



## STUDY OF ACHIEVEMENT IN SCIENCE IN RELATION TO SCIENTIFIC ATTITUDE AND SCIENTIFIC APTITUDE AMONG SECONDARY SCHOOL STUDENTS

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### Abstract

*The objective of the study is to analyze the influence of scientific attitude and scientific aptitude on the academic achievement of secondary school students based on a survey. The research consisted of 200 science students (100 Male and 100 Female) in 9th grade. The scientific attitude scale developed by Dr. S.C Gakhar and Dr. Amandeep Kaur and the scientific aptitude scale developed by Dr. Nagappa P. Shahapur and Dr. C.R. Rao were used in the research. In order to analyze data obtained from the survey, various statistical tools were used such as t-test, etc in order to reach the final conclusion.*

**Keywords:** Scientific Attitude, Scientific Aptitude, Achievement, Secondary School, Students



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### Introduction

Education is the process of bringing desirable changes in the behavior of human beings. It can also be defined as the process of imparting or acquiring knowledge and habits through instruction or study. Education comprises instruction, teaching, information gathering, knowledge gathering and transmittance, study and reflection, discussion, and demonstration of pilot programs. Imparting knowledge is only a fragment of education. Real education strives to awaken the curiosity of children, develop creative and critical thinking in them and inculcate desirable values. Education is the means to a better way of living for many and for others. It is the process of teaching required skills. Education is an activity or a process, which transforms the behavior of a person from instinctive behavior to human behavior. Mangal, 2005.

## **Changing the Nature of the Science Curriculum**

The National Curriculum for Primary and Secondary Education: A Framework (1985) has highlighted the need for a core curriculum where science will be an integral part from 1st to 10th Grade. Science will be started as environmental studies at the lower primary stage and will be taken as science at the upper primary stage. The main thrust is towards the realization of developmental and integrative aspects of education.

## **Developing Scientific Attitude among the Children**

It is the responsibility of the science teachers to develop a scientific attitude in children. The following methods can be used to develop a scientific attitude in children.

**i. Practical Work:** More activities must be given. Individual practical methods and individual projects can be assigned to students. Students are to follow intellectual honesty.

**ii. More Applied Knowledge:** All the details and knowledge gathered should be correlated to a life situation. They must be made to think scientifically. How, why, when, what, and where must be the questions put forward by the students.

**iii. Discussion:** The teacher should give more chances for discussion. Freedom and decision-making are to be stressed. Leadership qualities can be developed through the discussion method when the leader takes the responsibilities.

**iv. Wide Reading:** Students must be encouraged to read more and more reference books. They must be encouraged to write articles in college magazines. Model making, running a science club, and reading science news may induce a scientific attitude.

**v. Co-curricular Activities:** Apart from normal curricular activities, co-curricular and extra-curricular activities can be arranged. Science clubs, literary associations, conducting science fairs, and exhibitions, writing articles in science, and conducting excursions may help students to develop scientific attitudes.

**vi. Curriculum:** An enthusiastic teacher can help in developing a scientific attitude through the curriculum. The teacher should suggest projects which give the pupils training in problem-solving.

## **Achievement**

The phrase "achieves" signifies the level of educational development of an individual as determined by the score of an achievement test designed to measure the knowledge or proficiency in theoretical study acquired by normal education. Achievement means the extent to which the learner has learned the subject over a period of study.

## **Importance of the Study**

Science, in the curriculum, provides certain values which are not provided by any other subject. All the school subjects are taught because they provide liberal education; they are part of the equipment and preparation for life which we expect the school to give to its pupils so that they may play their part in the community as intellectual citizens. Science takes its place side by side with other subjects as an essential element of one's education. It affords knowledge of certain facts and laws and insight into methods and data peculiar to the domain of science. However, the inclusion of any subject in the curriculum should satisfy intellectual, utilitarian, vocational, cultural, moral, and aesthetic values.

The review of related literature is a crucial aspect of any research. No research begins in a vacuum. Knowledge of what has already been done or is being done is essential for doing research in any field. Researcher takes advantage of the knowledge, which has accumulated in the past as a result of constant human endeavor.

Bandyopadhyay, (1984) studied environmental Influence, Academic Achievement, and Scientific Aptitude as Determinants of Adolescents' Attitudes towards the Science Stream. The objects of the study were (i) to assess adolescent students' attitudes toward science, and (ii) to find out the environmental and academic factors that influenced their attitude toward science. The dependent variable was the attitude towards science, and three categories of independent variables were environmental influence measured by parental education, income and socioeconomic status, the influence of teachers and peers, and vocational value of science; achievements in language, physical science, life science and social study; and scientific aptitud measured by numerical ability, mechanical reasoning and space relations.

SajnaJaleel and Sherly Philip (2017) clarified that teaching science makes students explore and learn new things in their world. Being an ideal subject, science makes students interested and helps to establish scientific attitudes. Scientific attitudes refer to the planned behavioral arrangements of people who plan to become good scientists. Respect for facts, integrity, imagination, versatility, curiosity, objectivity, and skepticism is part of scientific attitudes.

G.C. of Jampannanavar. Yadawad S.B. (2018) clarified that science is one of the human activities developed by man to fulfill the needs and desires of man. The main motive force in scientific discovery has been disinterested curiosity. In the prosecution of science, the 'quest

for truth' became the prevailing motive. Science has become a component of general education now.

### **Rational of the Study**

In India, various commissions, committees, and policies have expressed their views with respect to the importance of science in enabling national development and progress and this has helped in fostering an interest in science studies. Aptitude is not totally inherited quality one can modify it if not completely but to a considerable extent. One who has a scientific aptitude, not only perceives the knowledge correctly but also applies it in understanding new situations.

### **Objectives of the Study**

- ❖ To study achievement in science of secondary school students with respect to gender.
- ❖ To study achievement in science of secondary school students with respect to locale.
- ❖ To study scientific aptitude in the science of secondary school students with respect to gender.
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- ❖ To study scientific attitude in the science of secondary school students with respect to gender.
- ❖ To study scientific attitude in the science of secondary school students with respect to locale.
- ❖ To study the relationship between scientific attitude & achievement in science of secondary school.
- ❖ To study the relationship between scientific aptitude & achievement in science of secondary school.

### **Hypotheses**

- ❖ There exists no significant difference in achievement in science of secondary school Male and Female students.
- ❖ There exists no significant difference in scientific attitude in the science of secondary school Rural and Urban students.
- ❖ There exists no significant difference in achievement in science of secondary school Rural and Urban students.
- ❖ There exists no significant difference in scientific attitude in the science of secondary

school Male and Female students

- ❖ There exists no significant difference in scientific aptitude in the science of secondary school Rural and Urban students.
- ❖ There exists no significant difference in scientific aptitude in the science of secondary school Male and Female students.
- ❖ There exists no significant relationship between scientific attitude and achievement in science of secondary school students.
- ❖ There exists no significant relationship between scientific aptitude and achievement in science of secondary school students.

### Delimitation of the Study

The present study has been delimited to only 200 secondary school students(Male/Female) from Government and Private institutions in Amritsar city.

### Methodology

The descriptive technique has been used.

The descriptive survey method has been adopted for the present study.

### Population and Sample

The population of this study will consist of IX<sup>th</sup> grade science students. For this study sample of, 200 science students (100 Male and 100 Female) of IX<sup>th</sup> standard has been taken randomly from four schools in Amritsar city.

### Tools Used

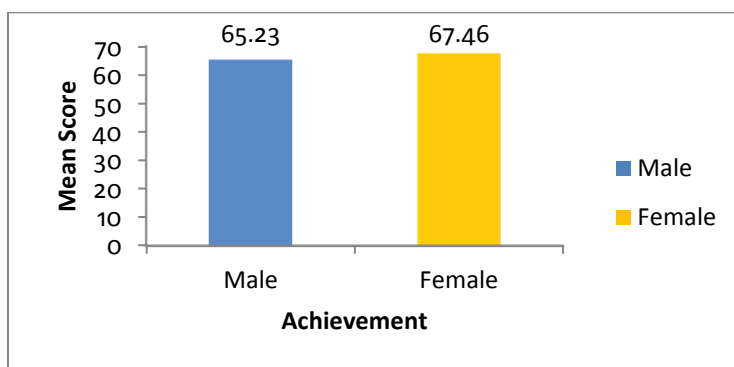
1. Scientific attitude scale (2004) Dr. S.C Gakhar and Dr. Amandeep Kaur
2. Scientific aptitude scale Dr. Nagappa P. Shahapur and Dr. C.R. Rao

### Analysis

**Table 1: Comparison of Mean Score and Standard Deviation of Achievement in Science of Secondary School Male and Female Students**

| Variable    | Gender | N   | df  | Mean    | Std. Deviation | Std. Error Mean | Error T-test |
|-------------|--------|-----|-----|---------|----------------|-----------------|--------------|
| Achievement | Male   | 100 | 198 | 65.2323 | 7.24935        | .72493          | 1.995*       |
|             | Female | 100 |     | 67.4607 | 8.49928        | .84993          |              |

\*\* Significant at the 0.01 level.



The mean score of achievement in science for secondary school students Male is 65.2323 and for females is 67.4607. Achievement of Female students is high as compared to Male students as shown above in Table 1. There is a significant difference between the achievement in science of Male and Female students while the t value is 1.995. Which is greater than the corresponding tabled value at the 0.01 level. The null hypothesis stating "There exists no significant difference between in achievement of male and female students of secondary school" was rejected.

**Table 2: Comparison of Mean Score and Standard Deviation of Scientific Attitude in Science of Secondary School Urban and Rural Students**

| Variable            | Locale | N   | df  | Mean   | Std. Deviation | Std. Error Mean | T-test |
|---------------------|--------|-----|-----|--------|----------------|-----------------|--------|
| Scientific Attitude | Urban  | 100 | 198 | 228.82 | 10.085         | 1.008           | 8.451* |
|                     | Rural  | 100 |     | 215.14 | 12.661         |                 |        |

\*\* Significant at the 0.01 level.

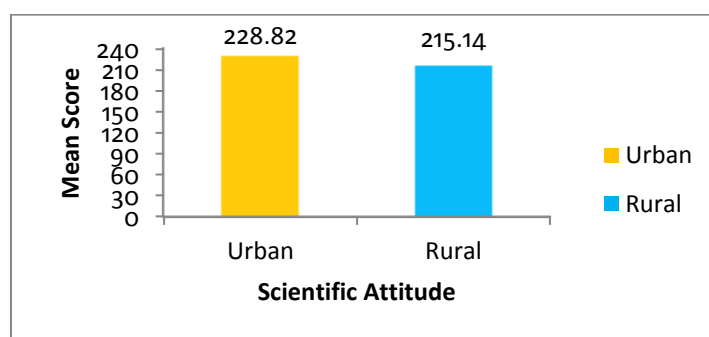
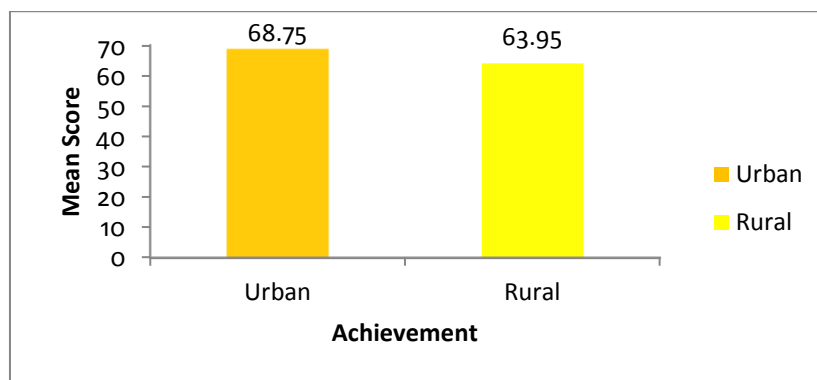


Table 2 reveals that the mean score of the scientific attitude in secondary school in the Urban area is 228.82. On the other hand in rural areas is 215.14. There is a significant difference in scientific attitude between the Urban and Rural areas. while the t value varies from 8.451. Which is greater than the corresponding tabled value at the 0.01 level. Hence it is concluded that the hypothesis null hypothesis stating "There exists no significant difference between in scientific attitude of rural and urban of secondary school" was rejected.

**Table 3: Comparison of Mean Score and Standard Deviation of Achievement in Science of Secondary School Urban and Rural Students**

| Variable    | Locale | N   | df  | Mean    | Std. Deviation | Std. Error Mean | T-test |
|-------------|--------|-----|-----|---------|----------------|-----------------|--------|
| Achievement | Urban  | 100 | 198 | 68.7477 | 7.80821        | .78082          | 4.466* |
|             | Rural  | 100 |     | 63.9453 | 7.39477        | .73948          |        |

\*\* Significant at the 0.01 level.

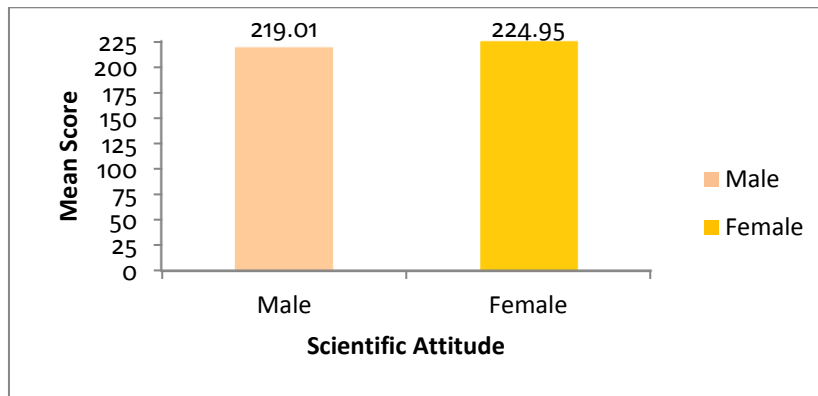


The mean and SD values of achievement in science according to the locale of the students are presented above in Table 3. The mean score of achievement in science of secondary school students in which urban have higher achievement in science scores 68.7477 than in Rural 63.9453. The mean and SD scores are also presented according to the locale of the students in the following graph. Obtained 't' value is 4.466 Which is greater than the corresponding tabled value at the 0.01 level. The null hypothesis stating "There exists no significant difference between in achievement of rural and urban students of secondary school" was rejected.

**Table 4: Comparison of Mean Score and Standard Deviation of Scientific Attitude in Science of Secondary School Male and Female Students**

| Variable            | Gender | N   | df  | Mean   | Std. Deviation | Std. Error Mean | T-test |
|---------------------|--------|-----|-----|--------|----------------|-----------------|--------|
| Scientific Attitude | Male   | 100 | 198 | 219.01 | 13.138         | 1.314           | 3.228* |
|                     | Female | 100 |     | 224.95 | 12.888         | 1.289           |        |

\*\* Significant at the 0.01 level.



The mean and SD values of scientific attitude in the science of the students are presented above in Table 4. The mean score in the scientific attitude of secondary school in which Female score is 224.95 and where Male is 219.01. So there is a significant difference between the scientific attitude in science in Male and Female students. Obtained 't' value is 3.228 Which is greater than the corresponding tabled value at the 0.01 level. The null hypothesis stating "There exists no significant difference between in scientific attitude of Male and Female Students of secondary school" was rejected.

**Table 5: Comparison of Mean Score and Standard Deviation of Scientific Aptitude in Science of Secondary School Urban and Rural Students**

| Variable            | Locale | N   | df  | Mean  | Std. Deviation | Std. Error Mean | T-test |
|---------------------|--------|-----|-----|-------|----------------|-----------------|--------|
| Scientific Aptitude | Urban  | 100 | 198 | 55.98 | 6.843          | .684            | 1.425* |
|                     | Rural  | 100 |     | 54.56 | 7.240          |                 |        |

\*\* Not Significant at the 0.01 level.

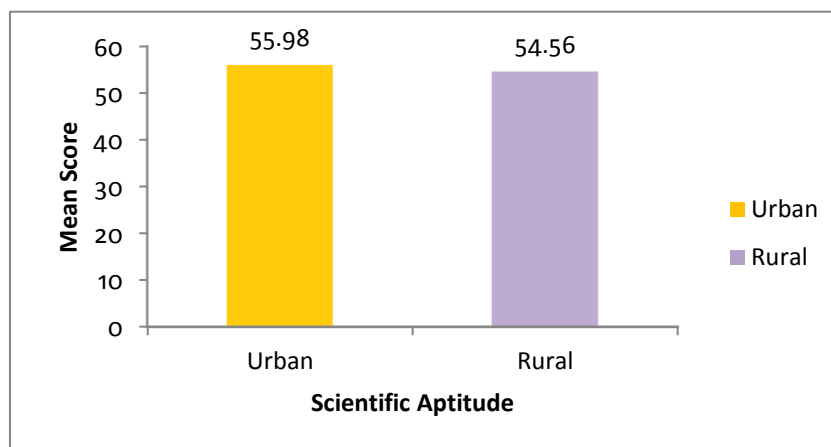


Table 5 reveals that the mean score of scientific aptitude of secondary school students in Urban is 55.98 and while the Rural is 54.56. There is no significant difference in scientific attitude in science in Urban and Rural students. Obtained 't' value is 1.425 Which is lesser than



the corresponding tabled value at the 0.01 level. The null hypothesis stating "There exists no significant difference between in scientific aptitude of Urban and Rural students in the science of secondary school" was not rejected.

**Table 6: Comparison of Mean Score and Standard Deviation of Scientific Aptitude in Science of Secondary School Male and Female Students**

| Variable            | Gender | N   | df  | Mean  | Std. Deviation | Std. Error Mean | T-test |
|---------------------|--------|-----|-----|-------|----------------|-----------------|--------|
| Scientific Aptitude | Male   | 100 | 198 | 54.14 | 7.044          | .704            | 2.287* |
|                     | Female | 100 |     | 56.40 | 6.933          | .693            |        |

\*\* Significant at the 0.01 level.

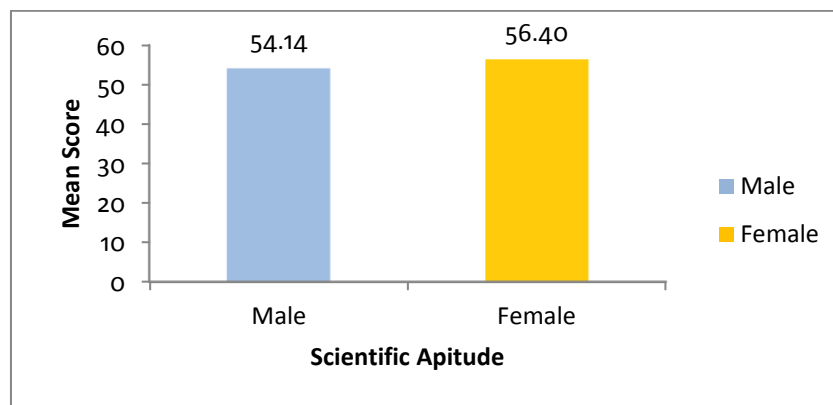


Table 6 reveals that the mean and SD value of scientific aptitude according to the Gender of the students are presented above in Table 6. The mean score of scientific aptitude of secondary school students is 56.40. Female students are higher in scientific aptitude as compared to Male students at 54.14. The mean and SD score is also presented according to Male and Female students in the following Graph. Obtained 't' value is 2.287 Which is greater than the corresponding tabled value at the 0.01 level. The null hypothesis stating "There exists no significant difference between in scientific aptitude of Male and Female Students of secondary school" was rejected.

**Table 7: Showing the Correlation Relationship between Achievement and Scientific Attitude in Science of Secondary School Students**

|             | Scientific Attitude |        |
|-------------|---------------------|--------|
| Achievement | Pearson Correlation | .285** |
|             | Sig. (2-tailed)     | .000   |
|             | N                   | 200    |

\*\* Correlation is significant at the 0.01 level (2-tailed).

Table 7 reveals that scientific attitude and achievement in science of secondary school students is significant (Significant at 0.01 level). Thus the hypothesis is that there is no significant relation between scientific attitude and achievement in secondary school. The null hypothesis states there exists a significant positive correlation between scientific attitude and achievement.

**Table 8: Showing the Correlation Relationship between Scientific Aptitude and Achievement in Science of Secondary School Students**

|                    |                     | Scientific Attitude |
|--------------------|---------------------|---------------------|
| <b>Achievement</b> | Pearson Correlation | .149*               |
|                    | Sig. (2-tailed)     | .035                |
|                    | N                   | 200                 |

\*\* Correlation is significant at the 0.05 level (2-tailed).

Table 8 reveals that scientific aptitude and achievement in science of secondary school students is significant (Significant at 0.05 level). Thus the hypothesis is that there is no significant relation between scientific aptitude and achievement in secondary school. The null hypothesis states there exists a significant positive correlation between scientific aptitude and achievement.

### Findings of the Study

- ❖ The secondary school students of private schools have higher achievement when compare to the students of Government schools.
- ❖ The Females in secondary schools are higher in scientific attitude as compared to Male.
- ❖ The Females in secondary schools is higher in scientific aptitude as compared to Male.
- ❖ The secondary school students of urban areas have a higher achievement when compared to the students of Rural areas.
- ❖ The secondary school students of urban areas have a higher scientific attitude when compared to the students of Rural areas.
- ❖ The secondary school students of private schools have higher achievement when compared to the students of government schools.

### Educational Implications of the Study

The present study is a modest attempt to explore the Scientific Aptitude and Scientific Attitude of the pupils and to find out the association between these two variables, the investigator suggests the following implications in the light of the present research findings.

1. Knowledge about the pupil's level of Scientific Aptitude and attitude would help in the modification of the existing science curriculum in schools.
2. Scientific Aptitude and Scientific Attitude should be made to establish students' careers.
3. Scientific Aptitude and Scientific Attitude would help the students to select a course of their own interest.
4. Scientific Aptitude and Scientific Attitude would help the students to identify their work field in the future.

### **Suggestions for Further Research**

The findings of the present study may serve as the basis for future research. Based on the present, a few suggestions are given below:

- The present study can be replicated by taking a large sample of students at the State level also.
- Studies may be conducted on Scientific Attitude and Scientific Aptitude at various levels of Education.
- The Same study can be undertaken involving the same variables at the Primary level.
- To investigate the relationship between Intelligence and Scientific Attitude.
- A study of the impact of blind beliefs on the young mind.

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