CHAPTER V

MAJOR FINDINGS, DISCUSSION, SUGGESTIONS AND CONCLUSION

<table>
<thead>
<tr>
<th>Caption</th>
<th>Content</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>Introduction</td>
<td>187</td>
</tr>
<tr>
<td>5.1</td>
<td>Major Findings</td>
<td>188</td>
</tr>
<tr>
<td>5.2</td>
<td>Discussion of the Findings</td>
<td>204</td>
</tr>
<tr>
<td>5.3</td>
<td>Implications</td>
<td>214</td>
</tr>
<tr>
<td>5.4</td>
<td>Suggestions</td>
<td>215</td>
</tr>
<tr>
<td>5.5</td>
<td>Conclusion</td>
<td>221</td>
</tr>
</tbody>
</table>
5.0 Introduction

Science is a universal subject. The inclusion of Science in the School Curriculum is very important and necessary. Science almost revolutionaries human life and proved indispensable for existence of man. Now, supremacy of Science has been established in every field. In fact, so great is its importance for man and society that the present day people live in an "age of science". Hence, Science should form an essential part of the curriculum as it is the only subject which affords knowledge of certain facts and laws and helps in achieving the main object of education.

Attitudes have emotional content and vary in intensity and generality according to the range of objects or situations over which they apply. Mostly attitude learnt are difficult to distinguish from such affective attributes of personality as interest, appreciation, likes, opinion values, ideals and character traits. Scientific Attitude is the mental state, more or less enduring, representing a tendency to react favorably or unfavorable toward designated class of stimuli. If this reaction is according to the ethics of science, then it is scientific attitude. The scientific attitude investigates for a certain scientific act or thought. The habit of thought associated with scientific thinking deserved more careful consideration. To be scientific mean that one has such attitudes as curiosity, rationality, willingness to suspend judgment, open mindedness, critical mindedness, objectivity, honesty and humility etc. attitude regulate behavior that is directed towards or away from some object or situation group of objects or situations.

Students therefore need to acquire a high Scientific Attitude, improve their General Intelligence and strive for high Academic
Achievement in order to be able to coup up with this present age of science.

This present chapter will therefore portray the Scientific Attitude, General Intelligence and Academic Achievement of Higher Secondary Science Students in East Khasi Hills District, Meghalaya.

5.1 Major Findings

1. Level of Scientific Attitude of Higher Secondary Students

   (a) It was found that 2.36 % of the students Strongly Agreed with the various Scientific Attitude Statements, 9.57 % Agreed with the Statements whereas 76.12% of the Students remained Undecided. However 8.87% of the students Disagreed with the various Scientific Attitude Statements and 3.07 % Strongly Disagreed. The above table also shows that the Mean Score on Scientific Attitude among the Higher Secondary Science Students is 201.57, whereas the Standard Deviation is 14.41.

   (b) With regards to the Scientific Attitude of Male Higher Secondary Science Students, only 0.26 % of the students Strongly Agreed with the various Scientific Attitude Statements, 9.09 % Agreed with the Statements and 79.74 % of the Students remain Undecided. Further 9.09 % of the students Disagreed with the various Scientific Attitude Statements and 0.26 % Strongly Disagreed. The Mean Score on Scientific Attitude among the Male Higher Secondary Science Students is 200.49, whereas the Standard Deviation is 11.31.

   (c) The Scientific Attitude of Female Higher Secondary Science Students shows that 4.12 % of the students Strongly Agreed
with the various Scientific Attitude Statements, 9.98 % Agreed with the Statements and 73.10 % of the Students remain Undecided. Further 8.68 % of the students Disagreed with the various Scientific Attitude Statements and 4.12 % Strongly Disagree. The Mean Score on Scientific Attitude among the Female Higher Secondary Science Students is 201.61 whereas the Standard Deviation is 20.29.

(d) The Scientific Attitude of Tribal Higher Secondary Science Students shows that 4.12 % of the students Strongly Agreed with the various Scientific Attitude Statements, 9.98 % Agreed with the Statements and 73.10 % of the Students remain Undecided. Further 8.68 % of the students Disagreed with the various Scientific Attitude Statements and 4.12 % Strongly Disagree. The Mean Score on Scientific Attitude among the Female Higher Secondary Science Students is 201.61 whereas the Standard Deviation is 20.29.

(e) The findings revealed that 1.27 % of the Non-Tribal students Strongly Agreed with the various Scientific Attitude Statements, 10.13 % Agreed with the Statements whereas 77.22% of the Students remain Undecided. However 9.49 % of the students Disagree with the various Scientific Attitude Statements and only 1.90 % Strongly Disagreed. The Mean Score on Scientific Attitude among the Non-Tribal Higher Secondary Science Students is 200.55 whereas the Standard Deviation is 12.46.

(f) The Scientific Attitude of Higher Secondary Science Students belonging to the Government Schools as shown in Table 4.6
above shows that only 1.16 % of the students Strongly Agreed with the various Statements on Scientific Attitude, 8.14 % Agreed with the Statements, 69.77 % of the Students remain Undecided, 10.47 % of the students Disagree with the various Scientific Attitude Statements and 10.47 % Strongly Disagree. The Mean Score on Scientific Attitude among the Higher Secondary Science Students belonging to the Government Schools is 198.69, whereas the Standard Deviation is 14.74.

(g) The Scientific Attitude of Deficit Higher Secondary Science Students shows that 0.69 % of the students Strongly Agreed with the various Scientific Attitude Statements, 7.80 % agreed with the Statements, 77.98 % of the Students remain Undecided, 10.55 % of the students Disagreed with the various Scientific Attitude Statements and 2.98 % Strongly Disagreed. The Mean Score on Scientific Attitude among the Deficit Higher Secondary Science Students is found to be 199.77 and the Standard Deviation of the same is 13.02.

(h) It was observed that, 4.94 % of the Deficit Higher Secondary students Strongly Agreed with the various Scientific Attitude Statements, 12.35 % Agree with the Statements, 75.31 % of the Students remain Undecided, 6.17 % of the students Disagreed with the various Scientific Attitude Statements and 1.23 % Strongly Disagree. The Mean Score on Scientific Attitude among the Private Higher Secondary Science Students is 203.52 whereas the Standard Deviation is 21.07.
2. **Level of General Intelligence of Higher Secondary Students**

(a) It is found that only 0.24 % of the Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence whereas 10.28 % were having High General Intelligence. However it is found that about 73.29 % are of Average General Intelligence and the remaining 10.52 % and 5.67 % were of Poor General Intelligence and Very Poor General Intelligence respectively. Further, it can also be observed that the Mean and the Standard Deviation of all the Higher Secondary Science Students of the District were 29.44 and 8.04 respectively.

(b) Only 0.26 % of the Male Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence whereas 11.69 % were having High General Intelligence, about 74.81 % are of Average General Intelligence and the remaining 7.53 % and 5.71 % were of Poor General Intelligence and Very Poor General Intelligence respectively. Further, it can also be observed that the Mean and the Standard Deviation of the Higher Secondary Science Students of the District were 30.57 and 7.79 respectively.

(c) A number of 0.22 % of the Female Higher Secondary Science Students of the District possessed a Very High General Intelligence and 9.11 % of the Students are of High General Intelligence. Further, 72.02 % of them were of Average General Intelligence, 13.02 % and 5.64 % have a Poor and Very Poor General Intelligence. The Mean and Standard
Deviation of the Female Students as observe from the above table were 28.50 and 8.12 respectively.

(d) It was observed that only 0.29 % of the Tribal Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence and 8.28 % High General Intelligence. However it is found that about 76.89 % are of Average General Intelligence and the remaining 9.59 % and 4.94 % were of Poor General Intelligence and Very Poor General Intelligence respectively. Further, it can also be observed that the Mean and the Standard Deviation of all the Higher Secondary Science Students of the District were 29.37 and 7.74 respectively.

(e) The Non-Tribal Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence whereas 18.99 % were having High General Intelligence, about 57.59 % are of Average General Intelligence and the remaining 14.56 % and 8.86 % were of Poor General Intelligence and Very Poor General Intelligence respectively. Further, it can also be observed that the Mean and the Standard Deviation of the Higher Secondary Science Students of the District were 29.77 and 9.22 respectively.

(f) It is found that only 1.16 % of the Government Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence, 15.12 % were having High General Intelligence, about 73.29 % are of Average General Intelligence and the remaining 1.16 % and 2.33 % were of Poor General Intelligence and Very Poor General Intelligence.
respectively. Further, it can also be observed that the Mean and the Standard Deviation of all the Government Higher Secondary Science Students of the District were 32.99 and 6.39 respectively.

(g) Only 0.23 % of the Deficit Higher Secondary Science Students of the District possessed a Very High General Intelligence and 10.78 % of the Students are of High General Intelligence. Further, 76.61 % of them were of Average General Intelligence, 9.86 % and 2.52 % have a Poor and Very Poor General Intelligence. The Mean and Standard Deviation of the Deficit Higher Secondary Science Students as observe from the above Table were 30.11 and 7.28 respectively.

(h) None of the Private Higher Secondary Science Students of East Khasi Hills District have a Very High General Intelligence whereas 8.33 % were having High General Intelligence, about 66.98 % are of Average General Intelligence and the remaining 13.89 % and 10.80 % were of Poor General Intelligence and Very Poor General Intelligence respectively. Further, it can also be observed that the Mean and the Standard Deviation of the Private Higher Secondary Science Students of the District were 27.60 and 10.80 respectively.

3. **Level of Academic Achievement in Science**

   (a) With reference to the Academic Achievement, 32.27 % of the Higher Secondary Science Students were Very High Achievers, 45.98 % are High Achievers, 19.98 % were Average Achievers and 1.77 % is very Low Achievers. The Mean and Standard Deviation of all the Higher Secondary
Science Students in Science as per the above Table were 70.47 and 13.26.

(b) 36.10 % of the Male students were classified under Very High Achievers, 43.12 % were categorized under High Achievers, 19.22 % were Average Achievers and only 1.56 % students were Low Achievers. However, the Mean and Standard Deviation of the Male Students was observed to be 71.56 and 13.78 respectively.

(c) The findings shows that 29.07 % of the female students were classified under very high achievers, 48.37 % were categorized under high achievers, 20.61 % were average achievers and only 1.95 % students were low achievers. Further, the Mean and Standard Deviation of the Male Students was observed to be 69.56 and 12.76 respectively.

(d) The analysis shows that 30.67 % of the Tribal students were classified under Very High Achievers, 47.09 % were categorized under High Achievers, 20.49 % were Average Achievers and only 1.74 % students were Low Achievers. The Mean and Standard Deviation with regards to the Tribal students were 69.96 and 12.98 respectively.

(e) The findings show that 39.24 % of the Non-Tribal students were classified under Very High Achievers, 41.14 % were categorized under High Achievers, 17.72 % were Average Achievers and only 1.90 % students were Low Achievers. The Mean and Standard Deviation with regards to the Tribal students were 72.73 and 14.25 respectively.
(f) The findings revealed that 10.47 % of the students from Government Institution were classified under Very High Achievers, 59.30 % were categorized under High Achievers, 27.91 % were Average Achievers and only 2.33 % students were Low Achievers. The Mean and Standard Deviation were 65.24 and 10.85 respectively.

(g) The analysis show that 31.65 % of the Deficit Science students were classified under Very High Achievers, 48.39 % were categorized under High Achievers, 18.81 % were Average Achievers and only 1.15 % students were Low Achievers. The Mean and Standard Deviation of the Deficit Science students were 71.49 and 13.32 respectively.

(h) The findings depicts that 38.89 % of the Private Higher Secondary Science students were classified under Very High Achievers, 39.20 % were categorized under High Achievers, 19.44 % were Average Achievers and only 2.47 % students were Low Achievers. The Mean and Standard Deviation of the Deficit Science students were 70.50 and 13.47 respectively.

4. **Comparison of Scientific Attitude of Higher Secondary Science Students with reference to Sex, Community, and Management of School**

   (a) There exist no significant difference in the mean scores of Scientific Attitude (SA) of Male and Female Higher Secondary Science Students.

   (b) There exist no significant difference in the mean scores of Scientific Attitude (SA) of Tribal and Non-Tribal Higher Secondary Science Students.
(c) There exist a significant difference in the mean scores of Scientific Attitude (SA) of Higher Secondary Science Students from Government and Private Schools.

(d) There exist no significant difference in the mean scores of Scientific Attitude (SA) of Higher Secondary Science Students from Government and Deficit Schools.

(e) There exist a significant difference in the mean scores of Scientific Attitude (SA) of Higher Secondary Science Students from Deficit and Private Schools.

5. **Comparison of General Intelligence of Higher Secondary Science Students with reference to Sex, Community and Management of School**

(a) There exist a significant difference in the mean scores of General Intelligence (GI) of Male and Female Higher Secondary Science Students.

(b) There exist no significant difference in the mean scores of General Intelligence (GI) of Tribal and Non-Tribal Higher Secondary Science Students.

(c) There exist a significant difference in the mean scores of General Intelligence (GI) of Higher Secondary Science Students from Government and Private Schools.

(d) There exist a significant difference in the mean scores of General Intelligence (GI) of Higher Secondary Science Students from Government and Deficit Schools.
(e) There exist a significant difference in the mean scores of General Intelligence (GI) of Higher Secondary Science Students from Deficit and Private Schools.

6. **Comparison of Academic Achievement (AA) of Higher Secondary Science Students with reference to Sex, Community, and Management of School**

(a) There exist a significant difference in the mean scores of Academic Achievement (AA) of Male and Female Higher Secondary Science Students.

(b) There exist a significant difference in the mean scores of Academic Achievement (AA) of Tribal and Non-Tribal Higher Secondary Science Students.

(c) There exist a significant difference in the mean scores of Academic Achievement (AA) of Higher Secondary Science Students from Government and Private Schools.

(d) There exist a significant difference in the mean scores of Academic Achievement (AA) of Higher Secondary Science Students from Government and Deficit Schools.

(e) There exist no significant difference in the mean scores of Academic Achievement (AA) of Higher Secondary Science Students from Deficit and Private Schools.
7. **Relationship between Scientific Attitude, General Intelligence and Academic Achievement (Science) of Higher Secondary Science Students in East Khasi Hills, Meghalaya**

(a) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Higher Secondary Science Students

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.033.

(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.139.

(iii) There is a significant relationship between General Intelligence and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.088.

(b) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Male Higher Secondary Science Students

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) of Male Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.076.
(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) of Male Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.148.

(iii) There is no significant relationship between General Intelligence and Academic Achievement (AA) of Male Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.068.

(c) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Female Higher Secondary Science Students.

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) of Female Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being -0.023.

(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) of Female Higher Secondary Science Students at 0.05 level. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.149.

(iii) There is no significant relationship between General Intelligence and Academic Achievement (AA) of Female Higher Secondary Science Students at 0.05 level.
Therefore the null hypothesis is retained. The computed ‘r’ being 0.093.

(d) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Tribal Higher Secondary Science Students.

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) of Tribal Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being -0.030.

(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) of Tribal Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.148.

(iii) There is a significant relationship between General Intelligence and Academic Achievement (AA) of Tribal Higher Secondary Science Students at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.083.

(e) Relationship between Scientific Attitude, General Intelligence and Academic Achievement of Non-Tribal Higher Secondary Students in Science

(i) There is a significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.277.
(ii) There is no significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.123.

(iii) There is no significant relationship between General Intelligence and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.104.

(f) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Higher Secondary Science Students from Government Schools.

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.156.

(ii) There is no significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.091.

(iii) There is no significant relationship between General Intelligence and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.063.

(g) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Higher Secondary Science Students from Deficit Schools.
(i) There is significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.108.

(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.127.

(iii) There is no significant relationship between General Intelligence and Academic Achievement (AA in Science) at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.062.

(h) There is no significant relationship between the Scientific Attitude, General Intelligence and Academic Achievement of Higher Secondary Science Students from Private Schools

(i) There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ being 0.069.

(ii) There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA in Science) at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.165.

(iii) There is a significant relationship between General Intelligence and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ being 0.070.
8. Scientific Attitude and General Intelligence in Relation to the Level of Academic Achievement in Science Among Higher Secondary Students in East Khasi Hills District, Meghalaya

**Scientific Attitude and Levels of Academic Achievement**

(a) There is a significant gender difference in the Scientific Attitude of Higher Secondary Science Students at different levels of Academic Achievement.

(b) There is no significant community difference in the Scientific Attitude of Higher Secondary Science Students at different levels of Academic Achievement.

(c) There is a significant management difference in the Scientific Attitude of Higher Secondary Science Students at different levels of Academic Achievement.

**General Intelligence and Levels of Academic Achievement**

(a) There is no significant difference in the General Intelligence of Higher Secondary Science Students at different levels of Academic Achievement.

(b) There is a significant gender difference in the General Intelligence of Higher Secondary Science Students at different levels of Academic Achievement.

(c) There is no significant community difference in the General Intelligence of Higher Secondary Science Students at different levels of Academic Achievement.

(d) There is a significant management difference in the General Intelligence of Higher Secondary Science Students at different levels of Academic Achievement.
5.2 Discussion of the Findings

1. Scientific Attitude of Higher Secondary Science Students

   Overall Level of Scientific Attitude of Higher Secondary Science Students.

   The findings showed that majority of the students are undecided, the reason for this maybe that, planning learning experiences to inculcate scientific attitudes and opportunities for increasing the degree of consistency of the environment in which students get education is not fully provided by the schools. However a study conducted by Weinburgh (1995) in meta-analysis of eighteen studies representing 6753 students (3337 boys and 3416 girls) reported that boys consistently showed more positive attitude towards science.

   Even though most of the students were undecided, when a comparison was made between the male and female students it was found that more female students were placed in the Strongly Agreed classification than the male students. However, ‘t’ test was used to find out whether there is a significant difference between the mean scores of Male and Female students. The result indicates that there is no significant difference between them. This finding refutes the findings of Srivastava, (1983) in “A study on Scientific Attitude of Science and Arts students belonging to Scheduled Caste and Scheduled Tribes vis-a-vis Non-Scheduled Caste communities” which depicted that boys scored consistently higher than girls on the Scientific Attitude Scale .This shows that an important tendency which is found among all human beings and especially in students is curiosity. It may be that girls are a little more curious to know about various things they observe around themselves in their daily life since their mean score is slightly higher. Arrangements in
the classroom of the schools may not have had facilities so that students can get maximum opportunities to get their curiosity satisfied to considerable extent.

It can also be seen that both the Tribal and Non-Tribal Students have more or less the same type of Scientific Attitude. The ‘t’ test results also shows that there is no significant difference between them. Generally it is found that whatever a student learns during his childhood, they become permanent qualities of his personality for life long time. Not only this, generally children begin to believe the things or stories they hear from the others. During this age, probability of developing the habit of relying on the superstitions is found to be maximum. Such kind of thinking prove to be an important blocker in developing the scientific attitudes among the students, for which teacher should stress on the removal of such impressions of these false beliefs and superstitions through the proper and well-arranged study of science especially at the Higher Secondary Level.

The findings of the study also reveals that Higher Secondary Science Students studying in Private Schools seems to be having a Higher Scientific Attitude than other Students studying in Government and Deficit Schools. The ‘t’ value also shows that there is significant difference between students studying in Government and Private Schools and Deficit and Private Schools. Whereas no significant difference was found between students studying in Government and Deficit Schools. This findings may be due to the fact that in the Government and Deficit Schools, a number of opportunities for making satisfying adjustments to attitude situations was not adequately provided to students where they can developed their Scientific Attitude and have the opportunities to analyse Scientific problems which can bring about intellectual and
desirable kind of changes in their attitude. Further these findings seem to be in line with the findings of Rao (1990) in his study on scientific attitude, scientific aptitude and achievement in Biology at Secondary School level reveals that the pupil studying in Private Schools held relatively better scientific attitude than their counterparts.

2. **General Intelligence Secondary Science Students**

   The General Intelligence of Secondary Science Students was also found to be Average. It can be inferred that Higher Secondary Science Students have average intellectual functioning and intelligence quotients. It may be due to the fact that there are generational differences in the population as a whole. It may be also stated that students may have lack in better nutrition, more education and other factors which can resulted in IQ improvements for each generation.

   It was also found that the level of general intelligence of Male Higher Secondary Science Students is higher than Female Higher Secondary Science Students. Further even the ‘t’ value shows that there is a significant difference between them. This may be due to the fact that the capacity to acquire and apply knowledge by means of thought and reason is better among the Male Higher Secondary Science Students. It can be noted that the present student is in line with the findings of Sahai (1985) in a research conducted on “A study of Relationship of Students’ sex-role Identity with Intelligence and certain Personality and Demographic variables” which revealed that male were found to be higher on mean Intelligence as compared to females. But the present findings contradicts to the research conducted by Baruah, (1981) on “Influence of the capacity of memorisation on Scholastic Achievement”
which conclude that boys of and girls were not different with respect to Intelligence

The findings show that both the Tribal and Non-Tribal Science Students have more or less that same General Intelligence. The ‘t’ test also shows that there is no significant difference between them. This finding is in line with the findings of Choudhuri (1959) in a study “A Comparative study of Concrete Intelligence of the Tribal and Non-Tribal Schools girls of Ranchi” which found that there was basically no difference in the concrete Intelligence of the Tribal and Non-Tribal group. Similarly the study conducted by Sinha (1964) on “Comparative study of Tribal and Non-Tribal Intelligence” revealed that there was no significant difference between Intelligence of Tribals and Non-Tribals. However, the findings refute the findings of Tripathy (1986) on “Home and Personality Determinants of Intelligence and Social competence of Tribal and Non-Tribal children” which showed that the Tribal and the Non-Tribal children differed significantly in their Intelligence. To have intelligence means having the ability to think. All forms of thinking (excluding, perhaps extremely insane forms of thinking) results in some kind of intelligent action, even if it may seem very low intelligence to us. A key to understanding intelligence requires the understanding of its basic mechanism for obtaining it. Maybe this is where the Tribal and Nontribal Science Student need to improve.

The Study also reveals that Science Students studying in Government Schools have high General Intelligence than the other Science Students studying in Deficit and Private Schools. The ‘t’ test also shows that there is a significant difference between the Students studying in Government and Private Schools, Government and Deficit Schools and Deficit and Private Schools. This refutes the findings in a study of
Shah, (1982) on “A Comparative study in Scholastic Achievement of the students who have taken their Primary Education in Corporation Schools” which revealed that the mean Intelligence score of the students coming from privately managed Schools was higher than that of the students coming from the Corporation Schools.

This may be due to the fact that the very task of acquiring knowledge predisposes an initial ignorance before obtaining and applying knowledge. This means that any intelligent entity must also possess limitations and unknowns about the universe before it can gather information and knowledge. Nowhere does intelligence require consciousness or self-awareness in order to achieve the capacity to acquire knowledge and apply it (although it could certainly enhance it). Students are capable of abstract and systematic thought and will construct a plan of action when confronted with a problem to solve, taking into account various factors and exploring possibilities. This is an area where maybe the Higher Secondary Students are not satisfactorily exposed to such situation to display their general intelligence in Deficit Schools and Private Schools.

3. **Level of Academic Achievement in Science**

The present findings revealed that Higher Secondary Science Student achievement is quite good as compared to their Scientific Attitude and General Intelligence because they portray to be High Achievers. It may also be due to the fact that parents are now aware of how important it is for their children to perform well in their studies or exams so they may have invested more time in their children – checking homework, attending school events and letting their children know the importance of studying in school and performing well in their examinations to meet the challenges to the world today. The reason to
this finding may also imply that teachers understand that teaching is a challenging task to accommodate all individual differences, optimize the learning environment and engage and support students together effectively. Teachers may also have played a role for preparing appropriate learning tasks, learning resources and evaluation materials that reflect their particular experience and knowledge and maybe these materials may have serve as guides and resources to be used while students at the same time take responsibility for their own learning.

The findings show that both the Female and Male Students have been high achievers in Science at their Secondary Level Examinations. However, the ‘t’ value show that there is a significant difference between them. The mean score shows that the male students have higher Academic Achievement than the female students. The findings is in line with the findings of Desai, (1979) on “A study of Classroom Ethos, Pupil’s Maturation and Academic Achievement”, found that boys were higher than girls in the level of pupil’s academic achievement. But it is not in line with the study by Harikhrishnan (1992) on “A study of academic achievement of the students of the Higher Secondary stage in relation to achievement- maturation and Socio-economic status”, the researcher found that Girls obtained a higher mean in academic achievement compare to boys. Further, the findings coincide with the research conducted by Baruah, (1981) on “Influence of the capacity of memorisation on Scholastic Achievement” which showed that boys and girls were not different with respect Scholastic Achievement. However, the findings is not in line with the study conducted by Jasuja (1983) on “A study of Frustration Level of Aspiration and academic Achievement in relation to Age, Educational and Sex Difference among Adolescents” which conclude that girls achieved higher in the academic field as
compared to boys and also with the study conducted by Devi (1990) on “Pupils academic achievement in relation to their intelligence, neurotic and locus of control” which revealed that Girls had a significantly higher academic achievement than boys and that there was no significant difference in the intelligence level of boys and girls. This refutes the findings of Jacobs (2002) which found that on average, girls do better in school than boys. Girls get higher grades and complete high school at a higher rate compared to boys.

With regards to the Tribal and Nontribal Students the Academic Achievement the findings indicate that the Nontribal Students Achievement in Science is much higher than the Tribal Students in Science. The ‘t’ value also indicates that there is a significant difference between them. The findings contradict to Aruna (1981) in a research on “A study of the factors influencing the achievement of the standard VII students belonging to Scheduled Caste and Scheduled Tribe whose medium of instruction is Kannada” which indicate that the academic achievement of Scheduled Tribe students was superior to that of Scheduled Caste students . The reason may be that nontribal students might have put in more time and effort in studying for the examinations. While tribal students might have taken studies very lightly.

The findings with regards to Science Students Studying in Deficit and Private Schools show that their achievement in Science is much higher than the students studying in Government School. The ‘t’ value also shows that there is a significant difference between them. This implies that the Deficit and the Private Schools have better facilities for Science Students. Further it may be due to the family background and maybe their participation in various club activities which relates to Science may have helped in obtaining better results in Science.
4. **Relationship between Scientific Attitude, General Intelligence and Academic Achievement (Science) of Higher Secondary Science Students in East Khasi Hills, Meghalaya**

There is no significant relationship between Scientific Attitude (SA) and General Intelligence (GI) at 0.05 levels. Therefore the null hypothesis is retained. The computed ‘r’ = 0.033.

There is a significant relationship between Scientific Attitude (SA) and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’ = 0.139. The findings is in line with the study by Bandyopadhyay (1984) in a study on “Environmental Influence, Academic Achievement and Scientific Attitude as Determinants of Adolescent Attitude towards Science stream” which showed the pupil who had a favourable attitude to Science possessed higher ability in mechanical comprehension and visualization of objects in space and also they were higher achievers in Physical and Life science. Further, the present findings coincide with the study conducted by Darchingpui (1989) on “A study of science achievement, Scientific attitude and Problem-Solving ability among Secondary School student in Aizawl” which revealed that there is a significant relationships between scores on scientific attitude and achievement in science and also with the comparative study conducted by Rao (1990) on scientific attitude, scientific aptitude and achievement in Biology at Secondary School level which depicted that there was a highly significant and positive association between scientific attitude and Biology achievement. Again, the study by Das, (1978) in “A psychometric study of low achievement of school Final candidates in general science” concluded that a positive correlation existed between Intelligence and achievement in general science which coincide with the
present study. Papanastasiou and Zembylas (2004) reported a high correlation between positive attitude towards science and achievement in science which is the same with the present study.

There is a significant relationship between General Intelligence and Academic Achievement (AA) in Science at 0.05 levels. Therefore the null hypothesis is rejected. The computed ‘r’=0.088. The findings are in line with the study by Thakur (1972) in “A Study of the Scholastic Achievement of Secondary School pupils in Bihar” which conclude that Scholastic Achievement and Intelligence were significantly associated. Malhotra (1986) in his study on “A study of the relationship between Intelligence, Socio-Economic Status, Anxiety, Personality adjustment and academic Achievement of High School students” remarked that there was a positive relationship between Intelligence and Academic Achievement which is in line with the present findings. Further, the present findings is the same with the one conducted by Makhija, (1973) on “Interaction among Values, Interest and Intelligence and its Impact on Scholastic Achievement” which showed that intelligence had a significantly positive influence on Scholastic Achievement and a study conducted by Sadhi (1977) on “Evaluation of Programmed Learning in Chemistry in relation to Taxonomy of Educational Objectives, Intelligence and Personality Traits at the Higher Secondary Level”, where the researcher showed that Intelligence facilitate Achievement. However, the findings is contrary to the study by Narula (1979) on “A study of Achievement Maturation, Personal Preferences, Perception, Anxiety, Risk taking Behaviour and other correlates in Secondary schools teachers of Orissa State” which revealed that Intelligence was not found to have any relationship with Achievement.
5. Scientific Attitude and General Intelligence in Relation to the Level of Academic Achievement in Science Among Higher Secondary Students in East Khasi Hills District, Meghalaya

The findings of the study reveal that there is a significant difference in the Scientific Attitude of Higher Secondary Science Students at different levels of Academic Achievement. Further the findings also indicate that there is a significant difference in the Scientific Attitude of Male and Female Higher Secondary Science Students between and within different levels of Academic Achievement. But it was found that there is no significant difference in the Scientific Attitude of Tribal and Non-Tribal Higher Secondary Science Students between and within different levels of Academic Achievement. However there is a significant difference in the Scientific Attitude of Government, Deficit and Private Higher Secondary Science Students between and within different levels of Academic Achievement.

It was also revealed that, there is no significant difference in the General Intelligence of Higher Secondary Science Students with their Academic Achievement. The findings show that there is a significant difference in the General Intelligence of Male and Female Higher Secondary Science Students between and within their Levels of Academic Achievement. It was found that there is no significant difference in the General Intelligence of Tribal and Non-Tribal Higher Secondary Science Students between and within their Levels of Academic Achievement. And there is a significant difference in the General Intelligence of Government, Deficit and Private Higher Secondary Science Students between and within their Levels of Academic Achievement.
5.3 Implications

The findings in the present study indicates that a number of students may not have been inculcated the spirit of curiosity and are not have been able to use rationality and open-mindedness in their thinking. It may be that they are not so accurate in calculations and observation. They may have not been toned to ideas about science and scientific methods which are directly or indirectly related to a course of action and also not able to give proper judgement. However, open mindedness, critical mindedness, respect for evidence, suspended judgment, intellectual honesty, willingness to change opinion, search for truth, curiosity, rational thinking, etc. are the most useful Scientific Attitudes.

Further, the present findings showed that majority of Higher Secondary Science Students have an average General Intelligence. The reasons for this finding may be due to the fact that the Higher Secondary Science Students’ ability to think about ideas, analyze situations, and solve problems has not been fully developed. Also, it maybe the opportunity for using the cognitive tools such as mnemonics, problem solving, heuristics, creativity techniques and decision making tool may not have been provided regularly or to the fullest extend as the teachers have to complete the course on time. The following suggestion may be helpful to the students in this area.

The findings implies that the student’s ability to study and remember facts and being able to communicate their knowledge verbally or write down on paper is satisfactory as their academic achievement in Science is mostly in the higher category. This showed how the students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers.
5.4 Suggestions

Scientific Attitude

The following points may prove fruitful to enhance the Scientific Attitudes among the students:

1. Awareness programmes on the importance of Science should be organised for HSSS.

2. Curiosity is considered to be the energizing factor that arouses exploratory behavior. Teachers can induce Curiosity in Student and that once induced, it can increase the input of information of value in interpreting observations. Curiosity leads to an increase in sensory data input.

3. The pre-scientific periods in our history was marked by numerous examples of mythological explanations. The tradition still abounds in our folklore and in the everyday thinking of many persons. To help students develop the attitude of rationality, Schools can help them confront with situations in which careful reasoning proves superior to explanations of a superstitious nature.

4. Students with scientific attitude accumulate sufficient evidence before making judgment or drawing conclusion. To develop this attitude, our students should be confronted with situations in which the behavior is rewarded and in some way leads to success, while formation of conclusions without evidence lead to failure. Students should be given the opportunity to examine closely the common practice to formulate a conclusion at the every experiment. At the end of these experiences, students should have the opportunities to choose among formulating a generalization with various qualifications, stating that they have only learned something about
the particular operation at hand, or stating that they could make new sense of the data.

5. An individual with scientific attitude looks for the natural causes of events is open-minded towards the work and opinion of others and towards information related to his problem, forms opinion and conclusions on adequate evidence, evaluates techniques and procedures used and information obtained, and is curious concerning the things he observes. Hence the Planners, Administrators and Teachers of Schools should provide an environment and a platform which will enable the Science Students to improve their Scientific Attitude.

6. To foster the development of Scientific Attitude, teacher should provide evidence to support generalization in the lessons taught. Students should be taught to look for arguments and evidence supporting important propositions, and they should be taught to provide these in their own communication. The reading of historical and biographical accounts of investigations is also valuable experiences from which pupils can learn of the sources of our current knowledge.

7. A scientist is objective in gathering and interpreting his ideas and is fair in communication his findings. To develop scientific attitude of objectivity, teachers should allow student to confront by situations with the recording of an observation or the interpretation of data in order to achieve a correct or accurate solution of a problem.

8. To be ‘scientific’ mean to have these personality traits. In our classroom, however, Students learn more than the content and processes of science. They incorporate these bits of knowledge and
skills along with those gained in other subjects and extracurricular experiences into their personal views of the world and their places in it. Each student will then gradually build his own philosophy of life.

9. To develop the Scientific Attitude of students should be free to attempt their own patterns of exploration. Learning experiences may be selected on the basis of knowledge, skills and attitudes to be learned.

10. Emphasis should be laid upon the teaching of science along with homemade cheep material for different experiments. The students may be encouraged to construct new equipment for the experiments.

11. Teachers should create interest in science teaching by organizing science exhibitions and science fairs. The modern scientific magazines, journals, films, video films, Science Exhibitions, Quiz, Innovative inventions etc should be provided to the school for students use.

12. Discovery and Constructivist approaches should replace the conventional method in science teaching.

General Intelligence

1. By practicing many proven cognitive tools such as mnemonics, problem-solving, heuristics, creativity techniques and decision-making tools. An increase in the general intelligence level can only result in a better life, health, and standard of living.

2. In life it’s not enough to just react to events, and situations, rather student should have a conscious objective and select their actions to get nearer to their objective.
3. Also it’s important to think about consequences of one’s actions, to minimize the possibilities of errors and regret. Deep thinking would normally help students live better, and reach their goals.

4. Good reasoning is the key to success, especially if performed consciously and in the proper order: a) have an objective, b) make a general sensing about it, c) determine your decision based on your sensing, d) make alternate plans (along the main objective), e) select the best response/plan. f) Start by carrying out your plan, g) observe results, h) store experiences (for future reference).

5. Human intelligence is not only difficult to measure; it’s also difficult to define. Most researchers, is of the opinion that our intelligence is a combination of what we know (our knowledge), our skills and our ability to understand and reason -- and that our cognitive abilities continue to grow throughout our lives, rather than being set at birth. Hence programmes and activities to improve the cognitive abilities of the students should be provided in order to enhance the general intelligence of the students.

6. Physical and mental health is related to one’s ability to gain desired achievement. A mental activity with delicate health, one may not possess enough energy to engage in mental activity to the extent that he achieves success. Physical defects such as in complete maturation of brain cells sensory and physical handicaps many interfere with observable intelligent behavior. Diseases also affect intelligence. Emotional bodies may interfere one’s ability. Unfavorable health affects mental status of the individual. Hence the parents of the students and School authorities should see that the physical and mental health of the students is sound.
7. It is a popular belief that boys are suppose to be more intelligent than girls. The research studies have shown that there is no significant differences between the sexes, on the average, girls seems to show slight superiority in language, memory and appreciation. Differences in intelligence are caused partly by environmental conditions. Hence the schools should provide a congenial environment to enable the students to learn better and improve the general intelligence as much as possible.

8. A person who is bright or dull in childhood tends to remain bright or dull throughout his life. Intelligence can continue through the early twenties, and a person achieves his maximum at about 10 years of age. At about 20 years an individual remains stable till 10 years and decreases after that. Some abilities remain constant while others decline rapidly due to decline in physical efficiency. Thus the School can organize co curricular activities to enhance students physical efficiency.

**Academic Achievement**

1. Students should be encouraged to take up science at the Higher Secondary Level if their Academic Achievement and Scientific Attitude is high.

2. Science Subject needs to be more interesting for young, high achieving students.

3. Being successful in school requires a high level of study skills. Students must first learn these skills, practice them and develop effective study habits in order to be more successful. Good study habits include many different skills: time management, self
discipline, concentration, memorization, organization, and effort. Desire to succeed is important, too.

4. Individual differences in academic performance have been linked to differences in intelligence and personality. Students with higher mental ability as demonstrated by IQ tests (quick learners) and those who are higher in conscientiousness (linked to effort and achievement motivation) tend to achieve highly in academic settings. A recent meta-analysis suggested that mental curiosity (as measured by typical intellectual engagement) has an important influence on academic achievement in addition to intelligence and conscientiousness (Stumm, Sophie; Hell, Benedikt; Chamorro-Premuzic, Tomas, 2011). Hence Teachers should be aware of the different types of individual differences prevailing in the classrooms. They should give students some space and opportunities to develop their curiosity.

5. Student’s home learning environment transitions into a more structured learning environment is necessary and important for parents to provide for their children. Early academic achievement enhances later academic achievement.

6. Another very important enhancer of academic achievement is the presence of physical activity. Studies have shown that physical activity can increase neurotic activity in the brain. (Tomporowski, & et al, 2008). Exercise specifically increases executive brain functions such as attention span and working memory.
5.5 Conclusion

The present study reveals that there are very less number of Higher Secondary Science Students who are having a favourable Scientific Attitude. Further, majority of the Higher Secondary Science Students have an average General Intelligence, hence, Students needs to be encourage to practice proven cognitive tools such as mnemonics, problem solving, heuristics, cognitive techniques and decision making tools which will help increase the General Intelligence level and can result in a better life, health and standard of living of our learners. However, the Academic Achievement of Higher Secondary Science Students in Science is quite high even if they are having a very less Scientific Attitude. The study further reveals that there is no difference between the Scientific Attitude of Students coming from different Community and of different Sex. However there is a difference between the Scientific Attitude of those Students studying in Government and Private Schools as well as those studying in Deficit and Private Schools. The study finally shows that there is a relationship between Scientific Attitude and Academic Achievement in Science as well as in General Intelligence of the Students.

Development of Scientific Attitude among Higher Secondary Science Students is an important factor for increasing their academic achievement especially in Science subject. It would help in nurturing them with an open minded attitude, which would enable them to search for truth and developing the desire to acquired correct knowledge. Such attitude would help these learners to solve problems in their everyday life in a scientific manner. Attitude towards science would help our learner to gain quality academic achievement not only in Science but in other areas as well. Therefore, the Investigator hope that the present
study would surely help to understand Higher Secondary Science Students better, so that remedial measures for those lacking in this area maybe given an improvement and support to those having a high Scientific Attitude to further increase and enhance their General Intelligence and Academic Achievement.