1. **Introduction**

Mathematics is exceptionally difficult subject but any student of an average intelligence can learn this subject. There is nothing like mathematical ability or intelligence, any student can acquire this ability by developing positive attitude towards mathematics. Some students who are not showing any potential in the subject at this stage may prove their worth in the coming years of their school stage by developing proper study habits.

Mathematics gains a very important place in man’s everyday life as well as in the school curriculum. It is a compulsory subject at secondary level and the result of class X has a significant role in opting subjects in senior secondary level. It is one of the strongest pillars in students’ academic edifice. And, therefore, one cannot ignore the value of this subject. By learning mathematics at secondary stage students understand the inter-relationship of mathematical facts, formulae, principles and processes. They also understand the theoretical and abstract aspects of mathematics. At this level they develop skills in solving the same problem by various possible methods. They learn the applications of mathematics in their day-to-day, social, vocational, occupational and recreational life. Students also gain confidence and competence in learning of mathematics.

There are enough researches done in this area that confirms that the students’ attitude towards mathematics and their study habits have significant relationship with academic achievement in mathematics. In many of the countries the problem of academic achievement in mathematics has been investigated, viz. Hong Kong, Cambodia, Singapore, Nigeria, Pakistan, Spain, Nepal, Turkey, Malaysia, Indonesia, Finland, Australia, Philippines, Tasmania, New Zealand, and Iran etc. Studies were also done in many Indian states/cities. This indicates that underachievement in mathematics is a global problem. As

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far as Sikkim is concerned the investigator could not locate any research done in this area.

2. Need and Justification

An important aim of mathematics education is to develop positive attitude towards mathematics in students. Without interest and personal effort in learning in mathematics students can hardly perform well in the subject. Attitude and study habits of student can obstruct or enhance students’ academic achievement.

The academic achievement of students influences their future career. It is widely accepted that high achievers are more successful as compared to the low achievers. It has been seen that majority of students have a sense of fear and failure regarding the subject of mathematics. Hence, the fear of the subject affects in achievement in academics. Liking and disliking of any subject is an outcome of attitude of students towards the subject. Positive attitude also leads in development of good study habits. If students are having inclination towards the subject they will pay more attention in studying that subject. Therefore, students should be motivated to develop positive attitude and good study habits.

Sikkim state too suffers from the problem of low achievers and failures in mathematics. As mathematics is a compulsory subject at secondary stage and it becomes important for every student to score good percentage. As mentioned above, in the absence of any study done in this area in the state the investigator thought to undertake this study to find out the status of class X students’ attitude towards mathematics and study habits in relation to their achievement in mathematics, and also to find out the probable reason of the problem and to recommend some possible measures.
3. Statement of the Problem

The problem under investigation is titled as:

“Attitude towards Mathematics and Study Habits in relation to the Achievement in Mathematics of Class X Students in East and South Sikkim”.

The main purpose of selecting this problem is to investigate the influence of Attitude towards Mathematics and Study Habits of students of class X on their performance in mathematics.

4. Operational Key Terms Used

The present study involves the following key terms which are operationally defined as follows:

i. Academic Achievement

It refers to the student’s achievement in the subject of Mathematics. In the present study it is reflected in terms of the percentage of marks obtained in Mathematics by students of class X in Central Board of Secondary Education (CBSE) Examination.

a) High Achievers

These are those students who acquire first division with 61% and above in the subject of Mathematics in their Central Board of Secondary Education (CBSE) examination.

b) Average Achievers

These are those students whose percentage is between 41% and 60% in the subject of Mathematics in their Central Board of Secondary Education (CBSE) examination.

c) Low Achievers

These are those students whose percentage is between 40% and below in the subject of Mathematics in their Central Board of Secondary Education (CBSE) examination.
ii. **Attitude towards Mathematics**

It is predisposition to perceive, feel or behave towards specific objects or certain people in a particular manner. In the present study it refers to the perception and feeling of a student towards the subject of mathematics.

iii. **Study Habits**

It is a natural tendency of engaging oneself in the task of learning so as to acquire knowledge about a given subject. It refers to the skills and strategies used by students when studying. In the present study it refers to school and home environment, general habits of student, planning and preparing for the examination.

5. **Objectives of the Study**

The objectives of the study are:

i. To find out the Attitude of Class X students towards Mathematics in East and South districts of Sikkim.

ii. To find out the Study Habits of Class X students in East and South districts of Sikkim.

iii. To find out the extent of relationship between Attitude towards Mathematics and Achievement in Mathematics of Class X students in East and South districts of Sikkim.

iv. To find out the extent of relationship between Study Habits and Achievement in Mathematics of Class X students in East and South districts of Sikkim.

v. To study the difference in Attitude towards Mathematics between high and low achievers in mathematics of Class X students in East and South districts of Sikkim in respect to the following components:
Abstract

a) Wider Applicability.
b) Development of Skills.
c) Reasoning.
d) Objectivity.
e) Intellectual Development.
f) Non-Intellectual Development.
g) Individual Outlook.
h) Universal Outlook.

vi. To study the difference in Study Habits between high and low achievers in mathematics of Class X students in East and South districts of Sikkim in respect to the following components:

a) Home Environment & Planning.
b) Reading & Note-taking.
c) Planning of Subjects.
d) Habits of Concentration.
e) Preparation for Examination.
f) General Habits & Attitudes.
g) School Environment.

vii. To find out sex differences (male/female) in Attitude towards Mathematics within high and low achievers of Class X students in East and South districts of Sikkim.

viii. To find out sex differences (male/female) in the Study Habits within high and low achievers of Class X students in East and South districts of Sikkim.

ix. To draw out the implications and suggest recommendations for the study.
6. **Null Hypotheses**

The following null hypotheses were framed for the study:

i. There is no significant relationship between Attitude towards Mathematics and academic achievement of Class X students in East and South districts of Sikkim.

ii. There is no significant relationship between Study Habits and academic achievement of Class X students in East and South districts of Sikkim.

iii. There is no significant difference in the Attitude towards Mathematics between high and low achievers in mathematics of Class X students in East and South districts of Sikkim in respect to the following components:

   a) Wider Applicability.
   b) Development of Skills.
   c) Reasoning.
   d) Objectivity.
   e) Intellectual Development.
   f) Non-Intellectual Development.
   g) Individual Outlook.
   h) Universal Outlook.

iv. There is no significant difference in the Study Habits between high and low achievers in mathematics of Class X students in East and South districts of Sikkim in respect to the following components:

   a) Home Environment & Planning.
   b) Reading & Note taking.
   c) Planning of Subject.
   d) Habits of Concentration.
   e) Preparation for Examination.
   f) General Habits & Attitudes.
g) School Environment.

v. There is no sex difference (male/female) in the Attitude towards Mathematics within high and low achievers of Class X students in East and South districts of Sikkim.

vi. There is no sex difference (male/female) in the Study Habits within high and low achievers of Class X students in East and South districts of Sikkim.

7. **Delimitation of the Study**

This study is delimited to the students studying in Government schools affiliated to the Central Board of Secondary Education (CBSE) in East and South districts of Sikkim.

8. **Design of the Study**

The present study is designed as follows:

i. **Population**

The population of the present study comprises of all the students studying in class X in various Secondary and Senior Secondary Schools in Government Schools affiliated to CBSE (Central Board of Secondary Education) in East and South districts of Sikkim.

ii. **Sample**

Random sampling method was applied to draw out the sample for the present study. The sample consists of 820 students studying in class X, from 27 schools from both the districts.

iii. **Tools Used**

In order to obtain the required data the following tools were used in the present study:
a) Dr. S. C. Gakhar and Rajni’s Attitude towards Mathematics Scale (ATMS).\(^1\)

b) B. V. Patel’s Study Habit Inventory (SHI).\(^2\)

**iv. Procedure for Collection of Data**

The data was collected by:

a) Administering the tools mentioned above on the sample taken.

b) Obtaining students’ marks in the subject of Mathematics in class X in CBSE examination 2012.

**v. Statistical Technique Used**

The present study has used the following statistical techniques:

a) Mean and Standard Deviation.

b) Percentage was also used for calculation.

c) Pearson’s Co-efficient of Correlation.

d) z-test.

**9. Analysis and Interpretation of Data**

The collected data was analysed and interpreted as follows:

**I. Status of Attitude towards Mathematics, Study Habits and Achievement in Mathematics of class X students.**

The research findings with regards to status of attitude towards mathematics, study habits and achievement in mathematics of class X students studying in Government schools in East and South districts of Sikkim are as follows:

**A. Attitude towards Mathematics of class X students.**

The sample of 820 students were tested on standardized ATMS (Attitude towards Mathematics Scale) and classified as per the manual into five categories

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\(^2\) Dr. B. V. Patel, Study-Habits Inventory, Agra Psychological Research Cell, n.d.
viz. strongly favourable, favourable, neutral, unfavourable, and strongly unfavourable. The entire score of attitude towards mathematics were classified for male and female students separately and also in total (male & female) for the above mentioned categories.

a) Male students

Majority (about 80%) of male student are having favourable attitude towards mathematics and none of them are having strongly unfavourable attitude towards mathematics.

b) Female students

Majority (about 80%) of female students are having favourable attitude towards mathematics and a negligible number (about 1%) of students are having unfavourable attitude towards mathematics. None of them are having strongly unfavourable attitude towards mathematics.

c) Total Sample

Majority (about 80%) of students (male & female) are having favourable attitude towards mathematics and a negligible number (about 1%) of students are having unfavourable attitude towards mathematics. None of them are having strongly unfavourable attitude towards mathematics.

B. Classification of Study Habits and Description of Study Habits of students with respect to its various Components.

The sample of 820 students were tested on standardized Study Habits Inventory (SHI) and classified as per the manual into five categories viz. very good, good, normal or satisfactory, below normal or poor, and very poor. The entire score of study habits were classified for male and female students separately and also in total (male & female) for the above mentioned categories. They were also classified according to the given components in the manual.
a) **Male students**

A large number (about 42%) of male students are having normal or satisfactory study habits, followed by a good number (about 30%) of them who are having below normal or poor study habits. Majority of them plan their subjects properly, they study with concentration, they prepare for their examinations properly, their habits & attitudes are proper and their school environment is congenial. On the other hand majority of them do not have congenial home environment, and have improper habits of reading & note-taking.

b) **Female students**

A large number (about 46%) of female students are having normal or satisfactory study habits, followed by a good number (about 28%) of them who are having below normal or poor study habits. Majority of them plan their subjects properly, they study with concentration, they prepare for their examinations properly, their habits & attitudes are proper and their school environment is congenial. On the other hand majority of them do not have congenial home environment, and have improper habits of reading & note-taking.

c) **Total sample**

A large number (about 44%) of students (male & female) are having normal or satisfactory study habits, followed by a good number (about 29%) of them who are having below normal or poor study habits. Majority of them plan their subjects properly, they study with concentration, they prepare for their examinations properly, their habits & attitudes are proper and their school environment is congenial. On the other hand majority of them do not have congenial home environment, and have improper habits of reading & note-taking.
C. Students Achievement in Mathematics

The sample of 820 students were divided into the categories of high achievers, average achievers and low achievers, based on their achievement in mathematics in Central Board of Secondary Education (CBSE) examination 2012.

Majority (about 60%) of students are average achievers and a fair number (about 30%) of students are low achievers and the rest (about 10%) of them are high achievers.

II. Relationship of Attitude towards Mathematics and Study Habits of class X students with their Achievement in Mathematics.

To find out relationship between attitude towards mathematics and study habits with achievement in mathematics, the Pearson $r$ (Product Moment Correlation) were calculated.

(a) Relationship between Attitude towards Mathematics and Achievement in Mathematics.

To analyse the relationship between attitude towards mathematics and achievement in mathematics, the following null hypothesis was formulated:

Hypothesis No. 1

“There is no significant relationship between attitude towards mathematics and academic achievement of class X students in East and South districts of Sikkim.”

The analysis showed that the computed value of $r$ was significant at 0.01 level of significance. It revealed that there is a significant relationship between attitude towards mathematics and achievement in mathematics. It indicates that more favourable the attitude towards mathematics higher will be the achievement in mathematics and more unfavourable attitude towards mathematics lower will be the achievement in mathematics.
(b) **Relationship between Study Habits and Academic Achievement.**

To analyse the relationship between study habits and achievement in mathematics, the following null hypothesis was formulated:

**Hypothesis No. 2**

“There is no significant relationship between study habits and academic achievement of class X students in East and South districts of Sikkim.”

The analysis showed that the computed value of $r$ was significant at 0.01 level of significance. It revealed that there is a significant relationship between study habits and achievement in mathematics. It indicates that better the study habits higher will be the achievement in mathematics and poorer the study habits lower will be the achievement in mathematics.

**III. Difference between High and Low Achievers with respect to the Attitude towards Mathematics.**

To analyse the difference between high and low achievers with respect to the attitude towards mathematics, the following null hypothesis was formulated:

**Hypothesis No. 3**

“There is no significant difference in the attitude towards mathematics between high and low achievers of class X students in East and South districts of Sikkim.”

To test this hypothesis, mean and standard deviation for attitude towards mathematics were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in attitude towards mathematics between high and low achievers of class X students. This difference is in favour of high achievers which show that high achievers have more favourable attitude towards mathematics as compared to the low achievers.
Hypothesis No. 3 (a)
“There is no significant difference in the attitude towards mathematics with respect to Wider Applicability between high and low achievers of class X students”.

To test this hypothesis mean and standard deviation for wider applicability were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in attitude towards mathematics with respect to wider applicability between high and low achievers. This difference is in favour of high achievers which show that high achievers have more favourable attitude towards mathematics with respect to the wider applicability of mathematical concepts as compared to low achievers.

Hypothesis No. 3 (b)
“There is no significant difference in the attitude towards mathematics with respect to development of skills between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for development of skill were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in attitude towards mathematics with respect to development of skills between high and low achievers. This difference is in favour of high achievers which show that high achievers have more favourable attitude towards mathematics with respect to the development of skills in mathematics as compared to low achievers.
Hypothesis No. 3 (c)
“There is no significant difference in the attitude towards mathematics with respect to reasoning between high and low achievers in class X students.”

To test this hypothesis mean and standard deviation for reasoning were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in attitude towards mathematics with respect to reasoning between high and low achievers. This difference is in favour of high achievers which show that high achievers have more favourable attitude towards mathematics with respect to reasoning in mathematics as compared to low achievers.

Hypothesis No. 3 (d)
“There is no significant difference in the attitude towards mathematics with respect to objectivity between high and low achievers of class X students”.

To test this hypothesis mean and standard deviation for objectivity were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in attitude towards mathematics with respect to objectivity between high and low achievers.

Hypothesis No. 3 (e)
“There is no significant difference in the attitude towards mathematics with respect to intellectual development between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for intellectual development were calculated with respect to high and low achievers and then
the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in attitude towards mathematics with respect to intellectual development between high and low achievers.

**Hypothesis No. 3 (f)**

“There is no significant difference in the attitude towards mathematics with respect to non-intellectual development between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for non-intellectual development were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in attitude towards mathematics with respect to non-intellectual development between high and low achievers. This difference is in favour of high achievers which show that high achievers have more favourable attitude towards mathematics with respect to non-intellectual development in mathematics as compared to low achievers.

**Hypothesis No. 3 (g)**

“There is no significant difference in the attitude towards mathematics with respect to individual outlook between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for individual outlook were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in attitude towards mathematics with respect to individual outlook between high and low achievers.
Hypothesis No. 3 (h)

“There is no significant difference in the attitude towards mathematics with respect to universal outlook between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for universal outlook were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in attitude towards mathematics with respect to universal outlook between high and low achievers.

IV. Difference between high and low achievers with respect to the Study Habits.

To analyse the difference between high and low achievers with respect to study habits following null hypothesis was formulated:

Hypothesis No. 4

“There is no significant difference in the study habits between high and low achievers of class X students in East and South districts of Sikkim.”

To test this hypothesis, mean and standard deviation for study habits were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in study habits between high and low achievers of class X students. This difference is in favour high achievers which show that high achievers have better study habits as compared to the low achievers.

Hypothesis No. 4 (a)

“There is no significant difference in the study habits with respect to home environment & planning between high and low achievers of class X students.”
To test this hypothesis mean and standard deviation for home environment & planning were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in study habits with respect to home environment & planning between high and low achievers.

**Hypothesis No. 4 (b)**

“There is no significant difference in the study habits with respect to reading & note-taking between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for reading & note-taking were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in study habits with respect to reading & note-taking between high and low achievers. This difference is in favour of high achievers which show that high achievers have better study habits with respect to reading & note-taking as compared to low achievers.

**Hypothesis No. 4 (c)**

“There is no significant difference in the study habits with respect to planning of subjects between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for planning of subjects were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in study habits with respect to planning of subjects between high and low achievers. This difference is in favour of high achievers which show that high achievers have better study habits with respect to planning of subjects as compared to low achievers.
Hypothesis No. 4 (d)
“There is no significant difference in the study habits with respect to habits of concentration between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for habits of concentration were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in study habits with respect to habits of concentration between high and low achievers.

Hypothesis No. 4 (e)
“There is no significant difference in the study habits with respect to preparation for examination between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for preparation for examination were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in study habits with respect to preparation for examination between high and low achievers. This difference is in favour of high achievers which show that high achievers have better study habits with respect to preparation for examination as compared to low achievers.

Hypothesis No. 4 (f)
“There is no significant difference in the study habits with respect to habits & attitudes between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for habits & attitudes were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was significant at 0.01 level of significance. It revealed that there is a significant difference in study habits with respect to habits &
attitudes between high and low achievers. This difference is in favour of high achievers which show that high achievers have better study habits with respect to habits & attitudes as compared to low achievers.

Hypothesis No. 4 (g)

“There is no significant difference in the study habits with respect to school environment between high and low achievers of class X students.”

To test this hypothesis mean and standard deviation for school environment were calculated with respect to high and low achievers and then the value of mean difference (D) and z-value were calculated. The analysis showed that the computed value of z was not significant. It revealed that there is no significant difference in study habits with respect to school environment between high and low achievers.

V. Difference among Male and Female in Attitude towards Mathematics within High and Low Achievers.

To study the difference between male and female students of class X in attitude towards mathematics within high and low achievers the following null hypothesis was formulated;

Hypothesis No. 5

“There is no sex difference (male/female) in the attitude towards mathematics within high and low achievers of class X students in East and South districts of Sikkim.”

To test this hypothesis, mean and standard deviation for attitude towards mathematics were calculated for male and female students within high and low achievers and then the value of mean difference (D) and z-value were calculated.

(a) The analysis for the difference between male and female students in attitude towards mathematics within high achievers showed that the computed value of z was not significant. It revealed that there is no
significant difference between male and female students within high achievers with respect to their attitude towards mathematics. This indicates that the sex of the students within high achievers does not influence their attitude towards mathematics.

(b) The analysis for the difference between male and female students in attitude towards mathematics within low achievers showed that the computed value of z was not significant. It revealed that there is no significant difference between male and female students within low achievers with respect to their attitude towards mathematics. This indicates that the sex of the students within low achievers does not influence their attitude towards mathematics.

VI. Difference among Male and Female in Study Habits within High and Low Achievers.

To study the difference between male and female students of class X in study habits within high and low achievers the following null hypothesis was formulated:

Hypothesis No. 6
“There is no sex difference (male/female) in the study habits within high and low achievers of class X students in East and South districts of Sikkim.”

To test this hypothesis, mean and standard deviation for study habits were calculated for male and female students within high and low achievers and then the value of mean difference (D) and z-value were calculated.

(a) The analysis for the difference between male and female students in study habits within high achievers showed that the computed value of z was not significant. It revealed that there is no significant difference between male and female students within high achievers with respect to their study habits. This indicates that the sex of the students within high achievers does not influence their study habits.
(b) The analysis for the difference between male and female students in study habits within low achievers showed that the computed value of z was not significant. It revealed that there is no significant difference between male and female students within low achievers with respect to their study habits. This indicates that the sex of the students within low achievers does not influence their study habits.

10. Findings, Conclusions and Recommendations

The Findings, conclusions and recommendations of the present study are summarised as under:

Findings:

I. Status of Attitude towards Mathematics, Study Habits and Achievement in Mathematics of class X students of East and South districts of Sikkim.

A. Status of Attitude towards Mathematics

a) Male students

Majority of male students (around 80%) have favourable attitude toward mathematics, whereas none of them have strongly unfavourable attitude towards mathematics.

b) Female students

Majority of female students (around 80%) have favourable attitude towards mathematics, whereas none of them have strongly unfavourable attitude towards mathematics.

c) Total number of students (male & female)

The findings of the study reveals that majority of students have favourable attitude towards mathematics. A very negligible number of student (around 1%) have unfavourable attitude towards mathematics. None of them have strongly unfavourable attitude towards mathematics.
B. **Status of Study Habits and description of students with regards to its various Components**

   a) **Male Students**
   A large number of male students (about 42%) have normal or satisfactory study habits, followed by a good number of students (about 30%) who have below normal or poor study habits.

   b) **Female Students**
   A large number of female students (about 46%) have normal or satisfactory study habits, followed by a good number of students (about 28%) who have below normal or poor study habits.

   c) **Total number of students (male & female)**
   A large number of students (about 45%) have normal or satisfactory study habits, followed by a good number of students (about 29%) who have below normal and poor study habits.

C. **Achievement in Mathematics**

   In the entire sample of 820 students, majority of students (about 60%) are average achievers and a good number of them (about 30%) are low achievers and the rest of the students (about 10%) are high achievers. This classification was done on the basis of their marks in mathematics in CBSE (Central Board of Secondary Education) examination 2012.

II. **Relationship of Attitude towards Mathematics and Study Habits with Achievement in Mathematics of class X students.**

   The research findings with regards to relationship of attitude towards mathematics and study habits with achievement in mathematics of class X students in East and South districts of Sikkim are as follows:
a) **Relationship between Attitude towards Mathematics and Achievement in Mathematics.**

The findings of the present study revealed that there is a significant relationship between attitude towards mathematics and achievement in mathematics. This indicates that students’ attitude towards mathematics affects their achievement in mathematics, which means more favourable the attitude towards mathematics higher will be the achievement in mathematics. Similarly, more unfavourable the attitude towards mathematics lower will be the achievement in mathematics.

b) **Relationship between Study Habits and Achievement in Mathematics.**

The findings of the present study revealed that there is a significant relationship between students’ study habits and achievement in mathematics. This indicates students’ study habits affect their achievement in mathematics, which means better the study habits higher will be the achievement in mathematics. Similarly, poorer the study habits lower will be the achievement in mathematics.

**III. Difference between High and Low achievers with respect to their Achievement in Mathematics and its various components.**

The findings of the present study revealed that there is a significant difference in attitude towards mathematics between high and low achievers of class X students. This difference is in favour of high achievers. The findings further revealed that there is a significant difference between high and low achievers of class X students with respect to various components of attitude towards mathematics viz. wider applicability, development of skill, reasoning, and non-intellectual development. On the other hand, the findings also revealed that there is no significant difference between high and low achievers of class X students with respect to various other components viz. objectivity, intellectual development, individual outlook, and universal outlook.
IV. Difference between High and Low achievers with respect to their Study Habits and its various components.

The findings of the present study revealed that there is a significant difference in study habits between high and low achievers of class X students. This difference is in favour of high achievers. The findings further revealed that there is a significant difference between high and low achievers of class X students with respect to various components of study habits viz. reading & note-taking, planning of subjects, preparation for examination, and habits & attitudes. On the other hand, the findings also revealed that there is no significant difference between high and low achievers of class X students with respect to various other components viz. home environment & planning, habits of concentration, and school environment.

V. Difference between Male and Female students in Attitude towards Mathematics within High and Low achievers.

The findings of the study revealed that:

(i) **High achievers**

There is no significant difference between male and female students of class X within high achievers with regards to the attitude towards mathematics. It shows that the sex of the students within high achievers does not influence their attitude towards mathematics.

(ii) **Low achievers**

There is no significant difference between male and female students of class X within low achievers with regards to the attitude towards mathematics. It shows that the sex of the students within low achievers does not influence their attitude towards mathematics.

VI. Difference between Male and Female students in Study Habits within High and Low achievers.
The findings of the study revealed that:

(i) **High achievers**

There is no significant difference between male and female students of class X within high achievers with regards to the study habits. It shows that the sex of the students within high achievers does not influence their study habits.

(ii) **Low achievers**

There is no significant difference between male and female students of class X within low achievers with regards to the study habits. It shows that the sex of the students within low achievers does not influence their study habits.

**Conclusion**

This study was undertaken with the aim to investigate the class X students’ attitude towards mathematics, study habits and their relationship with their achievement in mathematics. The sample of 820 students was drawn from the total number of students studying in class X in government schools in East and South districts of Sikkim, affiliated to the Central Board of Secondary Education (CBSE). This study further investigates into the high and low achievers in mathematics with respect to attitude towards mathematics and study habits. The investigation goes deeper into the components of attitude towards mathematics (viz. wider applicability, development of skills, reasoning, objectivity, intellectual development, non-intellectual development, individual outlook and universal outlook) and study habits (viz. home environment & planning, reading & note-taking, planning of subjects, habits of concentration, preparation for examination, general habits & attitudes and school environment).

The result of this investigation showed that the academic achievement of students in mathematics is affected by their attitude they have for the subject of mathematics and by their habits of study. Among the students who are studying in class X in Government schools in East and South districts of Sikkim,
majority (60%) of them are average achievers, i.e. they have scored only 40% and below, and least of them (10%) are high achievers who have scored 61% and above, in their class X CBSE (Central Board of Secondary Education) examination 2012. In fact, students’ sex (male/female) does not have any influence in their attitude towards mathematics and study habits within high and low achievers.

High achievers were found to have better capabilities of applying mathematical concepts and in using mathematical knowledge in different situations. They read properly and take down notes given in their class. They plan their subjects according to its difficulties and give more time to difficult subjects like mathematics. Their preparation for examinations is suitable. They have good general habits and attitudes as compared to low achievers.

On the other hand, the high achievers and low achievers were found to be alike in various other components. They have same objectivity. Their intellectual development is same. They have same belief in individual outlook in mathematical concept. Both high and low achievers have similar home environment and school environment. Both of them plan their time-table and study with concentration.

Implications and Recommendations

A. Attitude towards Mathematics

Many scholars believe that teachers can play a vital role in developing attitude towards mathematics in their students. To develop high favourable attitude towards mathematics, teachers can help to improve their students’ attitude by approaching the teaching of mathematics from its practical applications to the real life problems. Different types of aid materials that can be used by teachers are briefly mentioned below:

(i) Audio-visual aids

It helps in clarifying the various abstract concept of mathematics. The class no longer will be boring, dull and unreal. It will satisfy students’
interests and their innate tendencies which help in the process of learning. The use of audio-visual aids facilitates the teachers to follow the important maxims of teaching like, ‘simple to complex’, ‘concrete to abstract’, ‘known to unknown’, and ‘learning by doing’ etc.

To explain theories and principles in effective way teachers may use weighing measuring instruments, real objects, models, drawing instruments, pictures & charts and motivate students to participate in mathematical games & riddles.

(ii) Mathematics Club

Mathematics club in school can be organised in the same way as in other subjects. This club will provide a forum to those students who are interested in mathematics for mathematical activities. They will get opportunities to develop their mathematical hobbies; they can participate in mathematical projects, games, discussions and debates. This club can be a medium of exchanging of mathematical information, experiences, experiments and innovations.

(iii) Testing Students’ Attitude through Attitude test

Evaluation of mathematics achievement may include some items to test students’ attitude towards mathematics for ascertaining the students’ level of interest. This may help the teachers to guide students in proper channel in mathematics.

B. Study Habits

Some of the essences of good study habits are time management, concentration, note-taking, reviewing, organizational skill, and motivation. Students should develop a habit of studying regularly even if there is no homework/assignment or test on the next day. This habit will make them prepared. Setting goal can also be a good strategy of study.

C. Techniques for Enhancing Mathematics Achievement

Some of the effective techniques that may be used in studying and practicing mathematics are mentioned below:
(a) **Oral work**
This is the method in which one has to work mentally which helps in development of mental faculty. It quickens wit and sharpens intelligence.

(b) **Drill work**
One can achieve speed and accuracy in solving mathematical problems only through drill work. In mathematics, there is a least chance of cramming, therefore, operations of mathematics have to be memorised through enough number of drills. To motivate a drill work, a spirit of play may be introduced. This makes the process of memorisation less tiresome.