES group and the highest SES score formed the high SES group.

To illustrate how SES of students was divided into three groups.

Entire Sample N=596

Highest SES score was 34

Lowest SES Score was 05

Therefore, range = Highest - Lowest = 34-05 = 29.

To form three groups ; Range/3 = 29/3 = 9.6

Now, lowest score + 9.6 = 5+9.6 = 14.6

So, the limits of low SES group = 5.0 to 14.6

For average SES group.

the lower limit = 14.7

the upper limit = 14.7 + 9.6 = 24.3

So, the limits of average SES group = 14.7 to 24.3

For high SES group the limits are 24.4 to 34.0

Also, the highest and lowest score on achievement in science were 0 and 99. and that of general achievement were 0.88 and 88.0 respectively.

By following the similar procedure, low achievement in science, average achievement in science and high achievement in science students groups were formed by considering achievement in science as the base. Similarly, low general achievement, average general achievement and high general achievement students groups were formed by considering general achievement as the base.

The mean difference in the scientific attitude of students belonging to the three levels of SES, achievement in science and general achievement have been studied using the statistical technique ANOVA. The results are presented in Tables.

Table 4.5

Summary of ANOVA of Scientific Attitude of High SES, Average SES and Low SES students.

Sources of Variance	DF	SS	MSS	F-Value
Among	2	131311.23	65655.61	
Within	594	456764.47	768.69	85.38 *
Total	596	588075.70	275.42	

(Expected F-value for df=2/594 at 0.01 level is 4.66)

* Significant at 0.01 level

It can be observed from table 4.5, that the obtained 'F' value of 85.38 is highly significant at 0.01 level. This indicates that three groups of students belonging to three levels of SES differ significantly in their mean scientific attitude. Therefore, the null hypothesis Ho6 " there will be no significant difference in the mean scientific attitude of high SES student and average SES student and low SES student " is rejected.

Even though the 'F' value indicates clearly the difference in mean scientific attitude of different levels of SES students, one may not be able to say as to which pairs of means are really different. For studying the differences of specific pairs, t-test has been employed and the t-values have been given in table 4.6.

Table 4.6

The Mean, SD and t-value of Scientific Attitude of High SES students, Average SES students and Low SES students.

	Mean	SD	t-values			N
			High SES	Average SES	Low SES	
High	276.90	26.7723		4.8999*	13.1958*	129
Average	262.50	29.4901			9.8570 *	281
Low	237.32	25.3000				186

* Significant at 0.01 level

The t-values between high SES, and average SES, high SES and Low SES are 4.8999 and 13.1958 respectively. Both these t-value are significant at 0.01 level. The mean scientific attitude of high SES students is more than the mean scientific attitude of average SES students. This means that high SES students possess more scientific attitude than average SES students.

The t-value between the average SES, Low SES students is 9.8570. This t-value are significant at 0.01 level. The mean scientific attitude of average SES students is more than that of low SES students. This means that the scientific attitude of average SES students is more than the low SES students. Hence, there is a significant difference in the mean scientific attitude of students belonging to three different levels of SES. The mean scientific attitude of high SES students is more than that of average SES students and is least for the low SES students.

Table 4.7

Summary of ANOVA of Scientific Attitude of High, Average, and Low Achievers in Science.

Sources of Variance	DF	SS	MSS	F-Value
Among	2	154998.08	77499.04	
Within	594	433077.62	729.09	106.30 *
Total	596	588075.70		

(Expected F-value for df=2/594 at 0.01 level is 4.66)

* Significant at 0.01 level

It can be observed from table 4.7 that the obtained 'F' value of 106.30 is highly significant at 0.01 level. This Indicates that three groups of students belonging to three levels of achievement in science differ significantly in their mean scientific attitude. Therefore, the null hypothesis Ho7: " There will be no significant difference in the mean scientific attitude of high achievers in science, average achievers in science and low achievers in science " is rejected.

Though the 'F' value is indicative of the significant differences in mean scientific attitude of different levels of achievement of students in science, it does not give an idea about which pairs of means are really different. To study the differences of specific pairs, t-

test has been employed and the t-values are presented in table 4.8.

Table 4.8

The Mean, SD and t-value of Scientific Attitude of High, Average, and Low Achievement in Science students.

	Mean	SD	t-values[b]			N
			High	Average	Low	
High Achieve ment in Science	279.52	24.0474		7.0061*	16.0921*	155
Average Achieve ment in Science	260.31	30.3486			8.6596 *	242
Low Achieve ment in Science	237.71	24.5188				199

* Significant at 0.01 level

The t-values between high and average achievers in science, and between high and low achievers in science are 7.0061 and 16.0921 respectively. Both these t-value are significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of high and average achievers in science, and between high and Low achievers in science. The t-value between average and low achievers in science, is 8.6596 which is significant at 0.01 level. This means that there is a

significant difference in the mean scientific attitude
of average achievers in science, and low achievers in
science. It is also observed from table 4.8 that the mean
scientific attitude of high achievers in science is more
than that of average achievers in science and the mean
scientific attitude of average achievers in science is
more than that of low achievers in science.

Table 4.9

Summary of ANOVA of Scientific Attitude of students with
High, Average. and Low General Achievement.

Sources of Variance	DF	SS	MSS	F-Value
Among	2	162205.57	81102.78	
Within	594	425870.13	716.95	113.12 *
Total	596	588075.70		

(Expected F-value for df=2/594 at 0.01 level is 4.66)

* Significant at 0.01 level

It can be observed from table 4.9 that the obtained
'F' value of 113.12 is highly significant at 0.01 level.
This indicates that three groups of students belonging to
three levels of general achievement differ significantly
in their mean scientific attitude. Therefore, the null
hypothesis Ho_8 : "There will be no significant difference
in the mean scientific attitude of high general

achievers, average general achievers and low general achievers" is rejected.

Though the 'F' value is indicative of the significant differences in mean scientific attitude of different levels of general achievement of students, it does not give an idea about which pairs of means are really different. To study the differences of specific pairs, t-test has been employed and t-values are presented in table 4.10.

Table 4.10

The Mean, SD and t-value of Scientific Attitude of High, Average and Low General Achievers.

	Mean	SD	t-values			N
			High	Average	Low	
High General Achieve ment	282.01	23.8407		8.1792*	16.2902*	142
Average General Achieve ment	259.85	29.0159			8.4426 *	251
Low General Achieve ment	238.21	25.5959				203

* Significant at 0.01 level

The t-values between high and average general achievers, and between high and Low general achievers are 8.1792 and 16.2902 respectively. Both these t-values are significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of high and average general achievers, and between high and low general achievers. The t-values between average and low general achievers is 8.4426 which is significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of average general achievers, and low general achievers. It is also observed from table 4.10 that the mean scientific attitude of high general achievers is more than that of average general achievers and the mean scientific attitude of low general achievers is the minimum in comparison to the other two levels of general achievers.

The analysis of data carried out so far has revealed that scientific attitude of students is correlated with SES, achievement in science and general achievement of students. It further revealed that the mean scientific attitude of boys and girls, urban and rural students; high, average and low SES students; high, average and low achievers in science; and high, average and low general achievers differ significantly.

4.5 SIGNIFICANCE OF DIFFERENCE IN THE MEAN SCIENTIFIC ATTITUDE OF DIFFERENT GROUP.

As the mean scientific attitude of students belonging to different groups studied separately differed significantly, it would be interesting to study the scientific attitude of students of different combinations of groups. The scientific attitude of the following different combinations of groups have been studied.

1. Location of school and gender of students

2. Location of school and SES of students

3. Gender and SES of students

4. Location of school and achievement in science of students

5. Gender and achievement in science of students

6. Location of school and general achievement of students

7. Gender and general achievement of students

8. Location of school, gender and SES of students

9. Location of school, gender, and achievement in science of students

10.Location of school, gender and general achievement of students

The detailed analysis of the study of mean scientific attitude of different combinations of groups is presented in the following pages.

4.5.1 Location of School and Gender of Students

To study the difference in the mean scientific attitude with respect to the location of school and gender of students, the following null hypothesis was formulated.

$Ho9$: There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their gender.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.11.

Table 4.11

Summary of ANOVA of Scientific Attitude of Urban boys, Urban girls, Rural boys and Rural girls.

Sources of Variance	DF	SS	MSS	F-Value
Among	3	193335.74	64445.25	
Within	593	394739.96	665.67	96.81 *
Total	596	588075.70		

(Expected F-value for df=3/593 at 0.01 level is 3.83)

* Significant at 0.01 level

From table 4.11 it is observed that the analysis of variance has yielded the 'F' value of 96.81 which is highly significant at 0.01 level. Hence, the null hypothesis $H_0 9$: " There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their gender" is rejected.

Significant differences at this stage demand further analysis to know the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.12.

Table 4.12

The Mean, SD and t-value of Scientific Attitude of Urban Boys, Urban Girls, Rural Boys, and Rural Girls.

| | Mean | SD | t-Values | | | | N |
			Urban Boys	Urban Girls	Rural Boys	Rural Girls	
Urban Boys	274.30	25.3439		0.6684 NS	13.1361*	9.5085 *	147
Urban Girls	276.26	25.7776			13.9448*	10.1311*	157
Rural Boys	238.02	24.7355				1.2036 NS	187
Rural Girls	241.92	27.7304					105

* Significant at 0.01 level

NS- Not Significant

The t-values between urban boys and urban girls and between rural boys and rural girls are 0.6684 and 1.2036 respectively. Both these t-value are not significant at 0.01 level or 0.05 level. This means that there is no a significant difference in the mean scientific attitude of

- urban boys, and urban girls; and

- between rural boys, and rural girls.

There was a significant difference in the mean scientific attitude of boys and girls, and urban students

and rural students. However, when with respect to both these variables viz. location of school and gender of students is studied, boys and girls of the same location of schools did not differ significantly.

The t-values between urban boys and rural boys, urban boys and rural girls, urban girls and rural boys and urban girls and rural girls are 13.1361, 9.5085, 13.9448, and 10.1311 respectively. All these t-values are significant at 0.01 level. Hence, there is a significant difference in the mean scientific attitude of

- urban boys and rural boys

- urban boys and rural girls

- urban girls and rural boys, and

- urban girls and rural girls.

The mean scientific attitude of urban girls is the highest while that of the rural boys is the lowest. From this results it can be concluded that when the location of school and gender of students are combinedly studied, the location of school and gender of students do effect the scientific attitude of students.

4.5.2 Location of School and SES of Students

In order to study the difference in the mean scientific attitude with respect to the location of school and SES of students, the following null hypothesis was formulated.

Ho10 : There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their SES.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.13.

Table 4.13

Summary of ANOVA of Scientific Attitude of Urban: High, Average, and Low SES; and Rural: High, Average, and low SES Students.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	225073.68	45014.74	
Within	591	363002.02	614.22	73.29 *
Total	596	588075.70		

(Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.13 it can be observed that the analysis of variance has yielded the 'F' value of 73.29 which is highly significant at 0.01 level. Hence, the null hypothesis $H_0 10$: "There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their SES" is rejected.

Significant results at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.14.

Table 4.14

The Mean, SD and t-value of Scientific Attitude of Urban High SES, Urban Average SES, Urban Low SES, Rural High SES, Rural Average SES and Rural Low SES students.

	Mean	SD	t-values					
			Urban High SES	Urban Average SES	Urban Low SES	Rural High SES	Rural Average SES	Rural Low SES
Urban High SES	278.70	26.4154		0.7157 262 NS	3.2811 * 135	3.9969 * 137	11.5007* 261	15.0593* 176
Urban Avr. SES	276.35	24.3777			3.0495 * 207	3.8154 * 209	13.2792* 333	17.4769* 248
Urban Low SES	263.15	24.9610				0.9388 NS 82	5.1888 * 206	8.0589 * 121
Rural High SES	257.51	29.9273					3.4174 * 208	5.9703 * 123
Rural Avr. SES	240.58	24.9124						4.5957 * 247
Rural Low SES	227.62	18.6349						

Significant at 0.01 level
NS- Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

The t-values between urban high SES and urban average SES, and urban low SES and rural high SES students are 0.7157 and 0.9388 respectively. Both these t-values are

not significant even at 0.05 level. This means that there is no significant difference in the mean scientific attitude of

- urban high SES students and urban average SES students and

- urban low SES students and rural high SES students.

However, all other t-values were significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of,

- urban high SES students and urban low SES students,

- urban high SES students and rural high SES students,

- urban high SES students and rural average SES students,

- urban high SES students and rural low SES students,

- urban average SES students and urban low SES students,

- urban average SES students and rural high SES students,

- urban average SES students and rural average SES students,

- urban average SES students and rural low SES students,

- urban low SES students and rural average SES students,

- urban low SES students and rural low SES students,

- rural high SES students and rural average SES
  students,

- rural high SES students and rural low SES students,

- rural average SES students and rural low SES
  students,

It is observed from table 4.14 that the mean
scientific attitude of urban high SES students is
maximum while that of the rural low SES students is
minimum. The Mean scientific attitude of urban students
belonging to different levels of SES is more than that of
rural students belonging to different levels of SES. Even
the mean scientific attitude of rural high SES students
is less than that of urban low SES students. So, it can
be concluded that when the location of school and SES is
studied together to find out the combined effect on the
scientific attitude of students, the location of school
of students plays a dominant role with respect to the
scientific attitude of students.

4.5.3 Gender and SES of Students

In order to study the difference in the mean
scientific attitude with respect to the gender and SES

of students, the following null hypothesis was formulated.

Ho11 : There will be no significant difference in the mean scientific attitude of boys and girls with respect to their SES.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.15.

Table 4.15

Summary of ANOVA of Scientific Attitude of Boys: High, Average, and Low SES; and Girls: High, Average, and low SES Students.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	126362.44	25272.49	
Within	591	461713.26	781.24	32.35 *
Total	596	588075.70		

(Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.15 it can be observed that the analysis of variance has yielded the 'F' value of 32.35 which is highly significant at 0.01 level. Hence, the null hypothesis Ho11 " There will be no significant

difference in the mean scientific attitude of boys and girls with respect to their SES" is rejected.

Significant differences at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.16.

Table 4.16

The Mean, SD and t-value of Scientific Attitude of,

Boys: High, Average, and Low SES;   and

Girls: High, Average, and Low SES .

	Mean	SD	t-values					
			Boys High SES	Boys Average SES	Boys Low SES	Girls High SES	Girls Average SES	Girls Low SES
Boys High SES	275.04	27.2763		3.3908* 208	8.6836 * 177	0.4381 NS 171	4.7928 * 174	6.1163 * 77
Boys Avr. SES	260.43	27.9033			7.1657 * 277	4.9729 * 271	2.1089 ** 274	4.1811 * 177
Boys Low SES	236.89	26.7561				11.6622 * 240	4.3175 * 243	0.4329 NS 146
Girls High SES	276.97	26.7019					6.4609 * 237	7.2856 * 140
Girls Avr. SES	252.85	30.9151						2.5557 ** 143
Girls Low SES	239.12	21.9494						

* Significant at 0.01 level
** Significant at 0.05 level
NS- Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

The t-values between the boys with high SES and girls with high SES, and between the boys with low SES and

girls with low SES students are 0.4381 and 0.4329 respectively. Both these t-value are not significant even at 0.05 level. This means that there is no significant difference in the mean scientific attitude of,

- Boys with high SES and girls with high SES, and

- Boys with low SES and girls with low.

However, all other t-values were significant at 0.01 level or 0.05 level. This means that there is a significant difference in the mean scientific attitude of

- boys with high SES and boys with average SES,

- boys with high SES and boys low high SES,

- boys with high SES and girls with average SES,

- boys with high SES and girls with low SES,

- boys with average SES and boys with low SES,

- boys with average SES and girls with high SES,

- boys with average SES and girls with average SES,

- boys with average SES and girls with low SES,

- boys with low SES and girls with high SES,

- boys with low SES and girls with average SES,

- girls with high SES and girls with average SES,

- girls with high SES and girls with low SES,

- girls with average SES and girls with low SES,

It is also observed from table 4.16 that the mean scientific attitude of girls with high SES is maximum while that of boys with low SES is minimum. It can be concluded that boys and girls with high and low SES only did not significantly differ on their scientific attitude.

4.5.4 Location of the School and Achievement of Students in Science.

In order to study the difference in the mean scientific attitude with respect to the location of the school and achievement in science, the following null hypothesis was formulated.

Ho 12 : There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their achievement in science.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.17.

Table 4.17

Summary of ANOVA of Scientific Attitude of

Urban: High, Average, and Low Achievers in Science; and

Rural: High, Average, and low Achievers in Science.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	230037.36	46007.47	
Within	591	358038.34	605.82	75.94 *
Total	596	588075.70		

(Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.17 it can be observed that the analysis of variance has yielded the 'F' value of 75.94 which is highly significant at 0.01 level. Hence, the null hypothesis $H_0 12$ " There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their achievement in science" is rejected.

Significant results at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.18.

Table 4.18

The Mean, SD and t-value of scientific Attitude of

Urban: High, Average, and low Achievers in Science; and

Rural: High, Average, and low Achievers in Science.

	Mean	SD	t-values					
			Urban High ACHS	Urban Average ACHS	Urban Low ACHS	Rural High ACHS	Rural Average ACHS	Rural Low ACHS
Urban High ACHS	282.95	22.5369		3.7540* 267	4.8952 * 164	4.9041 * 155	10.7563* 230	19.4851* 291
Urban Avr. ACHS	271.68	26.6102			2.2248 ** 173	2.5570 ** 164	7.1719 * 239	13.9619* 300
Urban Low ACHS	261.75	23.1149				0.5008 NS 61	3.3749 * 136	6.9836 * 197
Rural High ACHS	258.78	23.0190					2.4738 ** 127	5.4763 * 188
Rural Avr. ACHS	245.56	28.8755						3.9684 * 263
Rural Low ACHS	232.40	21.4498						

* Significant at 0.01 level
** Significant at 0.05 level
NS- Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

The t-value between urban low achievers in science and rural high achieves in science is 0.5008 which is not significant at 0.01 level. This means that there is no

significant difference in the mean scientific attitude of urban low achievers in science and rural high achievers in science.

However, all other t-values were significant at 0.01 or 0.05 level. This means that there is a significant difference in the mean scientific attitude of

- urban high achievers in science and urban average achievers in science,

- urban high achievers in science and urban low achievers in science,

- urban high achievers in science and rural high achievers in science,

- urban high achievers in science and rural average achievers in science,

- urban high achievers in science and rural low achievers in science,

- urban average achievers in science and urban low achievers in science,

- urban average achievers in science and rural high achievers in science,

- urban average achievers in science and rural average achievers in science,

- urban average achievers in science and rural low achievers in science,

- urban low achievers in science and rural average achievers in science,

- urban low achievers in science and rural low achievers in science,

- rural high achievers in science and rural average achievers in science,

- rural high achievers in science and rural low achievers in science,

- rural average achievers in science and rural low achievers in science,

It is also observed from table 4.18 that the mean scientific attitude of urban high achievers in science is maximum while that of the rural low achievers in science is minimum. With respect to the combination of location of school and achievement of students in science, it is observed that except the urban low achievers in science and rural high achievers in science, all other pairs differed significantly in their mean scientific attitude.

4.5.5 Gender and Achievement of Students in Science

In order to study the difference in the mean scientific attitude with respect to the gender and achievement in science of students, the following null hypothesis was formulated.

Ho13:   There will be no significant difference in the mean scientific attitude of boys and girls with respect to their achievement in science.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.19.

Table 4.19

Summary of ANOVA of Scientific Attitude of Boys: High, Average, and Low Achievers in Science; and Girls: High, Average, and low Achievers in Science.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	171396.71	34279.34	
Within	591	416678.99	705.04	48.62 *
Total	596	588075.70		

Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.19 it can be observed that the analysis of variance has yielded the 'F' value of 48.62 which is highly significant at 0.01 level. Hence, the null hypothesis $Ho13$: " There will be no significant difference in the mean scientific attitude of boys and girls with respect to their achievement in science" is rejected.

Significant results at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.20.

Table 4.20

The Mean, SD and t-value of Scientific Attitude of Boys: High, Average, and Low Achievers in Science; and Girls: High, Average, and Low Achievers in Science.

	Mean	SD	t-values					
			Boys High ACHS	Boys Average ACHS	Boys Low ACHS	Girls High ACHS	Girls Average ACHS	Girls Low ACHS
Boys High ACHS	276.09	22.8289		6.2350* 227	12.2637* 194	2.1199** 153	2.0956** 194	10.1133* 183
Boys Avr. ACHS	254.14	30.3132			5.4956* 241	7.4889 * 200	3.7647 * 241	3.6922 * 230
Boys Low ACHS	234.97	24.0608				12.6867* 167	9.1995 * 208	1.6738 NS 197
Girls High ACHS	284.41	24.8770					3.8385 * 167	10.8623* 156
Girls Avr. ACHS	268.41	28.4306						7.3437 * 197
Girls Low ACHS	240.77	24.6639						

* Significant at 0.01 level
** Significant at 0.05 level
NS- Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

The t-value between the boys low achievers in science and girls low achievers is 1.6738 which is not

significant even at 0.05 level. This means that there is no significant difference in the mean scientific attitude of boys low achievers in science and girls low achievers in science.

However, all other t-values were significant at 0.01 level or 0.05 level. This means that there is a significant difference in the mean scientific attitude of

- boys high achievers in science and boys average achievers in science,

- boys high achievers in science and boys low achievers in science,

- boys high achievers in science and girls high achievers in science,

  .

- boys high achievers in science and girls average achievers in science,

- boys high achievers in science and girls low achievers in science,

- boys average achievers in science and boys low achievers in science,

- boys average achievers in science and girls high achievers in science,

- boys average achievers in science and girls average achievers in science,

- boys average achievers in science and girls low achievers in science,

- boys low achievers in science and girls high achievers in science,

- boys low achievers in science and girls average achievers in science,

- girls high achievers in science and girls average achievers in science,

- girls high achievers in science and girls low achievers in science,

- girls average achievers in science and girls low achievers in science,

It is als observed from table 4.20 that the mean scientific attitude of girls high achievers in science is maximum while that of boy low achievers in science is minimum. With respect to gender and achievers in science of students it is observed that except boys low achievers in science and girls low achievers in science all other pairs differed significantly in their scientific attitude. So, it can be concluded that

achievement of students in science plays an important role in their scientific attitude.

4.5.6 Location of the School and General Achievement of Students.

In order to study the difference in the mean scientific attitude with respect to the location of the school and general achievement of students, the following null hypothesis was formulated.

Ho14 : There will be no significant difference in the mean scientific attitude of urban and rural students with respect to their general achievement.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.21.

Table 4.21

Summary of ANOVA of Scientific Attitude of

Urban: High, Average, and Low General Achievers; and

Rural: High, Average, and Low General Achievers.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	230412.80	46082.56	
Within	591	357662.90	605.18	76.15 *
Total	596	588075.70		

(Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.21 it can be observed that the
analysis of variance has yielded the 'F' value of 76.15
which is highly significant at 0.01 level. Hence, the
null hypothesis Ho14 : " There will be no significant
difference in the mean scientific attitude of urban and
rural students with respect to their general
achievement" is rejected.

Significant differences at this stage demand further
analysis to study the differences in the mean scientific
attitude of specific pairs of groups. To study the
differences of specific pairs, t-tests has been employed
and the result are presented in table 4.22

Table 4.22

The Mean, SD and t-value of Scientific Attitude of
Urban : High, Average, and Low General Achievers; and
Rural : High, Average, and Low General Achievers.

	Mean	SD	t-values					
			Urban High GACH	Urban Average GACH	Urban Low GACH	Rural High GACH	Rural Average GACH	Rural Low GACH
Urban High GACH	284.11	22.4993		4.1890* 241	4.4193 * 178	3.3140 * 141	13.1646* 235	18.5758* 264
Urban Avr. GACH	271.10	25.8608			1.0150 NS 185	1.2903 NS 148	8.4995 * 242	13.0488* 271
Urban Low GACH	267.05	25.6543				0.6343 NS 85	5.9323 * 179	9.2484 * 208
Rural High GACH	262.64	30.0731					2.9351 * 142	4.7250 * 171
Rural Avr. GACH	243.40	25.0459						3.7447 * 265
Rural Low GACH	232.32	22.7008						

* Significant at 0.01 level

NS- Not Significant

Upper and lower numbers in each column under t-values
indicate t-value and df respectively.

The t-values between urban average general achievers
and urban low general achievers between urban average

general achievers and rural high general achievers and between urban low general achievers and rural high general achievers are 1.0150, 1.2903, and 0.6343 respectively. All these t-values are not significant at 0.01. This means that there is no significant difference in the mean scientific attitude of,

- urban average general achievers and urban low general achievers,

- urban average general achievers and rural high general achievers,

- urban low general achievers and rural high general achievers,

Whereas, all other t-values were significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of

- urban high general achievers and urban average general achievers,

- urban high general achievers and urban low general achievers,

- urban high general achievers and rural high general achievers,

- urban high general achievers and rural average general achievers,

- urban high general achievers and rural low general achievers,

- urban average general achievers and rural average general achievers,

- urban average general achievers and rural low general achievers,

- urban low general achievers and rural average general achievers,

- urban low general achievers and rural low general achievers,

- rural high general achievers and rural average general achievers,

- rural high general achievers and rural low general achievers,

- rural average general achievers and rural low general achievers,

It is also observed from table 4.22 that the mean scientific attitude of urban high general achievers is maximum and that of the rural low general achievers is minimum. With respect to the combination of location

of school and general achievement of students, the
location of school of the students is found to be
dominating variable in comparison to the general
achievement of students.

4.5.7 Gender and General Achievement of Students.

In order to study the difference in the mean
scientific attitude with respect to the gender and
general achievement of students, the following null
hypothesis was formulated.

Ho15 : There will be no significant difference in the
mean scientific attitude of boys and girls with
respect to their general achievement.

The hypothesis was tested using the statistical
technique ANOVA and the results have been presented in
the table 4.23.

Table 4.23

Summary of ANOVA of Scientific Attitude of

Boys: High, Average, and Low General Achievers; and

Girls: High, Average, and Low General Achievers.

Sources of Variance	DF	SS	MSS	F-Value
Among	5	175463.63	35092.72	
Within	591	412612.07	698.16	50.26 *
Total	596	588075.70		

(Expected F-value for df=5/591 at 0.01 level is 3.06)

* Significant at 0.01 level

From table 4.23 it can be observed that the analysis of variance has yielded the 'F' value of 50.26 which is highly significant at 0.01 level. Hence, the null hypothesis $Ho15$: " There will be no significant difference in the mean scientific attitude of boys and girls with respect to their general achievement" is rejected.

Significant differences at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.24.

Table 4.24

The Mean, SD and t-value of Scientific Attitude of

Boys: High, Average, and Low Achievers in Science; and

Girls: High, Average, and Low Achievers in Science.

	Mean	SD	t-values					
			Boys High GACH	Boys Average GACH	Boys Low GACH	Girls High GACH	Girls Average GACH	Girls Low GACH
Boys High GACH	279.09	23.4010		7.0825* 218	11.8778* 192	1.6738 NS 140	3.1756 * 190	10.4391* 167
Boys Avr. GACH	253.89	28.5188			5.0089 * 252	8.2356 * 200	3.7525 * 250	3.8536 * 227
Boys Low GACH	236.81	25.7712				12.6401 * 174	8.5311 * 224	0.8889 NS 201
Girls High GACH	285.79	23.8721					4.6043 * 172	11.3187* 149
Girls Avr. GACH	267.29	27.8906						7.2627 * 199
Girls Low GACH	240.01	25.2558						

* Significant at 0.01 level

NS Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

The t-values between the boys with high general achievers and girls with high general achievers and

between boys with low general achievers and girls with low general achievers are 1.6738 and 0.8889. Both are not significant even at 0.05 level. This means that there is no significant difference in the mean scientific attitude of

- boys with high general achievers and girls with high general achievers, and

- boys with low general achievers and girls with low general achievers.

However, all other t-values were significant at 0.01 level. This means that there is a significant difference in the mean scientific attitude of

- boys with high general achievers and boys with average general achievers,

- boys with high general achievers and boys with low general achievers,

- boys with high general achievers and girls with average general achievers,

- boys with high general achievers and girls with low general achievers,

- boys with average general achievers and boys with low general achievers,

- boys with average general achievers and girls with
  .high general achievers,

- boys with average general achievers and girls with
  average general achievers,

- boys with average general achievers and girls with
  low general achievers,

- boys low general achievers and girls high general
  achievers,

- boys low general achievers and girls average
  general achievers,

- girls high general achievers and girls average
  general achievers,

- girls high general achievers and girls low
  general achievers,

- girls average general achievers and girls average
  low achievers,

It is also observed from table 4.24 that the mean
scientific attitude of girls high general achievers is
maximum while that of boy low general achievers is
minimum. With respect to the combination of gender and
general achievement students, it is observed that except
for the high general achievers with high general

achievers and low general achievers with low general achievers, all other pairs differed significantly in their scientific attitude.

4.5.8 Location of the School, Gender, and SES of Students.

In order to study the difference in the mean scientific attitude with respect to the location of the school, gender and SES of students , the following null hypothesis was formulated.

Ho16: There will be no significant difference in the mean scientific attitude of urban and rural, boys and girls with respect to their SES.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.25.

Table 4.25

Summary of ANOVA of Scientific Attitude of

Urban- Boys: High, Average, and Low SES;

Girls: High, Average, and low SES;

Rural- Boys: High, Average, and Low SES; and

Girls: High, Average, and low SES.

Sources of Variance	DF	SS	MSS	F-Value
Among	11	231069.40	21006.31	
Within	585	357006:30	610.27	34.42 *
Total	596	588075.70		

(Expected F-value for df=11/585 at 0.01 level is 2.29)

* Significant at 0.01 level

From table 4.25 it can be observed that the analysis of variance has yielded the 'F' value of 34.42 which is highly significant at 0.01 level. Hence, the null hypothesis Ho16 "There will be no significant difference in the mean scientific attitude of urban and rural boys and girls with respect to their SES" is rejected.

Significant differences at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.26.

Table 4.26

The Mean, SD and t-value of Scientific Attitude of

Urban: Boys: High, Average, and Low SES;

Girls: High, Average, and Low SES;

Rural: Boys: High, Average, and Low SES;

Girls: High, Average, and Low SES.

	Mean	SD	t-values											
			Urban Boys High SES	Urban Boys Averag SES	Urban Boys Low SES	Urban Girls High SES	Urban Girls Average SES	Urban Girls Low SES	Urban Boys High SES	Rural Boys Average SES	Rural Boys Low SES	Rural Girls High SES	Rural Girls Average SES	Rural Girls Low SES
Urban Boys High SES	276.53	26.8564		0.5605 123 NS	0.8521 72 NS	0.8620 94 NS	0.3760 143 NS	4.1348 * 67	3.1079 * 72	7.7466* 148	11.4259* 133	1.8894 69 NS	7.7072 117 *	7.5286 67 *
Urban Boys Avr. SES	273.93	23.2782			0.5185 95 NS	1.5401 117 NS	1.1526 166 NS	4.1581 * 90	2.9474 * 95	8.8435* 171	13.4405* 136	1.6537 92 NS	8.4614 140 *	7.9389 90 *
Urban Boys Low SES	270.57	27.6890				1.5051 66 NS	1.1918 115 NS	2.3598 ** 39	1.9378 44 NS	4.4816* 120	7.0162 * 85	0.9832 41 NS	4.7795 89 *	5.0985 39 *
Urban Girls High SES	281.16	25.6861					0.6302 137 NS	4.9298 * 61	3.7265 * 66	8.6726* 142	12.3108* 107	2.4647 63 **	8.5535 111 *	8.2665 61 *
Urban Girls Avr. SES	278.24	25.0466						5.1132 * 110	3.6093 * 115	10.2989 191 *	15.0417* 156	2.2451 112 **	9.6706 160 *	8.8873 110 *
Urban Girls Low SES	253.67	16.7133							0.0391 39 NS	2.4740 115 **	5.9108 * 80	0.9861 36 NS	2.9423 84 *	3.4476 34 *

Table 4.26 continues.....

	Mean	SD	t-values											
			Urban Boys High SES	Urban Boys Averag SES	Urban Boys Low SES	Urban Girls High SES	Urban Girls Average SES	Urban Girls Low SES	Urban Boys High SES	Rural Boys Average SES	Rural Boys Low SES	Rural Girls High SES	Rural Girls Average SES	Rural Girls Low SES
Rural Boys High SES	253.96	29.1450								1.7918 120 NS	4.2045 * 85	0.8199 41 NS	2.2156 89 **	2.7436 39 **
Rural Boys Avr. SES	242.03	23.7357									4.8000 * 161	2.6635 117 *	0.8918 165 NS	1.7907 115 NS
Rural Boys Low SES	226.08	18.5112										4.8498 82 *	3.1380 130 *	1.4217 80 NS
Rural Girls High SES	261.60	30.2909											3.0232 86 *	3.4699 36 *
Rural Girls Avr. SES	238.47	26.3904												0.9891 84 NS
Rural Girls Low SES	233.11	18.0274												

*   Significant at 0.01 level
**   Significant at 0.05 level
NS   Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

From the table 4.26, it is observed that out of sixty six pairs of twelve groups, thirty eight pairs were significant at 0.01 level, six pairs at 0.05 level and

remaining twenty two pairs were not significant even at 0.05 level.

The t-values of the following twenty two pairs were not significant and hence it was concluded that there is no significant difference in the mean scientific attitude of,

- urban boys with high SES and urban boys with average SES,

- urban boys with high SES and urban boys with low SES,

- urban boys with high SES and urban girls with high SES,

- urban boys with high SES and urban girls with average SES,

- urban boys with high SES and rural girls with high SES,

- urban boys with average SES and urban boys with low SES,

- urban boys with average SES and urban girls with high SES,

- urban boys with average SES and urban girls with average SES,

- urban boys with average SES and rural girls with high SES,

- urban boys with low SES and urban girls with high SES,

- urban boys with low SES and urban girls with average SES,

- urban boys with low SES and rural boys with high SES,

- urban boys with low SES and rural girls with high SES,

- urban girls with high SES and urban girls with average SES,

- urban girls with low SES and rural boys with high SES,

- urban girls with low SES and rural girls with high SES,

- rural boys with high SES and rural boys with average SES,

- rural boys with high SES and rural girls with high SES,

- rural boys with average SES and rural girls with average SES,

- rural boys with average SES and rural girls with low SES,

- rural boys with low SES and rural girls with low SES,

- rural girls with average SES and rural girls with low SES,

Whereas, the remaining forty four t-values were significant at either 0.01 level or 0.05 level of significance. Out of forty four t-values of the specific pairs, six of them for the following pairs were found significant at 0.05 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of

- urban boys with low SES and urban girls with low SES,

- urban girls with high SES and rural girls with high SES,

- urban girls with average SES and rural girls with high SES,

- urban girls with low SES and rural boys with average SES,

- rural boys with high SES and rural girls with average SES,

- rural boys with high SES and rural girls with low SES,

The remaining thirty eight t-values were significant at 0.01 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of

- urban boys with high SES and urban girls with low SES,

- urban boys with high SES and rural boys with high SES,

- urban boys with high SES and rural boys with average SES,

- urban boys with high SES and rural boys with low SES,

- urban boys with high SES and rural girls with average SES,

- urban boys with high SES and rural girls with low SES,

- urban boys with average SES and urban girls with low SES,

- urban boys with average SES and rural boys with high SES,

- urban boys with average SES and rural boys with average SES,

- urban boys with average SES and rural boys with low SES,

- urban boys with average SES and rural girls with average SES,

- urban boys with average SES and rural girls with low SES,

- urban boys with low SES and rural boys with average SES,

- urban boys with low SES and rural boys with low SES,

- urban boys with low SES and rural girls with average SES,

- urban boys with low SES and rural girls with low SES,

- urban girls with high SES and urban girls with low SES,

- urban girls with high SES and rural boys with high SES,

- urban girls with high SES and rural boys with average SES,

- urban girls with high SES and rural boys with low SES,

- urban girls with high SES and rural girls with average SES,

- urban girls with high SES and rural girls with low SES,

- urban girls with average SES and urban girls with low SES,

- urban girls with average SES and rural boys with high SES,

- urban girls with average SES and rural boys with average SES,

- urban girls with average SES and rural boys with low SES,

- urban girls with average SES and rural girls with average SES,

- urban girls with average SES and rural girls with low SES,

- urban girls with low SES and rural boys with low SES,

- urban girls with low SES and rural girls with average SES,

- urban girls with low SES and rural girls with low SES,

- rural boys with high SES and rural boys with low SES,

- rural boys with average SES and rural boys with low SES,

- rural boys with average SES and rural girls with high SES,

- rural boys with low SES and rural girls with high SES,

- rural boys with low SES and rural girls with average SES,

- rural girls with high SES and rural girls with average SES,

- rural girls with high SES and rural girls with low SES,

It is also observed from table 4.26 that the mean scientific attitude of urban girls with high SES is maximum and that of the rural boys with low SES is minimum. With respect to the twelve groups which are formed by the combination of location of school, gender and SES of students, a definite trend does not seem to emerge which is different from the analysis carried out so far. However, it is observed that the mean scientific attitude of different pairs of urban students is not significant except with urban girls with low SES.

4.5.9 Location od School, Gender and Achievement of Students in Science.

In order to study the difference in the mean scientific attitude with respect to the location of school, gender and achievement in science of students, the following null hypothesis was formulated.

Ho 17 :There will be no significant difference in the mean scientific attitude of urban and rural, boys and

girls with respect to their achievement in science.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.27.

Table 4.27

Summary of ANOVA of Scientific Attitude of

Urban- Boys: High, Average, and Low Achievers in Science,

Girls: High, Average, and low Achievers in Science,

Rural- Boys: High, Average, and Low Achievers in Science, and

Girls: High, Average, and low Achievers in Science.

Sources of Variance	DF	SS	MSS	F-Value
Among	11	237035.30	21548.66	
Within	585	351040.40	600.07	35.91 *
Total	596	588075.70		

(Expected F-value for df=11/585 at 0.01 level is 2.29)

* Significant at 0.01 level

From table 4.27 it can be observed that the analysis of variance has yielded the 'F' value of 35.91 which is highly significant at 0.01 level. Hence, the

null hypothesis Ho17: "There will be no significant difference in the mean scientific attitude of urban and rural boys and girls with respect to their achievement in science" is rejected.

Significant differences at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.28.

Table 4.28

The Mean, SD and t-value of Scientific Attitude of,

Urban:　Boys: High, Average, Low　Achievers in Science,

　　　　 Girls:　High, Average, Low Achievers in Science,

Rural:　Boys: High, Average, Low Achievers in Science,

　　　　 Girls:　High, Average, Low Achievers in Science.

	Mean	SD	t-values											
			Urban Boys High ASCI	Urban Boys Averag ASCI	Urban Boys Low ASCI	Urban Girls High ASCI	Urban Girls Averag ASCI	Urban Girls Low ASCI	Urban Boys High ASCI	Rural Boys Average ASCI	Rural Boys Low ASCI	Rural Girls High ASCI	Rural Girls Average ASCI	Rural Girls Low ASCI
Urban Boys High ASCI	279.97	21.0288		2.7515 136 *	1.1426 84 NS	1.4356 133 NS	1.3291 146 NS	4.3186 * 100	4.1780 * 94	9.5977* 145	15.1294* 169	1.4884 81 NS	4.1593 105 *	12.708 142 *
Urban Boys Avr. ASCI	267.98	28.5756			0.2744 70 NS	3.6743 119 *	1.5067 132 NS	1.6835 NS 86	1.7713 80 NS	5.4531* 131	8.7267 * 155	0.4073 67 NS	2.0172 91 **	7.5153 128 *
Urban Boys Low ASCI	270.40	24.0716				1.7727 67 NS	0.5362 80 NS	1.3110 NS 34	1.4049 28 NS	3.3282* 79	4.7162 * 103	0.5241 15 NS	1.6259 39 NS	4.2987 76 *
Urban Girls High ASCI	285.69	24.3681					2.4993 129 **	5.0514 * 83	4.8899 * 77	9.8017* 128	14.2409 * 152	1.9658 64 NS	4.8268 88 *	12.416 125 *
Urban Girls Avr. ASCI	274.97	24.5068						3.1601 * 96	3.1303 * 90	7.7527* 141	12.1766 * 165	1.0320 77 NS	3.2375 101 *	10.369 138 *
Urban Girls Low ASCI	258.42	21.8424							0.1866 44 NS	3.0998 95 *	5.5904 * 119	0.4125 31 NS	0.5566 55 NS	4.7555 92 *

Table 4.28 continues...

	Mean	SD	t-values											
			Urban Boys High ASCI	Urban Boys Averag ASCI	Urban Boys Low ASCI	Urban Girls High ASCI	Urban Girls Averag ASCI	Urban Girls Low ASCI	Urban Boys High ASCI	Rural Boys Average ASCI	Rural Boys Low ASCI	Rural Girls High ASCI	Rural Girls Average ASCI	Rural Girls Low ASCI
Rural Boys High ASCI	257.20	21.3063								2.6625 89 *	4.8667 113 *	0.5075 25 NS	0.3682 49 NS	4.1540 86 *
Rural Boys Avr. ASCI	241.68	26.7838									2.7251 * 164	1.8953 76 NS	1.9728 100 NS	1.8386 137 NS
Rural Boys Low ASCI	231.24	20.8047										2.8724 100 *	3.8475 124 *	0.8066 161 NS
Rural Girls High ASCI	263.29	26.8206					·						0.7172 36 NS	2.5958 73 **
Rural Girls Avr. ASCI	254.45	31.4138												3.2686 97 *
Rural Girls Low ASCI	234.01	22.2192												

    *   Significant at 0.01 level
  **   Significant at 0.05 level
NS— Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

From the table 4.28, it is observed that out of sixty six pairs of twelve groups, thirty six pairs were significant at 0.01 level, three pairs at 0.05 level and

remaining twenty seven pairs were not significant even at 0.05 level.

The t-values of the following twenty seven pairs were not significant and hence it was concluded that there is no significant difference in the mean scientific attitude of,

- urban boys with high achievers in science and urban boys with low achievers in science,

- urban boys with high achievers in science and urban girls with high achievers in science,

- urban boys with high achievers in science and urban girls with average achievers in science,

- urban boys high achievers in science and rural girls high achievers in science,

- urban boys average achievers in science and urban boys low achievers in science,

- urban boys average achievers in science and urban girls average achievers in science,

- urban boys average achievers in science and urban girls low achievers in science,

- urban boys average achievers in science and rural boys high achievers in science,

- urban boys average achievers in science and rural girls high achievers in science,

- urban boys low achievers in science and urban girls high achievers in science,

- urban boys low achievers in science and urban girls average achievers in science,

- urban boys low achievers in science and urban girls low achievers in science,

- urban boys low achievers in science and rural boys high achievers in science,

- urban boys low achievers in science and rural girls high achievers in science,

- urban boys low achievers in science and rural girls average achievers in science,

- urban girls high achievers in science and rural girls high achievers in science,

- urban girls average achievers in science and rural girls high achievers in science,

- urban girls low achievers in science and rural boys high achievers in science,

- urban girls low achievers in science and rural girls high achievers in science,

- urban girls low achievers in science and rural girls high achievers in science,

- rural boys high achievers in science and rural girls high achievers in science,

- rural boys high achievers in science and rural girls average achievers in science,

- rural boys average achievers in science and rural girls high achievers in science,

- rural boys average achievers in science and rural girls average achievers in science,

- rural boys average achievers in science and rural girls low achievers in science,

- rural boys low achievers in science and rural girls low achievers in science,

- rural girls high achievers in science and rural girls average achievers in science,

Whereas, the remaining thirty nine t-values were significant at either 0.01 level or 0.05 level of significance. Out of thirty nine t-values of the specific pairs, three of them for the following pairs

were found significant at 0.05 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of,

- urban boys average achievers in science and rural girls average achievers in science,

- urban girls high achievers in science and urban girls average achievers in science,

- rural girls high achievers in science and rural girls low achievers in science,

The remaining thirty six t-values were significant at 0.01 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of,

- urban boys high achievers in science and urban boys average achievers in science,

- urban boys high achievers in science and urban girls low achievers in science,

- urban boys high achievers in science and rural boys high achievers in science,

- urban boys high achievers in science and rural boys average achievers in science,

- urban boys high achievers in science and rural boys low achievers in science,

- urban boys high achievers in science and rural girls average achievers in science,

- urban boys high achievers in science and rural girls low achievers in science,

- urban boys average achievers in science and urban girls high achievers in science,

- urban boys average achievers in science and rural boys average achievers in science,

- urban boys average achievers in science and rural boys low achievers in science,

- urban boys average achievers in science and rural girls low achievers in science,

- urban boys low achievers in science and rural boys average achievers in science,

- urban boys low achievers in science and rural boys low achievers in science,

- urban boys low achievers in science and rural girls low achievers in science,

- urban girls high achievers in science and urban girls low achievers in science,

- urban girls high achievers in science and rural boys high achievers in science,

- urban girls high achievers in science and rural boys average achievers in science,

- urban girls high achievers in science and rural boys low achievers in science,

- urban girls high achievers in science and rural girls average achievers in science,

- urban girls high achievers in science and rural girls low achievers in science,

- urban girls average achievers in science and urban girls low achievers in science,

- urban girls average achievers in science and rural boys high achievers in science,

- urban girls average achievers in science and rural boys average achievers in science,

- urban girls average achievers in science and rural boys low achievers in science,

- urban girls average achievers in science and rural girls average achievers in science,

- urban girls average achievers in science and rural girls low achievers in science,

- urban girls low achievers in science and rural boys average achievers in science,

- urban girls low achievers in science and rural boys low achievers in science,

- urban girls low achievers in science and rural girls low achievers in science,

- rural boys high achievers in science and rural boys average achievers in science,

- rural boys high achievers in science and rural boys low achievers in science,

- rural boys high achievers in science and rural girls low achievers in science,

- rural boys average achievers in science and rural boys low achievers in science,

- rural boys low achievers in science and rural girls high achievers in science,

- rural boys low achievers in science and rural girls average achievers in science, and

- rural girls average achievers in science and rural girls low achievers in science.

It is also observed from table 4.28 that the mean scientific attitude of urban girls high achievers in science is maximum and that of the rural boys low achievers in science is minimum.

4.5.10 Location of School, Gender, and General Achievement of Students.

In order to study the difference in the mean scientific attitude with respect to the location of school, gender and general achievement of students, the following null hypothesis was formulated,

Ho18 : There will be no significant difference in the mean scientific attitude of urban and rural, boys and girls with respect to their general achievement.

The hypothesis was tested using the statistical technique ANOVA and the results have been presented in the table 4.29.

Table 4.29

Summary of ANOVA of Scientific Attitude of,

Urban- Boys: High, Average, and Low General Achievers,

Girls: High, Average, and low General Achievers,

Rural- Boys: High, Average, and Low General Achievers, and

Girls: High, Average, and low General Achievers.

Sources of Variance	DF	SS	MSS	F-Value
Among	11	240232.11	21839.28	36.73 *
Within	585	347843.59	594.60	
Total	596	588075.70		

Expected F-value for df=11/585 at 0.01 level is 2.29)

* Significant at 0.01 level

From table 4.29, it is observed that the analysis of variance has yielded the 'F' value of 36.73 which is highly significant at 0.01 level. Hence, the null hypothesis Ho18 " There will be no significant difference in the mean scientific attitude of urban and rural, boys and girls with respect to their general achievement" is rejected.

Significant differences at this stage demand further analysis to study the differences in the mean scientific attitude of specific pairs of groups. To study the differences of specific pairs, t-tests has been employed and the result are presented in table 4.30.

Table 4.30

The Mean, SD and t-value of Scientific Attitude of

Urban: Boys: High, Average, Low General Achievers,

Girls: High, Average, Low General Achievers,

Rural: Boys: High, Average, Low General Achievers,

Girls: High, Average, Low General Achievers.

	Mean	SD	t-values											
			Urban Boys High GACH	Urban Boys Averag GACH	Urban Boys Low GACH	Urban Girls High GACH	Urban Girls Average GACH	Urban Girls Low GACH	Urban Boys High GACH	Rural Boys Average GACH	Rural Boys Low GACH	Rural Girls High GACH	Rural Girls Average GACH	Rural Girls Low GACH
Urban Boys High GACH	281.69	21.3207		3.5910 121 *	0.9291 89 NS	1.5320 116 NS	1.4158 132 NS	4.3718 * 101	2.6898 * 84	10.9956 141 *	14.8829* 153	0.9196 69 NS	6.5331 106 *	11.042 123 *
Urban Boys Avr. GACH	266.12	26.3145			1.5213 80 NS	4.6183 107 *	2.1875 123 **	0.8543 NS 92	0.5895 75 NS	5.6787* 132	8.5810 * 144	0.2661 60 NS	3.1988 97 *	6.3463 114 *
Urban Boys Low GACH	275.60	27.1219				1.8817 75 NS	0.0122 91 NS	2.1413 ** 60	1.6252 43 NS	5.6548* 100	7.6138 * 112	0.4565 28 NS	3.9460 65 *	6.2523 82 *
Urban Girls High GACH	286.96	23.2471					2.7194 118 *	5.3077 * 87	3.4259 * 70	11.2422 127 *	14.5584 * 139	1.3916 55 NS	7.2707 92 *	11.385 109 *
Urban Girls Avr. GACH	275.25	24.9206						3.0030 * 103	1.9117 86 NS	8.8072* 143	12.2310 * 155	0.4898 71 NS	5.2478 108 *	9.1543 125 *

Table 4.30 continues.....

	Mean	SD	Urban Boys High GACH	Urban Boys Averag GACH	Urban Boys Low GACH	Urban Girls High GACH	Urban Girls Average GACH	Urban Girls Low GACH	Urban Boys High GACH	Rural Boys Average GACH	Rural Boys Low GACH	Rural Girls High GACH	Rural Girls Average GACH	Rural Girls Low GACH
								t-values						
Urban Girls Low GACH	261.27	22.8694							0.0337 55 NS	4.4328 112 *	7.1177 * 124	0.5909 40 NS	2.3514 77 **	5.1950 94 *
Rural Boys High GACH	261.59	29.6029								2.6419 95 **	4.1577 107 *	0.5579 23 NS	1.6066 60 NS	3.2704 77 *
Rural Boys Avr. GACH	240.73	22.2538									3.2384 * 164	2.1375 80 **	1.2558 117 NS	1.3507 134 NS
Rural Boys Low GACH	230.16	21.0366										2.9864 92 *	3.4985 129 *	1.3912 146 NS
Rural Girls High GACH	269.67	23.5419											1.5870 45 NS	2.5315 62 **
Rural Girls Avr. GACH	246.49	28.6718												2.1833 99 *
Rural Girls Low GACH	235.59	24.6447												

* Significant at 0.01 level
** Significant at 0.05 level
NS Not Significant

Upper and lower numbers in each column under t-values indicate t-value and df respectively.

From the table 4.30, it is observed that out of sixty six pairs of twelve groups, t-values of thirty six pairs were significant at 0.01 level, seven pairs at 0.05 level and remaining twenty three pairs were not significant even at 0.05 level.

The t-values of the following twenty three pairs were not significant and hence it was concluded that there is no significant difference in the mean scientific attitude of,

- urban boys high general achievers and urban boys low general achievers,

- urban boys high general achievers and urban girls high general achievers,

- urban boys high general achievers and urban girls average general achievers,

- urban boys high general achievers and rural girls high general achievers,

- urban boys average general achievers and urban boys low general achievers,

- urban boys average general achievers and urban girls low general achievers,

- urban boys average general achievers and rural boys high general achievers,

- urban boys average general achievers and rural girls high general achievers,

- urban boys low general achievers and urban girls high general achievers,

- urban boys low general achievers and urban girls average general achievers,

- urban boys low general achievers and rural boys high general achievers,

- urban boys low general achievers and rural girls high general achievers,

- urban girls high general achievers and rural girls high general achievers,

- urban girls average general achievers and rural boys high general achievers,

- urban girls average general achievers and rural girls high general achievers,

- urban girls low general achievers and rural boys high general achievers,

- urban girls low general achievers and rural girls high general achievers,

- rural boys high general achievers and rural girls high general achievers,

- rural boys high general achievers and rural girls average general achievers,

- rural boys average general achievers and rural girls average general achievers,

- rural boys average general achievers and rural girls low general achievers,

- rural boys low general achievers and rural girls low general achievers,

- rural girls high general achievers and rural girls average general achievers,

Whereas, the remaining forty three t-values were significant at either 0.01 level or 0.05 level of significance. Out of forty three t-values of the specific pairs, seven of them for the following pairs were found significant at 0.05 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of,

- urban boys average general achievers and urban girls average general achievers,

- urban boys low general achievers and urban girls low general achievers,

- urban girls low general achievers and rural girls average general achievers,

- rural boys high general achievers and rural boys average general achievers,

- rural boys average general achievers and rural girls high general achievers,

- rural girls high general achievers and rural girls low general achievers,

- rural girls average general achievers and rural girls low general achievers,

The remaining thirty six t-values were significant at 0.01 level. Hence it was concluded that there is a significant difference in the mean scientific attitude of,

- urban boys high general achievers and urban boys average general achievers,

- urban boys high general achievers and urban girls low general achievers,

- urban boys high general achievers and rural boys
  high general achievers,

- urban boys high general achievers and rural boys
  average general achievers,

- urban boys high general achievers and rural boys
  low general achievers,

- urban boys high general achievers and rural girls
  average general achievers,

- urban boys high general achievers and rural girls
  low general achievers,

- urban boys average general achievers and urban
  girls high general achievers,

- urban boys average general achievers and rural
  boys average general achievers,

- urban boys average general achievers and rural
  boys low general achievers,

- urban boys average general achievers and rural
  girls average general achievers,

- urban boys average general achievers and rural
  girls low general achievers,

- urban boys low general achievers and rural boys
  average general achievers,

- urban boys low general achievers and rural boys
  low general achievers,

- urban boys low general achievers and rural girls
  average general achievers,

- urban boys low general achievers and rural girls
  low general achievers,

- urban girls high general achievers and urban
  girls average general achievers,

- urban girls high general achievers and urban girls
  low general achievers,

- urban girls high general achievers and urban boys
  high general achievers,

- urban girls high general achievers and urban boys
  average general achievers,

- urban girls high general achievers and urban boys
  low general achievers,

- urban girls high general achievers and rural girls
  average general achievers,

- urban girls high general achievers and rural girls low general achievers,

- urban girls average general achievers and urban girls low general achievers,

- urban girls average general achievers and rural boys average general achievers,

- urban girls average general achievers and rural boys low general achievers,

- urban girls average general achievers and rural girls average general achievers,

- urban girls average general achievers and rural girls low general achievers,

- urban girls low general achievers and rural boys average general achievers,

- urban girls low general achievers and rural boys low general achievers,

- urban girls low general achievers and rural girls low general achievers,

- rural boys high general achievers and rural boys low general achievers,

- rural boys high general achievers and rural girls low general achievers,

- rural boys average general achievers and rural boys low general achievers,

- rural boys low general achievers and rural girls high general achievers, and

- rural boys low general achievers and rural girls average general achievers.

It is also observed from table 4.26 that the mean scientific attitude of urban girls high general achievers is maximum and that of the rural boys low general achievers is minimum.

Thus far, we have seen that the level of possession of scientific attitude by secondary school students of Baroda is average; scientific attitude of students is correlated to SES, achievers in science, and general achievement of students; and the mean scientific attitude of different group of students is significantly different. As such these findings significantly do not convey any specific meaning unless they are situated in a proper context. This is the subject matter of discussion in the chapter to follow.