

## A CRITICAL STUDY OF SCIENTIFIC ATTITUDE AMONG THE STUDENTS OF SECONDARY SCHOOLS

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### Abstract

Science has become an internal part of human life. The World without science can't be imagined. Science has changed the world from modern civilization to scientific civilization by its wonderful achievements. One of the objectives of education is to develop scientific attitude in students. It has also been realized that without developing scientific attitude, any amount of knowledge in science contributes little to national development and to the process of social change. Now-a-days rate of admission of students in science courses is increasing at a rapid rate. Even parents are also driven strongly by the urge of admitting their children in science courses. But a more enrolment in science courses will not result any ultimate benefits of learners unless student's science learning is made effectively developing adequate scientific attitude through effective science teaching. The main objective of this study is to ascertain the level of scientific attitude possessed by the secondary school pupils and whether there is any difference regarding their gender or school type. The research questions were raised according to the objectives. Data was collected by using a standardized Scientific Attitude Scale (SAS) from different schools of Alipurduar district in West Bengal. Results show that scientific attitude in secondary school pupils is average and there exists significant difference in the attitude level between the schools regarding their locality and type of school. Findings suggest students should be given correct and proper knowledge through effective teaching and they should perform experiments, observe critically, and think rationally for resolving issues/assessing ideas or information.

**Keywords:** Scientific attitude, scientific attitude scale, Government, Private, Rural and Urban School.

### INTRODUCTION:

Science has brought about revolutionary changes in every walk of life. Its impact is visible everywhere and every aspect of our existence i.e. vocational, social, economic, political and cultural. Now a day's human being entirely depend on science for domestic amenities, industrial production, communication, agriculture, medicine, transport, defence

and others. "The progress, welfare and prosperity of nation depend on rapid, planned and sustained growth in both the quality and extent of education and research in science and technology"(Education Commission 1964-66). Right now science becomes a priority area in the education both at the compulsory as well as at the level of aspiration. The people processing positive attitude would get the benefit of science much as compared to those who lacked it. In modern time the chip aim of education is to enable a citizen to develop a science attitude of mind to think objectively to base his conclusion on tested data. With development of science attitude in individual is able to have the understanding and intellectual integrity to shift truth from the falsehood, facts from the propaganda and to reject the dangerous appeal of fanaticism and pressurize. Science attitude refers to an individual's outlook towards life. It means willingness adopt scientific approaches and procedures for resolving issues/ assessing ideas or information. Science attitude denotes interest or feeling towards studying science. It is the students "Disposition towards" "like" or "dislike" science while attitude in science means scientific approach assumed by an individual's for solving problems, assessing ideas and making decision.

Science is a very useful subject in school and range of this usefulness extend from simple problems to daily life to complex problems in various branches of higher scientific studies. Development of right kind of attitude should therefore be given due importance in the transaction of teaching learning process in school. Every student has educational aspiration. It is a decision which individuals make about what he wants to become in life and what course he wants to study. In order to ascertain whether it is their science attitude for having educational aspiration for a career in science or not, is the sincere attempt of the investigator.

### **SCIENTIFIC ATTITUDE:**

Scientific attitude is the combination of many qualities and virtues', which is reflected through the behaviour and action of the person. These persons are open minded, experiment oriented, systematic approach, possesses love for knowledge, intellectually honest. Unbiased, truthful and causes scientific temper and the expectations that the solution of the problem will come through the use of verified knowledge.<sup>1</sup> Some characteristics of scientific attitude in an individual are open mindedness, curiosity, judgement based on verified facts, ready to test and verify conclusion, faith in cause and effect relationship, be ready to reconsider his judgement, be free from superstitions and false beliefs, honest in recording, collecting and reporting scientific data, being critical in observations, accepting no conclusions a final or ultimate and more faith in the books written by specialists in their respective fields etc. Scientific attitude is a curiosity to know about once environment; the belief that nothing can happen without a cause and those occurrences that seem strange and mysterious can always be explained by natural causes.<sup>2</sup> Scientific attitude includes the following habits of thinking, viz. Habits of accuracy in all operations, including accuracy in calculation, observation and report, habit of looking for true causes and effects relationship and habit of suspended judgement, habits of criticalness, including that of self criticism.<sup>3</sup>

### **PRIVATE SCHOOLS:**

The schools managed by private organisations or persons, either partially or totally, were included in private schools. The public schools, Government recognised and aided schools were also included under private schools.

**GOVERNMENT SCHOOLS:**

The schools under the sole management of Government were included under Government schools. So the schools managed by Zilla Parishads, Municipalities or Government were included under private schools.

**URBAN SCHOOLS:**

The schools located in an urban area were considered urban schools. An urban area should satisfy the following conditions.

1. It should have a municipal corporation, cantonment board or notified town area committee, etc.
2. It should have a minimum population of five thousand.
3. At least 75% of its male working population should be engaged in non-agricultural pursuits.
4. It should have population of at least 400 persons per square kilometre.

**RURAL SCHOOLS:**

The schools located in rural area were considered as rural schools. A rural area should have a population below five thousand, with 75% of the population engaged in agricultural pursuits.

**OBJECTIVES OF THE STUDY:**

The following objectives are framed for the present study-

1. To study the level of scientific attitude possessed by the secondary school pupils.
2. To study the difference, if any between male and female students in respect to their scientific attitude.
3. To study the difference, if any, between rural and urban area students in respect of their scientific attitude.
4. To study the difference if any, among Government, Private and Govt. Sponsored school students in respect of their scientific attitude.

**RESEARCH QUESTIONS:**

Following questions arise in the mind of present researcher in this regard.

1. What is the level of scientific attitude possessed by the students of secondary schools?
2. How does the level of scientific attitude differ in the context to the gender of the students?

3. Is there any significant difference in scientific attitude of the students with respect to their area of the school (Urban and Rural)?
4. Does the type of school (Govt., Govt. Sponsored and Private) make difference in scientific attitudes of the students?

### **HYPOTHESES:**

The following null hypotheses were formulated for the purpose of testing –

- $H_1$  - Secondary school pupils will possess High Scientific attitude.
- $H_{01}$ - there is no significant difference between male and female students in respect to their scientific attitude.
- $H_{02}$ - There is no significant difference in the level of scientific attitude possessed by the pupils of rural and urban secondary schools.
- $H_{03}$ - There is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government secondary schools.
- $H_{04}$ - There is no significant difference in the level of scientific attitude possessed by the pupils of Government and Government Sponsored secondary schools.
- $H_{05}$ - There is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government Sponsored secondary schools.

### **SCOPE OF THE STUDY:**

The present study is mainly meant for the study of the level of possession of scientific attitude and scientific aptitude possessed by secondary school pupils and the relationship between them.

This study of scientific attitude is concerned with secondary school pupils, viz, tenth class pupils Alipurduar District. It is also concerned with sex, management of the school, locality of the school. The attitude items included in the scientific attitude scale are rationality, curiosity, aversion to superstitions, objectivity of intellectual beliefs and suspended judgement.

## **METHODOLOGY OF THE STUDY**

### **POPULATION:**

A population is usually defined as all the members of any well-defined class of people events or objects. In this study, the researcher has taken the secondary schools viz: Government, Government Sponsored, Private, Rural and Urban Schools of Alipurduar district as the population.

### **SELECTION OF SAMPLE:**

After finalizing the variables of the present study, consideration was given to whether the entire population is to be made the subject for data collection or a particular group is to be selected as representative of the whole population. The 'entire population' here refers to all the tenth class students of the secondary schools of Alipurduar District of West Bengal.

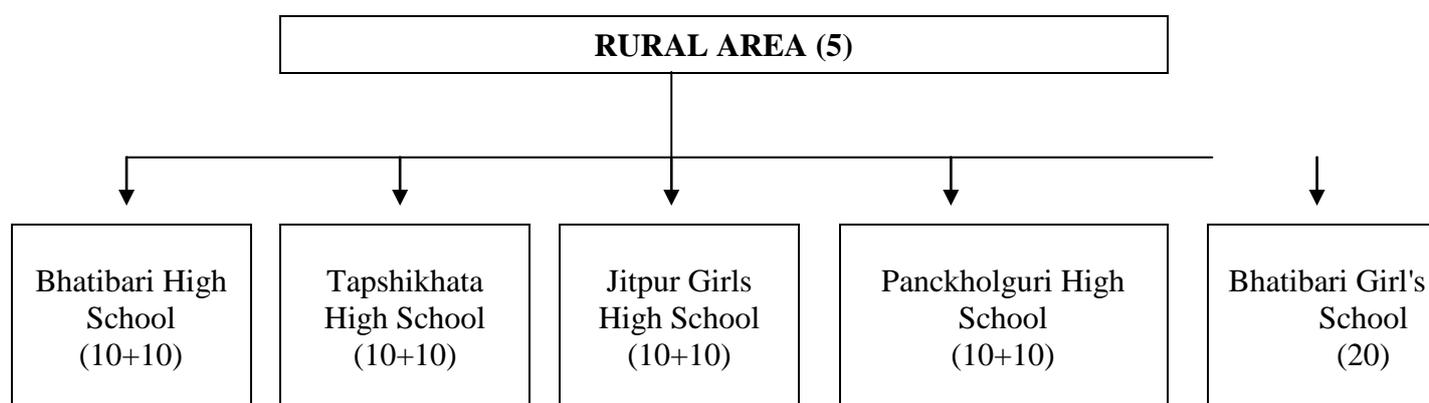
Of the two techniques, the second one namely, the selection of a group as a representative of the whole population was found to be more convenient and suitable. This technique leads to a considerable saving of time, efforts and finance. The number of pupils selected is small, and so it is possible to make a detailed and intensive study. This generally leads to more accurate and reliable results. As this sampling technique has many advantages, it was selected for the collection of data.

In any social research, various methods are utilised for selection and drawing of samples. After a detailed study of all these methods and considering the variables selected for the research work, the stratified sampling method was found to be most suitable.

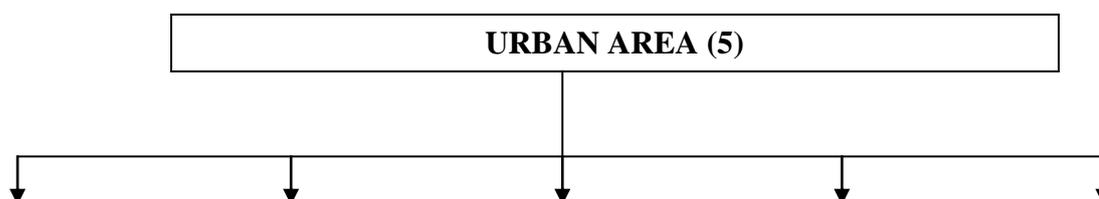
To collect data 400 students were selected from Government, Govt. Sponsored, Private and Urban, Rural Schools of which 200 were Boys and 200 were Girls.

The total sample includes- Rural students- 100, urban students- 100, Government students- 100, Govt. Sponsored students- 100, Private schools students- 100. The total sample was 400, Class- X pupils studying in secondary schools.

**Table: Sample Distribution in Rural Schools.**

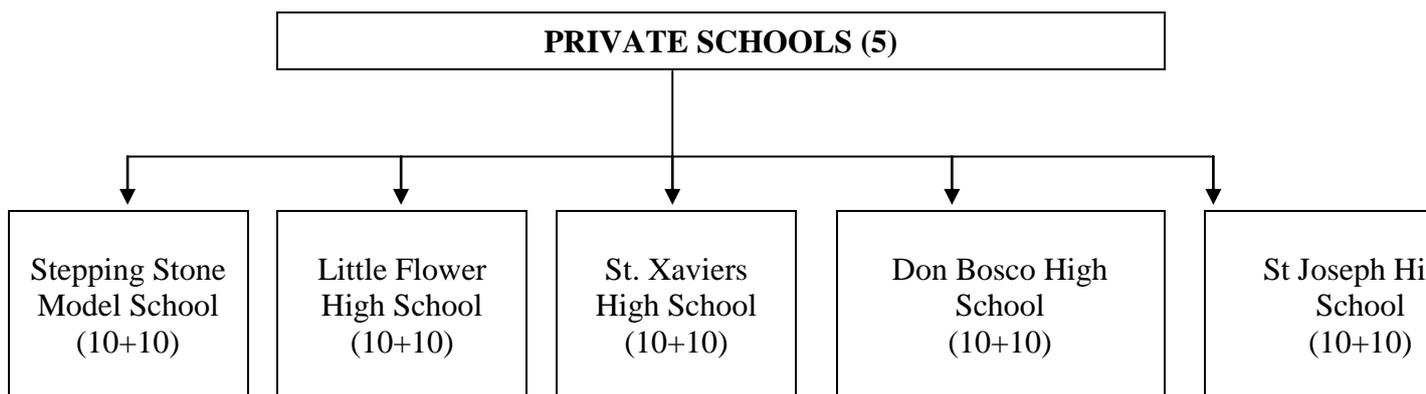


**Table: Sample Distribution in Urban Schools.**

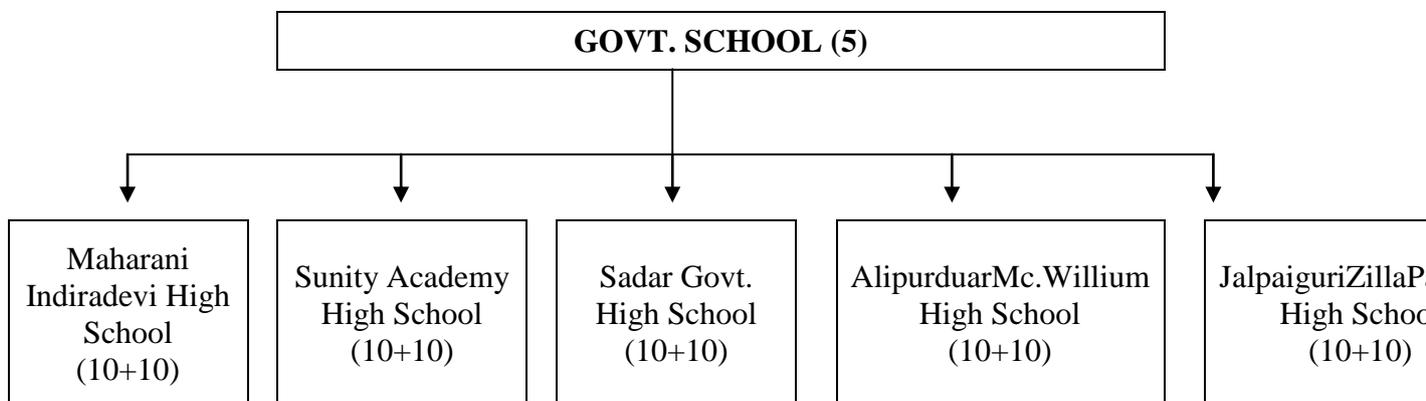


|                                |                                      |  |                                  |                                |
|--------------------------------|--------------------------------------|--|----------------------------------|--------------------------------|
| Alipurduar High School<br>(20) | Alipurduar Girls high School<br>(20) | Alipurduar Newtown Girls High School<br>(20) | Rabikanta High School<br>(10+10) | Santidebi Hi School<br>(10+10) |
|--------------------------------|--------------------------------------|--|----------------------------------|--------------------------------|

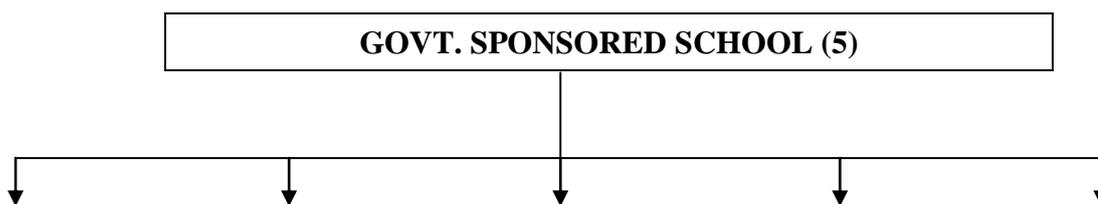
**Table: Sample Distribution in Private Schools.**



**Table: Sample Distribution in Govt. Schools.**



**Table: Sample Distribution in Govt. Sponsored Schools.**



|                               |   |                                |                                   |                                  |
|-------------------------------|---|--------------------------------|-----------------------------------|----------------------------------|
| Bhatibari High School<br>(20) | Alipurduar Newtown Girl's High School<br>(20) | Alipurduar High School<br>(20) | Tapsikhata High School<br>(10+10) | Alipurduar G High School<br>(20) |
|-------------------------------|---|--------------------------------|-----------------------------------|----------------------------------|

### VARIABLES OF THE STUDY:

The variables considered for the present study are –

- a. Boys versus girls
- b. Private versus government schools
- c. Rural versus Urban Schools
- d. Private versus govt. Sponsored schools
- e. Government versus govt. Sponsored schools, i.e.;
  - Dependent variables – Scientific Attitude of class X Students.
  - Independent variables are – Type of school, Area of school and sex of the students.

### SELECTION OF TOOL:

Among the tools developed in India, the scientific Attitude scale standardized by Dr. J.K. Sood and R.P. Sandhya is found most suitable for the present study. The validity of the Scientific Attitude Scale (SAS) was found 0.83 and the reliability as calculated by Split-Half method was found to be 0.88.

The Scientific Attitude Scale consists of six dimensions based on the instrument developed by Billech and Zakharia Das (1975), which consisted of six dimensions, viz. Open-mindedness, curiosity, aversion to superstitions, objectivity of intellectual beliefs and suspended judgement.

### ANALYSIS AND INTERPRETATION OF THE DATA:

The total score of Scientific Attitude of each pupil was taken to find out the level of scientific attitude possessed by each sub-sample as well as total sample of the study. The maximum score that a pupil can get is 180 and minimum is 36. In the present study, the highest score secured by a pupil was 176 and the lowest was 101.

For the purpose of classification of the level of scientific attitude possessed by the sample, the scientific attitude level was categorized by using normal probability of distribution.

**TABLE NO – 1 (Scoring of the test)**

| Score | Level of Scientific Attitude |
|-------|------------------------------|
|-------|------------------------------|

|           |         |
|-----------|---------|
| 36 – 114  | Low     |
| 115 – 149 | Average |
| 150 – 180 | High    |

According to the problem, there are four (4) hypotheses. The raw data are collected from different secondary schools of Alipurduar district, West Bengal. After data collection mean, medium, standard deviation, and 't' value were calculated. On the basis of analysis, significance or insignificance of the null hypothesis is to be found out.

#### FORMULA USED:

$$1. \text{ MEAN (M)} = \frac{\sum fx}{N}$$

Where,  $\sum fx$  = total frequency

N = total no. Of cases

$$2. \text{ Median (Q}_2) = L + \left( \frac{\frac{N}{2} - F}{fm} \right) \times i$$

L = lower limit of the median class

N = total score

F = Cumulative frequency of the previous class of median class

fm = frequency of the median class

i = class length

$$3. \text{ Standard deviation } (\sigma) = \frac{\sqrt{\sum fd^2}}{N}$$

Where, f = frequency

D = deviation of the midpoint of the class intervals from the mean.

$$4. \text{ Formula for 't' Test} = \frac{|M_1 - M_2|}{\sqrt{\frac{SD_1^2}{N_1} + \frac{SD_2^2}{N_2}}}$$

Where,  $M_1, M_2$  = Means of two groups

$SD_1, SD_2$  = standard deviation of two groups

$N_1$  = size of the sample of first group.

$N_2$  = size of the sample of second group.

5. Degree of freedom:-

$$df = (N_1 + N_2) - 2$$

Where, df = degree of freedom

$N_1$  = size of the sample of first group.

$N_2$  = size of the sample of second group.

The obtained 't' value will be used to detect the level of significance at 0.05 level of confidence.

**Hypothesis 1(H<sub>1</sub>):** *Secondary School Pupil will possess High Scientific Attitude.*

To test the validity of hypothesis, 1, the total scores of the entire sample were calculated to arrive at mean and standard deviation of the sample. The results are as follows.

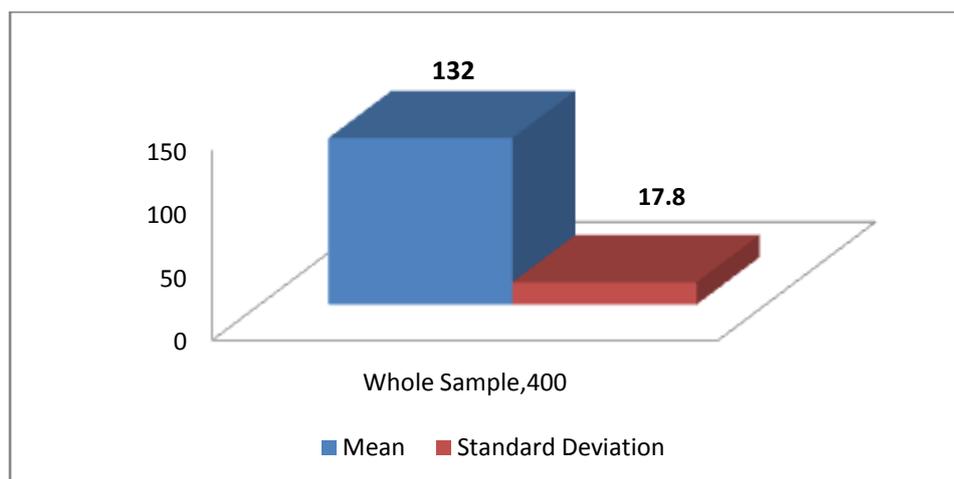
**Table- 2: Level of Scientific Attitude Possessed by the whole sample**

| Sample | Mean  | Standard deviation |
|--------|-------|--------------------|
| 400    | 132.1 | 17.8               |

The pupils studying in secondary schools hold average level of scientific attitude.

Therefore, the hypothesis that secondary school pupils will possess high scientific attitude can be rejected as the pupils hold an average scientific attitude

**Level of Scientific Attitude Possessed by the whole sample:**



**HYPOTHESIS (H<sub>01</sub>):-** *There is no significant difference in the level of scientific attitude possessed by boys and girls of secondary schools.*

Here dependent variable is Scientific Attitude of class X Students and Independent variables are boys and girls.

A comparison of the scientific attitude scores of boys and girls is made to find out the difference in the level of scientific attitude possessed by them. The data are as follows:

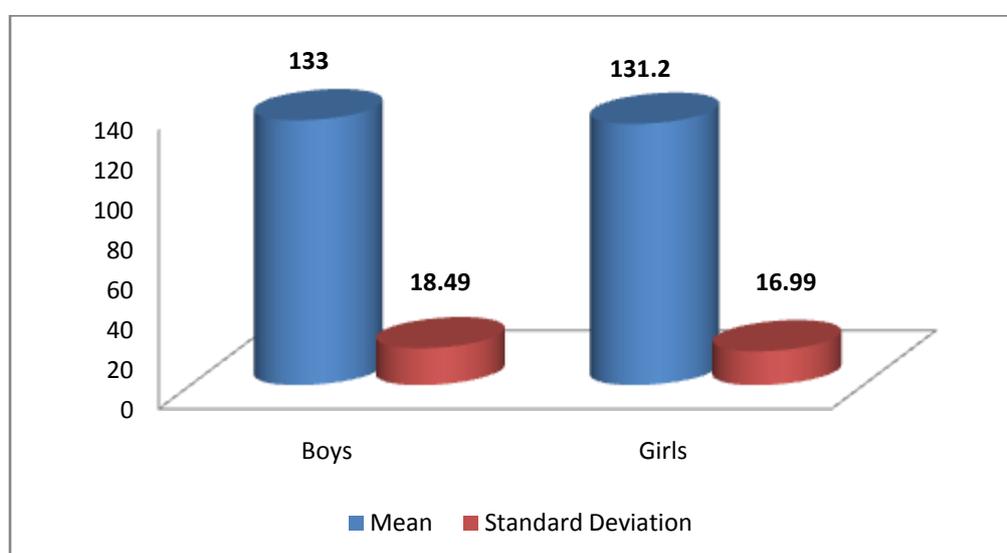
**Table- 3: Comparison of Scientific attitude of Boys and Girls**

| Variable | Sample | Mean | Standard deviation | 't'- value | Remarks |
|----------|--------|------|--------------------|------------|---------|
|----------|--------|------|--------------------|------------|---------|

|  |     |       |       |       |                               |
|--|-----|-------|-------|-------|-------------------------------|
| Boys                                   | 200 | 133   | 18.49 | 0.715 | Not significant at 0.05 level |
| Girls                                  | 200 | 131.2 | 16.99 |       |                               |
| df = 398, value of 't' at 0.05 is 1.97 |     |       |       |       |                               |

It can be seen that boys and girls of secondary schools hold average scientific attitude. It can also be seen clearly that there is no significant difference in the level of scientific attitude possessed by both boys and girls as 't' value is 1.97 which is greater than the tabulated t value 0.715 with df=398. Therefore, the hypothesis that there is no significant difference in the level of scientific attitude possessed by boys and girls of secondary schools can be accepted.

### Comparison of Scientific attitude of Boys and Girls:



**HYPOTHESIS ( $H_{02}$ ):** *There is no significant difference in the level of scientific attitude possessed by the pupils of rural and urban secondary schools.*

Here dependent variable is Scientific Attitude of class X Students and Independent variables are rural and urban secondary schools.

A comparison is made to identify the difference in the possession of scientific attitude by the pupils residing in urban and rural areas. The results are as follows:

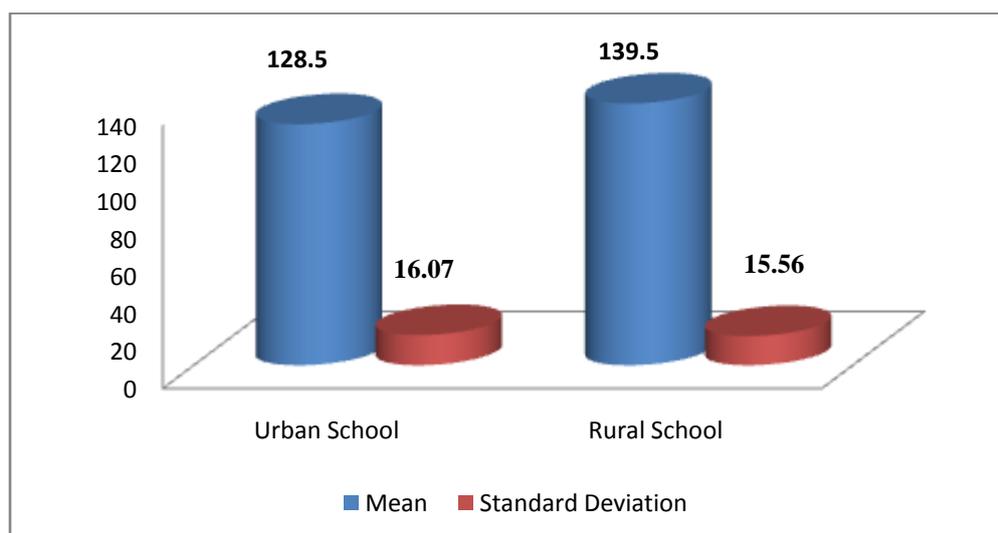
**Table- 4: Comparison of Scientific Attitude of the pupils of urban and rural schools**

| Variable | Sample | Mean  | Standard deviation | 't'- value | Remarks                   |
|----------|--------|-------|--------------------|------------|---------------------------|
| Rural    | 100    | 128.5 | 16.07              | 2.45       | significant at 0.05 level |
| Urban    | 100    | 139.5 | 15.56              |            |                           |

|  |
|--|
| df = 198, value of 't' at 0.05 is 1.97 |
|--|

Therefore, the hypothesis that there is no significant difference in the level of scientific attitude possessed by the pupils of rural and urban secondary schools can be rejected.

### Comparison of Scientific Attitude of the pupils of urban and rural schools:



**HYPOTHESIS ( $H_{03}$ ):** *There is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government secondary schools.*

Here dependent variable is Scientific Attitude of class X Students and Independent variables are Private and Government secondary schools.

To test the validity of the hypothesis, a comparison is made. The values are given below:

**Table 5: Comparison of Scientific Attitude of the pupils of Private and Government secondary schools.**

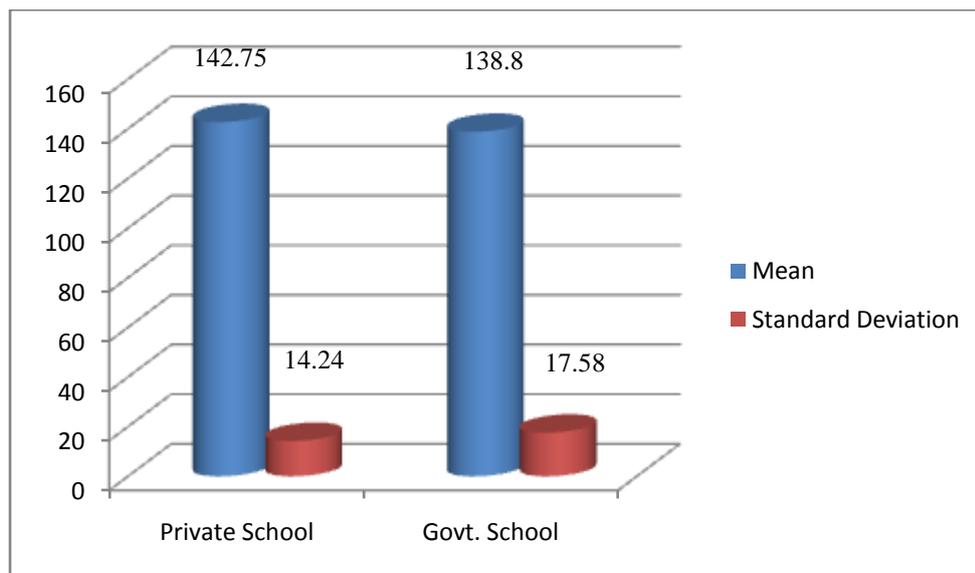
| Variable                               | Sample | Mean   | Standard deviation | 't'- value | Remarks                       |
|--|--------|--------|--------------------|------------|-------------------------------|
| Private school                         | 100    | 142.75 | 14.24              | 0.87       | Not significant at 0.05 level |
| Govt. school                           | 100    | 138.8  | 17.58              |            |                               |
| df = 198, value of 't' at 0.05 is 1.97 |        |        |                    |            |                               |

Above table shows that calculated value of "t" is 0.87 which is less than the tabulated value 1.97, so there is no significant difference in the level of scientific attitude possessed by the

pupils of private and government schools. Although there is a significant difference in the mean scores of the groups.

Therefore the hypothesis that there is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government secondary schools can be accepted.

### Comparison of Scientific Attitude of the pupils of Private and Government secondary schools:



**HYPOTHESIS ( $H_{04}$ ):** *There is no significant difference in the level of scientific attitude possessed by the pupils of Government and Government Sponsored secondary schools.*

Here dependent variable is Scientific Attitude of class X Students and Independent variables are Government and Government Sponsored secondary schools.

A comparison was made between the pupils studying in Government and Government sponsored schools regarding the scientific attitude scores to test the validity of hypothesis. The details are shown in the table.

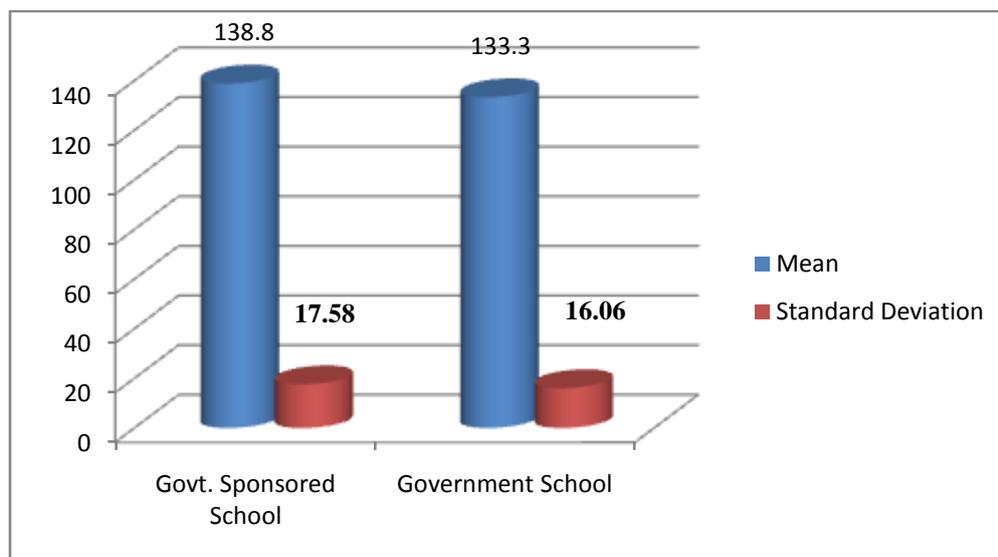
**Table- 6: Comparison of Scientific Attitude of the pupils of Government sponsored and Government secondary schools.**

| Variable                               | Sample | Mean  | Standard deviation | 't'- value | Remarks                       |
|--|--------|-------|--------------------|------------|-------------------------------|
| Government                             | 100    | 138.8 | 17.58              | 1.15       | Not significant at 0.05 level |
| Government sponsored                   | 100    | 133.3 | 16.06              |            |                               |
| df = 198, value of 't' at 0.05 is 1.97 |        |       |                    |            |                               |

The table shows that there is no significant difference between the pupils of government and government sponsored school regarding their scientific attitude because the calculated value of “t” is 1.15 which is less than the tabulated value of t 1.97. Although there is significant difference in the mean scores of the two groups.

Therefore the hypothesis that there is no significant difference in the level of scientific attitude possessed by the pupils of Government and Government Sponsored secondary schools can be accepted.

### Comparison of Scientific Attitude of the pupils of Government sponsored and Government secondary schools:



**HYPOTHESIS ( $H_{05}$ ):** *There is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government Sponsored secondary schools.*

Here dependent variable is Scientific Attitude of class X Students and Independent variables are Private and Government Sponsored secondary schools.

A comparison is made to identify the difference in the possession of scientific attitude by the pupils of Private and Government Sponsored secondary schools. The results are as follows:

**Table- 7: Comparison of Scientific Attitude of the pupils of private and Government sponsored secondary schools.**

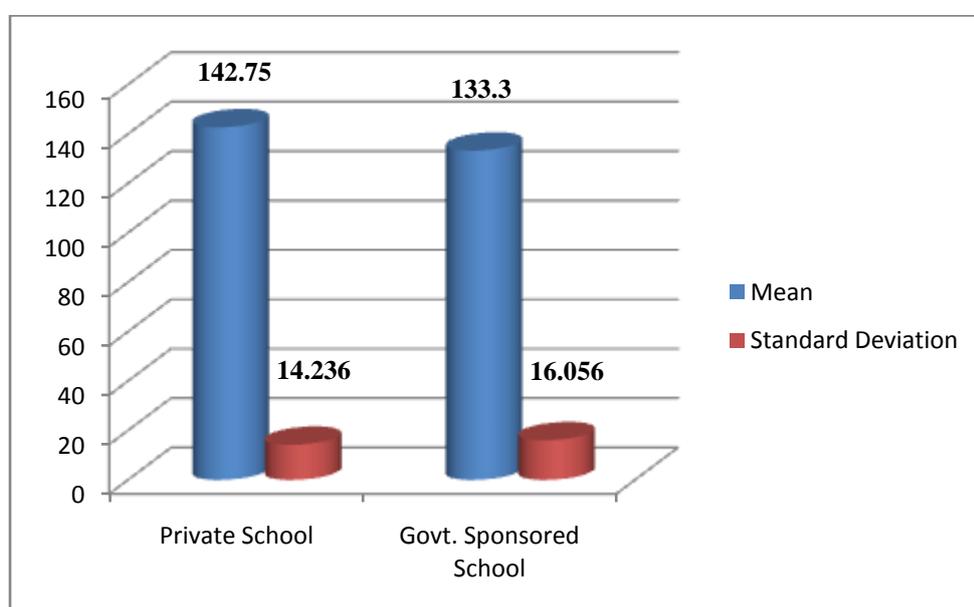
| Variable             | Sample | Mean   | Standard deviation | 't'- value | Remarks                   |
|----------------------|--------|--------|--------------------|------------|---------------------------|
| Private              | 100    | 142.75 | 14.236             | 2.19       | Significant at 0.05 level |
| Government sponsored | 100    | 133.3  | 16.056             |            |                           |

df = 198, value of 't' at 0.05 is 1.97

The table shows that obtained mean scores are 142.75 and 133.3 and standard deviations are 14.236 and 1.056 of private and Govt. sponsored schools respectively. By employing "t" test value is 2.19 which is greater than the tabulated value of t. So there exists significant difference in the level of scientific attitude possessed by the pupils of private and government sponsored schools.

Therefore the hypothesis that there is no significant difference in the level of scientific attitude possessed by the pupils of Private and Government Sponsored secondary schools can be rejected.

### Comparison of Scientific Attitude of the pupils of private and Government sponsored secondary schools:



### Findings of the study:

The findings of this study are as follows-

1. The scientific attitude in secondary school pupils is average.
2. There exists no significant difference in the level of scientific attitude between boys and girls.
3. There is significant difference in the scientific attitude of the students according to the locality of the schools. Urban students have high level of scientific attitude than rural students.
4. There exists significant difference in the scientific attitude of students according to the type of management. Private school students are better than government and government sponsored school students in their scientific attitude.

**Conclusion:**

Science education has become part and parcel of human life without which we can't live comfortably. Identifying the multifarious values of science education it is included in the school curriculum as a compulsory subject.

Scientific attitude is necessary to an individual to lead a smooth and comfortable life in the society.<sup>4</sup> An individual with good scientific attitude can understand the phenomenon of nature and human behaviour and accordingly he will behave to prove himself an ideal individual in his own family as well as in the society in which he lives.<sup>5</sup>

In this research, the investigator has studied about the scientific attitude possessed by the students of secondary schools. The results showed that students of secondary schools. The results showed that students have only the average level of scientific attitude. Student's scientific attitude does not differ with respect to gender but differ with respect to their locality, type of management of the schools in which they are studying.<sup>6</sup> The science teacher and the management of the schools are perhaps mainly responsible for developing scientific attitude among students.<sup>7</sup> They should provide adequate opportunities to study the biography of scientists, to do simple experiments and laboratory work and to develop problem solving ability. The government, management, family and guardians of pupils also cooperate with the teachers to develop scientific attitude.

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