

# APTITUDE AND ACHIEVEMENT IN SCIENCE: A COMPARATIVE STUDY OF HIGHER SECONDARY SCHOOL STUDENTS IN MIZORAM AND MEGHALAYA

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**Abstract:** *The purpose of this study was to compare the scientific aptitude and achievement in science among higher secondary science students of Mizoram and Meghalaya affiliated under Mizoram Board of School Education (MBSE) and Meghalaya Board of School Education (MBOSE) respectively. Totally, 600 students, (300 males, and 300 females) were randomly selected from both the states (300 each from Mizoram and Meghalaya). Data on scientific aptitude and achievement in science were collected through 'Scientific Aptitude Test (SAT-Ns)' developed by Nagappa P.Shahapurand and 'Achievement Test in Science (ATS- GR)' developed by S.C. Gakhar and Rajnish. Girls were found to possess higher scientific aptitude as compared to their male counterparts but boys scored higher with regard to their achievement in science. Furthermore, students of Mizoram outperform students of Meghalaya in terms of scientific aptitude and achievement in science.*

**Key Words:** *Scientific Aptitude, Achievement in Science, Higher Secondary Science Students.*

## 1. INTRODUCTION:

It is an observable fact that scientific and technological advancements have greatly influenced the development and progress of nations the world over. According to the Education Commission 1964-66, "The Progress, welfare and prosperity of a nation depend on a sustained growth in the quality of education and research in the science and technology." For a nation to grow and prosper, the involvement of science and technology is imperative. For this reason, development and advancement of scientific knowledge and its applications has become of paramount importance to nations since no nation can achieve greatness without it. Advancements in power and resources of a country hinges on the presence of a highly-educated and well-trained workforce who can help propel scientific and technological advancements which can have a positive impact on society. Therefore, the promotion and enhancement of science studies has become a priority in education.

The economic growth and prosperity of a country is propelled by attaining leadership positions in science and technology. The Indian government recognizes that India has the potential to channel its large human resource towards the creation of a formidable and promising scientific community which has the potential to propel the country towards greatness. For this to happen, it is imperative that the quality of science education is advanced and uplifted. The Indian government has set up various commissions, committees and policies to ensure the promotion and improvement of science education. Looking at the current status of science education in India, it is clear that there is a need for drastic changes and transformations to be made to ensure its advancement. In this connection, the recognition of the scientific aptitude of a person can be instrumental in gearing students towards achieving their true potential which can in turn, ensure that they achieve success.

Scientific aptitude gears students towards having a better grasp and understanding of scientific concepts and enables them to synthesise and apply their knowledge in a creative, meaningful, and enterprising ways. Several factors such as physical development, socio-economic status, cultural background, motivation or support received, attitude, interests, certain study skills and grit and determination towards learning as well as the achievement of goals have been noted as being capable of engendering scientific aptitude. One may observe that in schools, some students outperform others in scientific studies and skills related to it. Such students having a specific ability or aptitude for science studies in addition to their general intelligence are recognised as possessing scientific aptitude. According to Dressel (1963)

‘Scientific aptitude is a potentiality for future accomplishment in science without regard to past training and achievement.’ Miles (1954) has stated ‘scientific aptitude is another example of a talent present in the gifted group to far greater extent than its probable realization in adult achievement.’

Scientific aptitude is indispensable to succeed in scientific studies and research since students having high scientific aptitude are able to have a better grasp and understanding of scientific ideas and concepts, which aids in the development of an overall interest in scientific knowledge besides helping in the achievement of better results. At the higher secondary school level especially, achievement in science is of paramount importance since this is the stage where one transitions from school level studies to serious research at the higher studies level. A student having scientific aptitude should be encouraged and nurtured to develop and enhance their potential so as to be able to ensure that they have success in their pursuit of scientific research and careers in science.

## 2. RATIONALE 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. As a result, research in this field has intensified. However, with regard to the states of Meghalaya and Mizoram in particular, research in science is in its infancy stage.

Upon a close analysis of the status of science studies at the higher secondary school level in these two states, it becomes apparent that the number of students opting for the science stream continues to increase annually but despite this increase, science students are lesser in number than students opting for the arts stream. Moreover, the academic performance of science students is dismal in terms of exam results and this is a cause for concern, given the stiff competition seen among science students in other states. This paper will undertake a comparative research of scientific aptitude of both the states encompassing their similarities and dissimilarities and in this connection, it will explore the factors that impede progress and suggest remedial measures for the same. The following research questions can be explored to ascertain the status of science education in the two states:

- What is the scientific aptitude of Higher Secondary School students of Meghalaya and Mizoram towards science?
- What is the achievement level in science among Higher Secondary School students of Meghalaya and Mizoram?
- Does gender difference in aptitude and achievement in science exist among Higher Secondary Schools of Meghalaya and Mizoram?

Based on the preceding questions that have arisen, comparative study of the aptitude and achievement of higher secondary science students in the states of Meghalaya and Mizoram is therefore justified.

## 3. OBJECTIVES:

The present study has the following objectives:

- To study the scientific aptitude among all higher secondary science students of Mizoram and Meghalaya.
- To compare the scientific aptitude between higher secondary science students of Mizoram and Meghalaya
- To compare the scientific aptitude of all higher secondary science students with reference to their gender.
- To study the achievement in science among all higher secondary science students
- To compare the achievement in science between higher secondary science students of Mizoram and Meghalaya
- To compare the achievement in science among all higher secondary science students with reference to their gender.
- To make suggestions for improvement in science education in Mizoram and Meghalaya.

## 4. HYPOTHESES:

- There is no significant difference in the scientific aptitude between higher secondary science students of Mizoram and Meghalaya
- There is no significant difference in the scientific aptitude of all higher secondary science students with reference to their gender.
- There is no significant difference in the achievement in science between higher secondary science students of Mizoram and Meghalaya
- There is no significant difference in the achievement in science among all higher secondary science students with reference to their gender.

## 5. METHODOLOGY:

The present study employed the causal comparative status survey design since the present study aims to find out and compare the difference in the scientific aptitude as well as achievement in science among the students of Mizoram and Meghalaya.

### Tools used

The following tools were used for the present study:

1. Scientific Aptitude Test (SAT-Ns) developed by Nagappa P. Shahapur; National Psychological Corporation; Agra; 2011.
2. Achievement Test in Science (ATS-GR) developed by S.C. Gakhar and Rajnish; National Psychological Corporation Agra; 2004.

### Population

The population for the present study consists of all the higher secondary science students in Mizoram and Meghalaya studying under Mizoram Board of School Education (MBSE) and Meghalaya Board of School Education (MBOSE).

### Sample

The sample comprises of all higher secondary science students in Mizoram and Meghalaya. Out of which, 300 students are from Mizoram and 300 are from Meghalaya. There are 300 males and 300 females.

### 6. ANALYSIS OF DATA:

The data collected on scientific aptitude test and achievement test in science were analyzed, keeping in mind the objectives and hypothesis of the study.

#### *Objective 1: To study the scientific aptitude among all higher secondary science students of Mizoram and Meghalaya.*

The scores of all the higher secondary science students on the 'Scientific Aptitude Test' were scored and tabulated. Based on their responses, the students were classified into three groups as per the norms of the scale. The scores above the 75<sup>th</sup> percentile constitute high scientific aptitude, those below the 25<sup>th</sup> percentile constitute low scientific aptitude, and those between the 25<sup>th</sup> and 75<sup>th</sup> percentile constitute average scientific aptitude. The following Table - 1 shows the position of the students with regard to their scientific aptitude.

**Table - 1**  
**Scientific aptitude among all higher secondary school respondents:**

Scientific Aptitude	Total (N=600)	
	No of Students	Percentage
High Scientific Aptitude	180	30%
Average Scientific Aptitude	277	46.17%
Low Scientific Aptitude	143	23.83%

Table - 1 indicated that out of 600 higher secondary science students, there were 180 (30%) students with high scientific aptitude, 277 (46.17%) students with average scientific aptitude, and 143 (23.83%) students with low scientific aptitude. This shows that majority of the students had average scientific aptitude. The table also revealed that there were more students having high scientific aptitude than low scientific aptitude.

#### *Objective 2: To compare the scientific aptitude between higher secondary science students of Mizoram and Meghalaya*

For comparing the scientific aptitudes of higher secondary science students of Mizoram and Meghalaya, the mean and standard deviation of each score was calculated. The t-value was established in order to ascertain the significance of difference and the nature of difference between the two groups.

#### **Difference in the scientific aptitude between higher secondary science students of Mizoram and Meghalaya**

Hypothesis (No.1) states: "There is no significant difference in the scientific aptitude between higher secondary science students of Mizoram and Meghalaya".

Table - 2 discloses the comparison in the scientific aptitude between higher secondary science students of Mizoram and Meghalaya.

**Table - 2**  
**Scientific aptitude between higher secondary school students of Mizoram and Meghalaya**

State	N	Mean	SD	MD	SE <sub>MD</sub>	t-value	Sig. level
Meghalaya	300	37.81	9.308	5.070	.658	7.710	**
Mizoram	300	42.88	6.563				

\*\* Significant at 0.01 level

Table - 2 revealed that the obtained value of 't' was found to be significant at 0.01 level. A comparison of the mean score shows that the difference was in favour of higher secondary science students of Mizoram. Therefore, it can be concluded that higher secondary science students of Mizoram have higher scientific aptitude than those of higher secondary science students of Meghalaya.

**Objective - 3: To compare the scientific aptitude of all higher secondary science students with reference to their gender.**

Hypothesis (No.2) states: "There is no significant difference in the scientific aptitude of all higher secondary science students with reference to their gender.

Table - 3 exhibits the comparison in the scientific aptitude of all higher secondary science students with respect to gender.

**Table - 3**  
**Scientific aptitude of all higher secondary science students with respect to gender**

Gender	N	Mean	SD	MD	SE <sub>MD</sub>	t-value	Sig. level
Male	300	39.58	8.937	1.523	.687	2.218	*
Female	300	41.11	7.847				

\* Significant at 0.05 level

From Table - 3, it was found that the obtained 't' value was significant at 0.05 level, and the mean score of the males (39.58) was found to be higher than the mean score of the females (41.11). The result revealed that male students possessed higher scientific aptitude in comparison to their female counterparts.

**Objective - 4: To study the achievement in science among all higher secondary science students**

The Achievement Test in Science (ATS-GR) developed by S.C. Gakhar and Rajnish was administered to all higher secondary science students and the scores obtained were scored and tabulated. The scores above the 75<sup>th</sup> percentile constitute high achievement, those below the 25<sup>th</sup> percentile constitute low achievement, and those between the 25<sup>th</sup> and 75<sup>th</sup> percentile constitute average achievement. The following Table - 4 shows the position of all higher secondary science students with respect to their science achievement.

**Table - 4**  
**Achievement in science among all higher secondary science students:**

Achievement in Science	Total (N=600)	
	No of Students	Percentage
High Achievement	159	26.5 %
Average Achievement	310	51.67 %
Low Achievement	131	21.83 %

As evident in Table - 4, out of the total sample of 600 higher secondary science students, 159 (26.5%) students have high achievement, 310 (51.67%) students have average achievement, and 131 (21.83%) students have low achievement. This indicated that majority of the students have average achievement in science. The numbers of students with high achievement (26.5%) in science are somewhat more in numbers than those with low achievement (21.83%) in science.

**Objective - 5: To compare the achievement in science between higher secondary science students of Mizoram and Meghalaya**

In order to compare the achievement in science between all higher secondary science students of Mizoram and Meghalaya, the mean and standard deviation of each score were calculated. The t-value was established in order to ascertain the significance of difference and the nature of difference between the two groups.

**Difference in the science achievement between higher secondary school students of Mizoram and Meghalaya**

Hypothesis (No.3) states: "There is no significant difference in the achievement in science between higher secondary science students of Mizoram and Meghalaya".

Table - 5 shows the comparison in the science achievement between higher secondary science students of Mizoram and Meghalaya.

Table - 5

Science achievement between all higher secondary science students of Mizoram and Meghalaya with respect to gender

State	N	Mean	SD	MD	SE <sub>MD</sub>	t-value	Sig. level
Meghalaya	300	16.00	4.670	2.000	.364	5.493	**
Mizoram	300	18.00	4.238				

\*\* means significant at 0.01 level

Looking at Table - 5, it was found that the calculated 't' value is significant at 0.01 level of significance. This shows that there is a significant difference in the achievement in science between higher secondary school students of Mizoram and Meghalaya. A comparison of the mean score of Meghalaya students (16) and Mizo students (18) indicates that students of Mizoram have higher science achievement as compared to the students of Meghalaya.

**Objective 6: To compare the achievement in science among all higher secondary science students with reference to their gender.**

Hypothesis (No.4) states: "There is no significant difference in the achievement in science among all higher secondary science students with reference to their gender".

Table - 6 shows the comparison in the science achievement of all higher secondary school students with reference to their gender.

Table - 6

Science achievement of all higher secondary science students with respect to gender

Gender	N	Mean	SD	MD	SE <sub>MD</sub>	t-value	Sig. level
Male	300	17.41	5.144	.820	.372	2.206	*
Female	300	16.59	3.869				

\* Significant at 0.05 level.

As shown by Table - 6, there is a 0.05 confidence level of significant difference in the science achievement among all higher secondary science students with respect to gender. A comparison of the mean score of males (17.41) and females (16.59) revealed that since males have higher mean score, their science achievement was definitely higher than that of female students.

**Objective - 7: To make suggestions for improvement in science education in Mizoram and Meghalaya:**

As per the findings of the present study, the fact that science education at the higher secondary level in Mizoram and Meghalaya needs drastic improvement is hardly in dispute.

The following measures may be noted:

- Teachers should be provided in-service and pre-service trainings, if possible every year. This is essential to improve the competency of science teachers at all levels, as the quality of teachers will determine the achievement level of students. It is the teachers who can motivate the students, inculcate positive attitude towards science, identify their scientific aptitude, draw out their interest and thus help enhance their science achievement.
- Scholarships and other incentives given to meritorious science students should be increased and more opportunities should be created in order to enhance greater participation of students.
- Science exhibitions, science fairs, science clubs, science project, seminars, etc. should be organized more frequently for school students at the block level, district level and state level; and larger participation of students should be encouraged so as to open more avenues for exploring their abilities.
- Initiative should be taken by the government to create more opportunities for globally competitive scientific research.
- It is desirable to conduct aptitude tests at the time of admission. This will help in identifying the aptitude of the students so as to help them in choosing the right stream and subject.
- Schools should have well equipped infrastructural facilities to impart science education to serve the needs of each and every student. If students have more exposure to facilities such as well-equipped laboratories, good libraries, audio-visual aids, etc. it will serve as positive enrichment.
- It is important that students be provided with thorough academic guidance and counselling at the higher secondary stage. In this regard, the teachers and counsellors should continuously work together and should also involve interaction with the parents. This will help the students in making the right decision for future choices and careers.

- It is about time that we take away the wrong perception prevailing amongst our society, wherein boys are considered more able and intelligent than girls in the scientific field. Parents and society should not undermine the abilities and aptitude of girls.
- The youth play a very important role in church and in the local community. There are numerous events and activities in which society expects the youth to participate. Participation in such local activities and events while not compulsory, but are an integral part of a community-based society. But often, it has been found that excessive involvement in such practices has a negative effect on the pursuit of studies leading to poor academic results. Therefore, parents and society should take caution to see that the participation of the youth in activities of the local community does not negatively affect their studies.
- Science curriculum and practices currently adopted in our schools may not be appropriate for a larger section of the society. Educators should face the reality that science programmes failed to produce citizens who are sufficiently literate in science. This has resulted that only a few of them entered the higher secondary stage with a solid background and commitment towards science. This may again be the reason why we find only a handful of them continuing the Undergraduate and Post Graduate stage in the field of science. It is therefore essential that children should be properly equipped with the much needed scientific knowledge right from the initial stage that continues through the most critical stages of adolescence.

## 7. CONCLUSION:

The present study discloses that female students possessed higher scientific aptitude as compared to male students. On the other hand, it was found that the male students have higher achievement in science than the female students. The study further revealed that the students of Mizoram outperform the students of Meghalaya with regard to scientific aptitude and achievement in science.

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