Chapter 6

An Investigation on the Effect of Institutional Factors on Interest in Mathematics of Students

Discussion of this chapter is on the basis of our papers Entitled “Effect of Institutional Factors on ‘Mathematics Interest’ of students of Guwahati” which was presented in the Technical session on Mathematical Sciences of Assam Academy of Mathematics at Gauhati University on 22nd December, 2012.

&

Entitled “Effect of Teachers’ qualification and gender on ‘mathematics interest’ of students of Guwahati” which was presented in the National seminar entitled ‘Mathematics : the need of the hour’ at Department of Mathematics, Shillong College, Shillong, Meghalaya on 7th and 8th December, 2012

In this chapter, we have discussed

The ‘mathematics interest’ of the upper primary students of Guwahati studying in different categories of schools such as Government SEBA, Private SEBA and Private CBSE schools and different types of schools such as normal co-educational, co-educational schools segregated by gender, girls’ only and boys’ only schools.

Hence, in this study we tried to investigate whether the enrolment of boys and girls in different categories as well as different types of schools influence on their ‘mathematics interest’.

In our study, teachers’ gender and educational qualification were also taken into account as two of the factors to be investigated. Teachers’ qualification in this study measures the educational attainment of the teachers.
So, main focuses of this chapter are:

- To study the ‘mathematics interest’ of the upper primary students of Guwahati studying in different categories and types of schools.
- To find out the association between gender of teachers and interest of their students in mathematics.
- To find out the association between qualification of teachers and interest of their students in mathematics.
- To study the effect of gender and qualifications of teachers on the mathematics interest of their students.

6.00 Introduction:

Education is mainly considered as a process of human development. All the educational institutions or schools and colleges have the focus to impart knowledge to the students for their development. The purpose of education is to prepare the students for the future. Those who get admitted into the schools at elementary stage would come out after 16 or 20 years to enter into their lives in society. Thus, the orientation of education is towards future life situation. A micro level longitudinal study by NCERT in India which followed a cohort of children from the pre-primary stage through five grades of primary school has shown a significantly favorable and long term impact of a quality early childhood care programme on children’s learning, specifically in mathematics [70].

Several efforts have been made in the past to use technological aids for improving the quality of education. Audio-visual units and film libraries were set up at the center and in the states for promoting the use of educational films and projection/ non projection aids. Educational technology cells were established in different states and a center of educational technology was set up in the National Council of Education, Research and Training (NCERT) to stimulate the use of television and other instructional media [114].
Mathematics has been an inseparable part of school curriculum ever since the beginning of formal education. Teaching of mathematics has been a challenge to teachers. Necessity of teaching more mathematics and better mathematics has emerged from the advancement of this subject itself and its applications in other disciplines. It is well known that the levels of achievement in mathematics increase as the interest of the students increase. Interest in raising the levels of achievement of the students in mathematics has led to focus on identifying the factors responsible to limit or enhance the 'mathematics interest' of different groups of students. For many years educators have debated which school variables influence students' achievements as students' poor achievement in mathematics has become an issue of global concern (Reynolds & Farrell, 1996; Darling-Hammond, 2000) [28]. Some of the studies focused on teachers' qualifications (Darling-Hammond, 2000; Rice, 2003), and some others on different institutional factors (Stigler & Hiebert, 1999; Reynolds & Muijs, 1999) [28, 98].

One of the three dimensions of educational process is the teacher. Involvement of teachers who are not qualified to teach may be one reason for the poor academic performances of students in mathematics. Investigations of researchers namely, Sanders & Rivers (1996), Collias, Pajak, & Rigden (2000) revealed that influence of teachers is the single-most important factor in determining students' achievements [23,100]. Achievement in academic success of the students with more exposure to qualified teachers are far more than those with less exposure [53]. Teacher is an essential element in the process of teaching and learning [83]. Teacher provides environment which facilitate learning. Teacher helps the pupils to visualize facts in new light and thereby help them to discover knowledge. The teacher should act as a guide. The teacher must be able to develop interest of students in that particular subject. It is the teacher who can help the students from socially, economically backward classes to come up to the level of students coming from high socio-economic classes. The teacher must have the ability to teach the students as per their ability to learn something. They must possess high level of teaching aptitude, good physical and mental health, intelligence, creativity, subject knowledge, emotional
stability etc [76]. Among the group of teachers the role of primary teachers are very important.

Teachers have been recognized as key persons in the preservation, progression and projection of a nation’s cultural heritage. “Teachers establish and nurture an environment conducive to learning mathematics through the decisions they make, the conversations they orchestrate, and the physical setting they create” (NCTM, 2000). Good teaching is the main criterion of an effective teacher. High quality teaching can close the achievement gap [12]. Teaching is a purposeful activity. The purpose of teaching students is to help students in their all round development, while the main focus of teaching is to facilitate learning. Where there is teaching, learning must be there. Hence, teaching activities must be designed to produce change in the behavior of the learner. For this, the teachers must be a learned person and professionally trained. He must have mastery over the subject matter which he teaches. He must have knowledge about the best methods and techniques of teaching. A number of researchers have opined that a powerful predictor of students’ performance is the quality of teachers, teaching the students. Qualifications of teacher play an important role in teaching but professional education is more important in teaching as because, a trained teacher can teach better than an un-trained teacher. Ruhela and Singh defined the importance of teacher training as “the schools could not succeed without trained teacher” [99]. From a study by Saxena, Singh and Gupta (1995) on the importance of teachers’ educational base in determining students performance, it was found that there is a positive relationship between pre-service general education of teachers and achievement of students in Assam and Tamil Nadu [110]. Kuraishy, S. & Ahmad, J.(2010) observed that high academic background group is significantly different from low academic background group on mental ability, attitude towards children, interest in profession and total teaching aptitude[76].

According to some researchers, teachers’ professional development, teaching experiences and teaching practices are important variables that influence students’ achievement (Lubinski, 1993; Farrow, 1999; King, 2002) [34,81].
Darling-Hammond concluded that the effect of student background factors on their achievement can be diminished by well prepared teachers [28]. According to Shukla and others (1994) the percentage of un-trained teachers was positively related to the achievement of students in arithmetic in four states and negatively in three states [8]. According to Wenglinsky (2002) also, teacher is an important factor in determining his/her students’ interest in a subject as well as academic achievements [130].

The most important ingredient of teaching is the instructional procedure designed by a teacher to use in the classroom. An important aspect of students learning is the classroom instructional practice as reported by Stigler and Hiebert (1997) [119]. Verbal and non-verbal interactions bring desirable behavioral change among students. Teaching is a social phenomena and it is very complex. It includes several components such as teaching activities, learning conditions, entering behaviors of the students, age level of students, school organization, classroom climate, teaching techniques and maxims for generating appropriate learning situation. Recent work on differences in ‘mathematics achievement’ has highlighted the importance of classroom, teacher and school factors [77]. To enhance students’ interest in mathematics, different experts have suggested for specific changes [4].

Bidwell and Kasarda found that teachers’ qualifications are related to teaching skills [10]. Similarly, Turner et al found that percent of teachers holding a master’s degree was a significant determinant of elementary pupil achievement in mathematics [123]. Tsang and Rowland (2005) reported that a teacher who has good mastery over the subject can be an effective teacher [122].

Institutional factors may be one of the factors on which the interest of the students in mathematics may be dependent. School system and the qualifications of teachers within the school system are variables that have been important factors in the formulation of policies and practices intended to improve educational outcomes at the state level. According to Lamb and Fullarton (2000), in Australia apart from student background variables, classroom and school variables also contribute to differences in mathematics achievement. The study of Richard Moreau provides evidence that
school systems within single legislative jurisdiction vary in the level of pupil achievement produced [88]. The results of the study done by A.N. Ejiogu and E.Adeleye (1984) revealed that students' level of performance in the WASC mathematics examinations had very strong relationship with the variables of category of school (like boys' school, girls' school, co-educational school etc.), age of school, geographical location of school etc [33]. Dale (1974) shows that male students in co-educational schools were academically advanced [26]. On the other hand, Tidball (1974) and Okonkwo (1983) showed that students in schools having either only boys or only girls consistently achieve better than their co-educational counterparts [93].

The aim of this study is to find the extent to which these are also the cases in Guwahati. In this chapter, therefore, we have studied the influence of different institutional factors on 'mathematics interest' of students.

We have already discussed about the questionnaires related to these investigations in our chapter three.

SECTION 1:

In Assam, schools are generally affiliated to Secondary education board of Assam (SEBA) and Central board of secondary education (CBSE). Again, under SEBA there are some schools which are Government undertaking where government appoints teachers and provides funds to the institutions and there are some other schools which are run by private owner and Government do not provide any fund to them. Similarly, in case of CBSE schools also private and Govt. schools are there. In our study we took into consideration the Govt. SEBA schools, private SEBA schools and private CBSE schools of Guwahati.

6.01 Objectives:

To study the 'mathematics interest' of the upper primary students of Guwahati studying in different categories of schools such as Government SEBA, Private SEBA and Private CBSE schools.
6.02 Hypothesis:

There is no significant difference between the mean 'mathematics interest' score of students studying at different categories of schools.

6.03 Analysis and interpretation of the above hypothesis:

Analysis:

Statistical analysis was done by using SPSS. All the data were entered in the SPSS spreadsheet and then the required analysis was observed.

The following table shows the Classification of the sample in different categories of schools according to the level of interest in mathematics.

<table>
<thead>
<tr>
<th>Levels of interest</th>
<th>Govt. SEBA School</th>
<th>Pvt. SEBA School</th>
<th>Pvt. CBSE School</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>High interest</td>
<td>15</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Above average interest</td>
<td>37</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>Average interest</td>
<td>43</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Below average interest</td>
<td>49</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Low interest</td>
<td>19</td>
<td>12</td>
<td>7</td>
</tr>
</tbody>
</table>

124
Fig (6.1, 6.2, 6.3, 6.4 and 6.5): pie diagrams showing mathematics interest of students studying at different categories of schools
To see the significance of difference between the mean ‘mathematics interest’ score of students studying at different categories of schools we perform analysis using one way ANOVA.

The following table shows $F$-statistic derived from one way ANOVA analysis.

<table>
<thead>
<tr>
<th>Types of interest</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean squares</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>62.628</td>
<td>2</td>
<td>31.314</td>
<td>25.346</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>470.706</td>
<td>381</td>
<td>1.235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>533.333</td>
<td>383</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:**

In this case, the calculated $p$-value is 0.000<0.001. This means that the test is significant at 0.01 level of significance. Hence, there is enough evidence that the population means are not the same. So, we reject the null hypothesis of no difference in means. Further, to gain more information as to why a significant result was obtained for the overall ANOVA, a post-hoc test was carried out. That means the test was carried out to compare pairs of treatments simultaneously. In this case, Tukey HSD TEST was performed.
Table 6.3: Tukey HSD Post Hoc Test (Multiple comparisons)

Types of interest

<table>
<thead>
<tr>
<th>Category of school (I)</th>
<th>Category of school (J)</th>
<th>Mean difference (I-J)</th>
<th>Std. Error</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govt. SEBA</td>
<td>Pvt. SEBA</td>
<td>0.652**</td>
<td>0.140</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Pvt.CBSE</td>
<td>0.913**</td>
<td>0.134</td>
<td>0.000</td>
</tr>
<tr>
<td>Pvt. SEBA</td>
<td>Pvt. CBSE</td>
<td>0.261</td>
<td>0.150</td>
<td>0.193</td>
</tr>
</tbody>
</table>

** at 0.01 levels of significance

Interpretation:

From the above table, observing the comparisons of Government SEBA schools with Private SEBA and Private CBSE schools, it is revealed that in both the cases the p-value is 0.000 < 0.001. So, the values are highly significant. Hence, there are evidences to reject the null hypothesis of the means for these two treatments being equal. However, comparisons between Private SEBA schools and Private CBSE schools reveals that the test is not significant in this case as the p-value is greater than 0.05. Thus, there is no evidence to reject the null hypothesis of no difference in means.

6.04 Main findings of section 1:

1. There is difference in the 'mathematics interest' of students from Government SEBA schools and Private SEBA schools.
2. There is difference in the 'mathematics interest' of students from Government SEBA schools and Private CBSE schools.
3. There is no difference between the 'mathematics interest' of students from Private CBSE schools and Private SEBA schools.
SECTION 2:

There are different types of schools in our country. These are normal co-educational schools where boys and girls sit together in the same classroom, co-educational schools segregated by gender where boys and girls of same standards sit separately in different classrooms, boys only schools and girls only schools. In current educational debates, one of the important issue is the studying environment where the boys and girls study together in co-educational schools. Some researchers have opinion that schools having students of single sex are favorable for girls in learning mathematics (Anstey, 1997 and Kaino, 1998) [1,60]. They concluded that girls from only girls school can be interested more in mathematics than girls in co-educational schools. Some others have views that girls in girls' only schools perform equally good as boys in boys only schools. They have the suggestion that girls in normal co-educational schools should be allowed to sit separately in different rooms so that they can enhance their 'mathematics interest'.

Hence, in this study we tried to investigate whether the enrolment of boys and girls in different types of schools influences on their 'mathematics interest'.

6.05 Objectives:

To study the mathematics interest of the upper primary students of Guwahati studying in different types of schools such as normal co-educational schools, co-educational schools segregated by gender, Girls' only schools and Boys' only schools.

6.06 Hypothesis:

(i) There is no significant difference between mean ‘mathematics interest’ scores of girls from normal co-educational schools and only girls’ school.

(ii) There is no significant difference between mean ‘mathematics interest’ scores of girls from normal co-educational schools and co-educational schools segregated by gender.
(iii) There is no significant difference between mean ‘mathematics interest’ scores of boys from normal co-educational schools and only boys’ school.

(iv) There is no significant difference between mean ‘mathematics interest’ scores of boys from normal co-educational schools and co-educational schools segregated by gender.

### 6.07 Analysis and interpretation of hypothesis:

#### Analysis:

Following table shows t-statistic for the mean difference in the impact of type of school on interest of students in mathematics:

#### Table 6.4: t-test showing the mean difference in the impact of type of school on interest of students in mathematics:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Type of school</th>
<th>Total students</th>
<th>Mean</th>
<th>SE</th>
<th>df</th>
<th>t-cal</th>
<th>t-critical</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Co-educational, Normal</td>
<td>97</td>
<td>24.76</td>
<td>7.00</td>
<td>118</td>
<td>2.57</td>
<td>1.98</td>
<td>S*</td>
</tr>
<tr>
<td></td>
<td>Boys only</td>
<td>23</td>
<td>21.57</td>
<td>4.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Co-educational, Normal</td>
<td>97</td>
<td>24.76</td>
<td>7.00</td>
<td>107</td>
<td>6.25</td>
<td>2.63</td>
<td>S**</td>
</tr>
<tr>
<td></td>
<td>Co-educational, segregated by gender</td>
<td>12</td>
<td>16.58</td>
<td>3.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Co-educational, Normal</td>
<td>61</td>
<td>22.90</td>
<td>8.02</td>
<td>115</td>
<td>2.65</td>
<td>2.62</td>
<td>S**</td>
</tr>
<tr>
<td></td>
<td>Girls only</td>
<td>56</td>
<td>26.73</td>
<td>7.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Co-educational, Normal</td>
<td>61</td>
<td>22.90</td>
<td>8.02</td>
<td>75</td>
<td>1.16</td>
<td>1.99</td>
<td>NS*</td>
</tr>
<tr>
<td></td>
<td>Co-educational, segregated by gender</td>
<td>16</td>
<td>25.13</td>
<td>6.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* at 0.05 level of significance

** at 0.01 level of significance
Interpretation:

i) From the table 4.6 it is observed that for girl students of normal co-educational schools and only girls’ schools, calculated value of \( t = 2.65 \) is higher than that given in the table \( (=2.62) \) at 0.01 level of significance due to 115 degrees of freedom. Hence, there are enough evidences to reject the hypothesis. Therefore, it can be concluded that there is difference in ‘mathematics interest’ scores of female students from co-educational schools and only girls’ schools. The mean interest score of girl students studying in co-educational schools is smaller than that of students from only girls’ schools. So, girls from only girls’ schools are superior in ‘mathematics interest’.

ii) Again it is observed that for girl students of normal co-educational schools and co-educational schools segregated by gender, calculated value of \( t = 1.16 \) is smaller than that given in the table \( (=1.99) \) at 0.05 level of significance and 75 degrees of freedom. Hence, there are no evidences to reject the hypothesis. Therefore, it can be concluded that there is no difference in ‘mathematics interest’ scores of female students from co-educational schools and from co-educational schools segregated by gender.

iii) On the other hand from the table 4.6 it is observed that for boy students, calculated value of \( t = 2.57 \) is greater than that given in the table \( (=1.98) \) at 0.05 level of significance, but smaller than that \( (=2.62) \) at 0.01 level of significance due to 118 degrees of freedom. Hence, there are evidences to reject the null hypothesis at 0.05 level of significance only. Therefore, it can be concluded that there are differences in ‘mathematics interest’ scores of male students from co-educational schools and boys’ only schools at 5% level of significance. The mean interest score of boys studying in co-educational schools is higher than that of students from boys’ only schools. So, it may be concluded that boys from co-educational schools are superior in ‘mathematics interest’.

iv) Further, it is observed for boy students of normal co-educational schools and co-educational schools segregated by gender that calculated value of \( t = 6.25 \) is
more than that given in the table (=2.63) at 0.01 level of significance with 107
degrees of freedom. Hence, the test is significant and there are enough evidences
to reject the null hypothesis. Therefore, it can be concluded that there is
difference in ‘mathematics interest’ scores of male students from co-educational
schools and co-educational schools segregated by gender. In this case, it can be
concluded that boys from normal co-educational schools are superior in
‘mathematics interest’ scores to the boys from co-educational schools segregated
by gender.

6.08 Main findings of section 2:

1) ‘Mathematics interest’ of upper primary boy students are influenced by type of
   school (i.e. whether normal co-educational, co-educational schools segregated by
   gender or boys’ only).

2) ‘Mathematics interest’ of upper primary girl students from normal co-educational
   schools are less than those of studying in only girls’ schools but have no
difference with those studying in co-educational schools segregated by gender.

SECTION 3:

Many studies have indicated teachers were instrumental in creating a conducive
classroom setting and stimulating atmosphere for constructive learning (Brophy, 1990
and Cheng, 1993) [13,19]. Hill and his colleagues highlighted the role of teacher in
the differences in mathematics learning of the students (Hill 1994) [54]. Many of
these researchers found that teachers’ qualifications correlated positively with
students’ achievement. Betts, Zau and Rice (2003) also reported that there is a positive
correlation between teachers’ highest qualifications and students’ mathematics
achievements [9]. Greenwald, Hedges and Laine (1996) found that there was a
significant and positive relationship between students’ achievement in mathematics
and teachers’ qualifications measured as having a master’s degree or not having a
master’s degree [46]. Goldhaber and Brewer (1996) also had the same findings [41].
On the contrary, Greenberg, et al. (2004) reported that highest qualifications of the teachers were not significantly related to the achievement of the students in mathematics [47].

In our study, teachers' qualification was categorized according to the general qualifications attained by the teachers and the professional training they had. Till now so many researchers have examined the influence of teachers’ gender and educational qualifications on ‘mathematics achievement’ of the students. In the present study we are trying to observe the influence of the above factors in the ‘mathematics interest’ of the students of Guwahati.

6.09 Objectives:

1. To find out the association between gender of teachers and interest of their students in mathematics.
2. To find out the association between qualification of teachers and interest of their students in mathematics.
3. To study the effect of gender and qualifications of teachers on ‘mathematics interest’ of their students.

6.10 Hypothesis:

1. There is no significant association between teacher’s gender and ‘mathematics interest’ of their students.
2. There is no significant association between teacher’s qualification and ‘mathematics interest’ of their students.
3. (i) There is no significant difference between the mean ‘mathematics interest’ score of students taught by male and female mathematics teachers.
(ii) There is no significant difference between the mean ‘mathematics interest’ score of students taught by the teachers having M.Sc. and B.Sc. degree.
(iii) There is no significant difference between the mean ‘mathematics interest’ score of students taught by the mathematics teachers having B.Ed. degree and teachers without B.Ed. degree.

Following table shows the demographic characteristics of teachers.
Table 6.5

Demographic characteristics of teachers:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Category</th>
<th>Teachers</th>
<th>Total teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>12</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>11</td>
<td>48</td>
</tr>
<tr>
<td>Qualifications</td>
<td>M.Sc.</td>
<td>14</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>B.Sc.</td>
<td>9</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>With B.Ed.</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Without B.Ed.</td>
<td>13</td>
<td>57</td>
</tr>
</tbody>
</table>

Hypothesis 1:

There is no significant association between teacher's gender and 'mathematics interest' of their students.

Distribution of students of different categories of school on gender of teachers:

The distribution of students with respect to teachers' gender is shown in the following table. It is observed from the table that 53% students study mathematics under male teachers whereas 47% of total students study mathematics under female teachers.
Table 6.6

Distribution of students on gender of teachers with relation to students’ interest in mathematics:

<table>
<thead>
<tr>
<th>Teachers’ gender</th>
<th>High interest</th>
<th>Above average interest</th>
<th>Average interest</th>
<th>Below average interest</th>
<th>Low interest</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>43</td>
<td>11</td>
<td>60</td>
<td>15</td>
<td>49</td>
<td>13</td>
</tr>
<tr>
<td>Female</td>
<td>24</td>
<td>6</td>
<td>62</td>
<td>16</td>
<td>47</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>17</td>
<td>122</td>
<td>31</td>
<td>96</td>
<td>25</td>
</tr>
</tbody>
</table>

Fig 6.6

Hypothesis 2:

There is no significant association between teacher’s qualification and ‘mathematics interest’ of their students.
Table 6.7: Distribution of students on qualifications of teachers with relation to interest in mathematics:

<table>
<thead>
<tr>
<th>Teachers' qualifications</th>
<th>High interest</th>
<th>Above average interest</th>
<th>Average interest</th>
<th>Below average interest</th>
<th>Low interest</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>48</td>
<td>12</td>
<td>94</td>
<td>24</td>
<td>59</td>
<td>15</td>
</tr>
<tr>
<td>B.Sc.</td>
<td>19</td>
<td>5</td>
<td>28</td>
<td>7</td>
<td>37</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>17</td>
<td>122</td>
<td>32</td>
<td>96</td>
<td>25</td>
</tr>
<tr>
<td>Degree with B.Ed.</td>
<td>28</td>
<td>7</td>
<td>60</td>
<td>16</td>
<td>42</td>
<td>11</td>
</tr>
<tr>
<td>Degree without B.Ed.</td>
<td>39</td>
<td>10</td>
<td>62</td>
<td>16</td>
<td>54</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>17</td>
<td>122</td>
<td>32</td>
<td>96</td>
<td>25</td>
</tr>
</tbody>
</table>

Bar Chart

- Teachers qualification
  - M.Sc.
  - B.Sc.

Count

<table>
<thead>
<tr>
<th>types of Interest</th>
<th>high interest</th>
<th>above average interest</th>
<th>average interest</th>
<th>below average interest</th>
<th>low interest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
</tbody>
</table>

135
Fig 6.7, 6.8: Bar chart showing distribution of students on qualifications of teachers with relation to their interest in mathematics.

Following table shows the results of chi-square analysis.

<table>
<thead>
<tr>
<th>characteristics</th>
<th>Chi-square value</th>
<th>Degrees of freedom</th>
<th>Assym. Sig (2 sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender of teachers</td>
<td>4.347</td>
<td>4</td>
<td>0.361</td>
</tr>
<tr>
<td>Qualifications of teachers(in case of general degree)</td>
<td>15.827</td>
<td>4</td>
<td>0.003</td>
</tr>
<tr>
<td>Qualifications of teachers(in case of B.Ed. degree)</td>
<td>9.297</td>
<td>4</td>
<td>0.054</td>
</tr>
</tbody>
</table>
6.11 Interpretation of hypothesis 1 and 2:

From the above output result it is seen that

(i) For the gender of teachers, the Pearson chi-square statistic is 4.347 with a p-value of 0.361, which is not significant at the 5% level and tells us that there is no evidence to reject the null hypothesis of no association between teachers’ gender and their students’ interest in mathematics. Hence, can be observed that students’ mathematics interest is not dependent on the gender of teachers.

(ii) On the contrary, in case of teachers’ qualifications (in terms of general degree), the Pearson chi-square statistic is 15.827 with a p-value of 0.003, which is significant and tells us that there is evidence to reject the null hypothesis of no association between teachers’ qualifications and their students’ interest in mathematics. Hence, it can be said that students’ mathematics interest is dependent on teachers’ qualifications.

(iii) Again, in case of teachers’ qualifications (in terms of B.Ed. degree), the Pearson chi-square statistic is 9.297 with a p-value of 0.054, which is less than 0.1 but greater than 0.05. Therefore, there is weak evidence to reject the null hypothesis of no association between teachers’ professional qualifications and their students’ interest in mathematics.

Hypothesis 3:

(i) There is no significant difference between the mean ‘mathematics interest’ score of students taught by male and female mathematics teachers.

(ii) There is no significant difference between the mean ‘mathematics interest’ score of students taught by the teachers having M.Sc. and B.Sc. degree.

(iii) There is no significant difference between the mean ‘mathematics interest’ score of students taught by the mathematics teachers having B.Ed. degree and teachers without B.Ed. degree.
Following table shows group statistics for gender of teachers of different schools of Guwahati.

Table 6.9: Group statistics for gender of teachers:

<table>
<thead>
<tr>
<th>Gender of teacher</th>
<th>No. of students</th>
<th>Mean interest of students</th>
<th>Std. deviation</th>
<th>Std. error of mean</th>
<th>t-value</th>
<th>df</th>
<th>Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>204</td>
<td>25.95</td>
<td>7.251</td>
<td>0.508</td>
<td>0.955</td>
<td>382</td>
<td>0.340</td>
</tr>
<tr>
<td>Female</td>
<td>180</td>
<td>25.26</td>
<td>6.855</td>
<td>0.511</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig 6.9: Bar chart showing mean mathematics interest of students

6.12 Interpretation of hypothesis 3(i):
The t-statistic of 0.955 and p-value of 0.340 on 382 degrees of freedom reveals that there is no such evidence to reject the null hypothesis. Thus, it can be observed that there is no difference between the mean interest scores in mathematics of the two groups of students studying under male and female teachers at 5% level of significance.
Following table shows the group statistics for qualifications of teachers.

Table 6.10: Group statistics for qualifications of teachers:

<table>
<thead>
<tr>
<th>Qualifications of teachers</th>
<th>No. of students n</th>
<th>Mean interest of students</th>
<th>Std. deviation</th>
<th>Std. error of mean</th>
<th>t-value</th>
<th>df</th>
<th>Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Sc.</td>
<td>254</td>
<td>26.51</td>
<td>6.871</td>
<td>0.431</td>
<td>3.481</td>
<td>382</td>
<td>0.001</td>
</tr>
<tr>
<td>B.Sc.</td>
<td>130</td>
<td>23.89</td>
<td>7.152</td>
<td>0.627</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree with B.Ed</td>
<td>159</td>
<td>26.52</td>
<td>6.504</td>
<td>0.516</td>
<td>2.106</td>
<td>382</td>
<td>0.036</td>
</tr>
<tr>
<td>Degree without B.Ed</td>
<td>225</td>
<td>24.99</td>
<td>7.388</td>
<td>0.493</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig 6.10: Bar chart showing mean mathematics interest of students

6.13 Interpretations of hypothesis 3 (ii) & 3(iii):

(ii) The t-statistic of 3.481 and p-value of 0.001 on 382 degrees of freedom reveals that there is enough evidence to reject the null hypothesis. This means, we can reject the null hypothesis that the mean mathematics interest scores of the two groups of students studying under the teachers having M.Sc. degree and B.Sc.
degree are same. That is there is a difference between the two groups of students at 1% level of significance. Again, the mean interest score of the students studying under the teachers having M.Sc. degree are higher and hence it can be assumed that this group of students is more interested in the subject mathematics.

(iii) The t-statistic of 2.106 and p-value of 0.036 on 382 degrees of freedom reveals that there is evidence to reject the null hypothesis at 5% level. This means, we can reject the null hypothesis that the mean mathematics interest scores of the two groups of students studying under the teachers having B.Ed. degree and teachers without B.Ed. degree are same. That is there is a difference between the two groups of students at 5% level of significance. Again, the mean interest score of the students studying under the teachers having B.Ed. degree are higher and hence it can be observed that this group of students is more interested in the subject mathematics.

6.14 Main findings of section 3:

1. There is no association between teachers’ gender and mathematics interest of their students.

2. Students mathematics interest is dependent on the qualification of their mathematics teacher.

3. Students mathematics interest is dependent on the professional qualification of their mathematics teacher.

6.15 Educational implications:

Mathematics is a subject which is very important for the intellectual development of students and also the prosperity of the society. Moreover it is a compulsory subject up to the secondary level. Therefore policy makers can adopt various measures to make the subject equally interesting to the students of all the types and categories of schools and thereby increasing the achievement level of secondary students.
The national bodies like the NCERT and teacher associations like 'Associations of mathematics teachers, of India (AMTI) made efforts to improve the quality of mathematics teaching by organizing trainings, workshops, seminars, bringing out journals etc. But, the quality of teaching can be improved by the efforts of individual teachers.

The present study indicates that academic background plays a prominent role in affecting the teaching aptitude. Therefore students with good academic background may be encouraged to take up teaching profession.

The candidates who are professionally sound, have keen interest in the subject mathematics, must come forward to be a teacher of mathematics.

To improve recruitment and retention of the best teachers there is a need to change the image of the teaching profession.

Appointment of mathematics teachers in the school level should be on the basis of academic as well as their professional qualifications in the subject to enhance students’ mathematics interest.

The best teachers should be rewarded with higher pay and more recognition and responsibility in their profession.

To improve the quality of teaching it is needed to develop better management systems within schools.

Decision makers who are concerned with the development of policies to improve students’ interest in mathematics should give consideration to the significant relationship between teachers’ qualification and students’ mathematics interest.

Education reform efforts must strive to provide high quality pre-service programs in colleges and universities.