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## **SCIENTIFIC APTITUDE OF STUDENTS WITH REFERENCE TO NUMERICAL ABILITY, LOGICAL REASONING, SCIENTIFIC KNOWLEDGE, SCIENTIFIC REASONING AND APPLICATION**

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### **Abstract**

Scientific aptitude has a pivotal role in career progression of students specifically in science education. In this paper, scientific aptitude of male and female students was measured in terms of numerical ability, logical reasoning, scientific knowledge and scientific reasoning & its application. Descriptive method was used and the sample of 100 students studying in class IX from government schools of Mahendergarh district of Haryana state consists of 50 male and 50 female students. Scientific Aptitude Test developed by Kusum, Kumar and Devi (2021) was used. Results of study indicate that students studying in government secondary schools had above average scientific aptitude. Male students had better scientific aptitude in comparison to female students with reference to numerical ability, logical reasoning, scientific knowledge, scientific reasoning & application. The present study has its implications for teachers, and administrators and institutions, academicians and policymakers should create a learning ecosystem to nurture scientific aptitude among students.

**Keywords:** Scientific Aptitude, Government Secondary School Students.

### **Introduction**

Aptitude is an ability to attain some specific knowledge with training. Aptitude is an ability which is hereditary and may be nurtured by learning environment. Few traits such as singing and playing musical instruments may be God gifted and many skills may be acquired through training. Individuals with the comparable intelligence generally have different aptitude for different aspects.

“Scientific Aptitude is presumably largely an intellectual matter and it seems that a battery of test for the selection of promising scientists will stress such factors as reasoning, spatial visualization, number ability, scientific vocabulary and mechanical comprehension are too less pure aptitudes which should also be significant” (Aggarwal 1986).

“Scientific Aptitude appears to be dependent upon a variety of factors. The presence of certain study skills, persistence in learning, motivation, satisfactions derived from learning a subject;



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socio-economic factors and cultural background are some of the important determinants, interests, attitudes are also being considered necessary for scientific aptitude” (Rao 1990).

Scientific aptitude is natural inclination and ability of a student to understand, analyze, and apply scientific concepts and methods. At the secondary school level, this aptitude plays a crucial role in shaping a student’s cognitive development, critical thinking, and problem-solving skills. It encompasses curiosity, logical reasoning, observation, experimentation, and the ability to draw conclusions based on evidence.

### **Need and significance of study**

Secondary school is a pivotal stage where students transition from basic understanding to more complex scientific concepts across disciplines such as physics, chemistry, biology, and environmental science. During this phase, fostering scientific aptitude is essential as it lays the foundation for future academic pursuits and careers in science, technology, engineering, and mathematics (STEM).

Developing scientific aptitude involves encouraging inquiry-based learning, hands-on experiments, and real-world problem-solving activities. It requires creating an environment where students feel free to question, hypothesize, and explore without fear of failure. Additionally, the integration of modern tools and technologies, such as virtual labs and data analysis software, can enhance engagement and deepen understanding.

Teachers and educators play a critical role in identifying and nurturing scientific talent by using diverse teaching methods, promoting critical thinking, and guiding students through scientific processes. Cultivating scientific aptitude not only benefits individual learners but also contributes to building a society that values innovation, evidence-based reasoning, and sustainable development.

Characteristics possessed by individual which may help him/her to succeed later in scientific endeavor may be identified with the help of scientific aptitude test which measure numerical ability, logical reasoning, scientific knowledge and scientific reasoning & its applications. Scientific aptitude test give an assessment for capability of a student to understand subjects of science domain. A complete assessment of scientific aptitude along with the other attributes of a student will help in deciding further course of study.

Scientific aptitude in relation to study practices was studied by Balasundaram (2022). Findings indicated that scientific aptitude and study practices had a significant positive correlation. Scientific aptitude of senior secondary school students of West Bengal was studied by Mishra (2020) wherein male students had better scientific aptitude. Roy and Goel (2018) concluded that scientific abilities play an important role for better living of students. Chemistry knowledge and scientific aptitude of XI class students was studied by Kalaivani (2018) by using tool developed by Vadivu, Sridhar, and Kumar (2016) and found a difference in scientific aptitude on the basis of gender. Mukhopadhyaya and Sen (2013) studied correlation of aptitude in physics, scientific attitude and deep approach of class 12<sup>th</sup> students studying in different schools in West Bengal. It



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was found that all three variables were strongly correlated. The above reviews of literature indicated that scientific aptitude has play a very important role in holistic development of secondary school students.

## Statement of the problem

“Scientific aptitude of government secondary school students of Mahendergarh district of Haryana State with particular reference to numerical ability, logical reasoning, scientific knowledge, scientific reasoning and application”

## Objectives

1. To study the level of scientific aptitude students studying in the class XI of Government school.
2. To compare the male and female students in terms of scientific aptitude with respect to numerical ability, logical reasoning, scientific knowledge, scientific reasoning and application.

## Hypotheses

**H<sub>0</sub>1.** There is no significant difference between male and female students on scientific aptitude.

**H<sub>0</sub>2.** There is no significant difference between male and female students in term of numerical ability of scientific aptitude.

**H<sub>0</sub>3.** There is no significant difference between male and female students in term of logical reasoning scientific aptitude.

**H<sub>0</sub>4.** There is no significant difference between male and female students in term of scientific knowledge scientific aptitude.

**H<sub>0</sub>5.** There is no significant difference between male and female students in term of scientific reasoning and application scientific aptitude.

## Delimitations of the study

- (i) The study is delimited to study only scientific aptitude of secondary school students of Mahendergarh district of Haryana State.
- (ii) The present study is also delimited to 100 students studying in class XI of Government schools of Mahendergarh District only.

## Research Methodology

In the present study, the descriptive research method was used.

## Sample

The researcher had decided to study the Scientific Aptitude in terms of Numerical ability, logical reasoning, scientific knowledge and scientific reasoning & application of Secondary school students. Therefore, all the students of class IX, studying in Government Schools of Mahendergarh were considered as the population of the study and 100 students were taken as sample, in which 50 were male and 50 were female students. Data collection was done by using random sampling technique.



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## Tool used

Adolescents Scientific Aptitude Test developed by Kusum, Satish Kumar and Sumitra Devi (2021) was used for the data collection.

## Statistical techniques used

Mean (M), Standard deviation (SD) and t-test have been used in the present study.

## Result

The results of the study are given below in the following Tables:

**Table-1: Levels of scientific aptitude of students studying in government secondary schools**

Sr. No.	Range of Raw Score	No. of Students	Grade	Level of Scientific Aptitude
1	47 and above	23	A	Extremely High
2	41-46	27	B	High
3	34-40	33	C	Above Average
4	25-33	16	D	Average
5	19-24	01	E	Below Average
6	12-18	Nil	F	Low
7	11 and below	Nil	G	Extremely Low

## Interpretation

The results from the above table-1 indicate that mostly students (83%) had above average level and only 17% students had average and below average scientific aptitude. The mean score of the whole sample was found 40.42 which is above average as per norms of the test.

**Table-2: Comparison of male and female students on their Scientific Aptitude**

Variable	N	M	SD	t – value	Level of Significance (p)
Males	50	45.70	5.46	9.63	.05
Females	50	35.14	5.50		

Note: Critical t – value (df = 98) = 1.98,  $p < .05$

## Interpretation

The table- 2 shows that mean scores of male and female students are 45.70 and 35.14 respectively. The standard deviation for male students is 5.46 while for female students has 5.50. The calculated 't' value indicates that male and female students differ significantly ( $t = 9.63$ ,  $p < .05$ ) in their scientific aptitude. Hence, the hypothesis, "There is no significant difference between male and female government secondary school students in their scientific aptitude" is not retained. The findings indicated that male students had better scientific aptitude.



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**Table 3: Comparison of male and female students in term of numerical ability, logical reasoning, scientific knowledge and scientific reasoning and application**

Area of ASAT	Sec-I Numerical Ability		Sec-II Logical Reasoning		Sec-III Scientific Knowledge		Sec-IV Scientific Reasoning and Application	
	Males	Females	Males	Females	Males	Females	Males	Females
<b>Gender</b>	Males	Females	Males	Females	Males	Females	Males	Females
<b>N</b>	50	50	50	50	50	50	50	50
<b>Mean</b>	8.12	4.98	8.00	5.60	20.60	18.40	8.98	6.16
<b>SD</b>	2.42	1.99	1.64	1.97	3.51	3.31	2.55	2.58
<b>Calculated 't' value</b>	7.06		6.59		3.21		5.49	
<b>Remarks at 5% level</b>	Significant		Significant		Significant		Significant	

Note: Critical t – value (df = 98) = 1.98,  $p < .05$

## Interpretation

The table- 3, Sec-I shows that mean score for numerical ability of males is 8.12 while mean score of females is 4.98. The standard deviation for males is 2.42 while for females it is 1.99. The calculated 't' value indicates that male and female students differ significantly ( $t = 7.06$ ,  $p < .05$ ) in their numerical ability. Hence, the hypothesis, "There is no significant difference between male and female government secondary school students in term of numerical ability" is not retained and it was found that male students have better numerical ability.

Results in table-3, Sec-II shows that the mean score for logical reasoning of males is 8.00 while mean score of females is 5.60. The standard deviation for male students is 1.64 while for female students it is 1.97. The calculated 't' value indicates that male and female students differ significantly ( $t = 6.59$ ,  $p < .05$ ) in their logical reasoning. Hence, the hypothesis, "There is no significant difference between male and female government secondary school students in term of logical reasoning" is not retained. It was found that the male students had better logical reasoning.

Results in table-3, Sec-III shows that the mean score for scientific knowledge of males is 20.60 while mean score of females is 18.40. The standard deviation for male students is 3.51 while for female students it is 3.31. The calculated 't' value indicates that male and female students differ significantly ( $t = 3.21$ ,  $p < .05$ ) in their scientific knowledge. Hence, the hypothesis, "There is no significant difference between male and female government secondary school students in term of scientific knowledge" is not retained. It was found that male students had better scientific knowledge than females studying in government secondary school.



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Results in table-3, Sec-IV show that the mean score for scientific reasoning & application of males is 8.96 while mean score of females is 6.16. The standard deviation for male students is 2.55 while for female students it is 2.58. The calculated 't' value indicates that male and female students differ significantly ( $t = 5.49, p < .05$ ) in their scientific reasoning & application. Hence, the hypothesis, "There is no significant difference between male and female government secondary school students in term of scientific reasoning and application" is not retained. It was found that in government secondary schools, the male students performed better in scientific reasoning & application than the female students.

## Conclusion

The study concluded that students studying in government secondary schools of Mahendergarh district had above average level of scientific aptitude. Male students perform better and showed higher level of scientific aptitude in comparison to female students. Male students had better than female students in terms of numerical ability, logical reasoning, scientific knowledge, scientific reasoning & application and overall scientific aptitude. So, there is a need to nurture the scientific aptitude of girl students which may be achieved by motivation, sensitization and encouragement. A positive learning environment will improve science learning. Measurement of scientific aptitude helps teachers, curriculum developers and policy makers to develop strategies for improvement of learning capacity and interest of student toward science education.

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