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Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

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Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

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Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

Ph.D Dissertation

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DEDICATED

TO

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Certificate

This is to certify that the dissertation entitled **"Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh"** is an original research work of Md. Abdul Kafi under our supervision for the award of the degree of Doctor of Philosophy from the Institute of Education and Research, University of Rajshahi. As far as we know, no other person was associated with the completion of the study or anybody has done a research on the same topic as yet.

We have gone through the draft and final version of the dissertation and it appears to us as worthy of submission to the Institute of Education and Research, University of Rajshahi in fulfillment of the requirements for the award of the degree of Doctor of Philosophy.

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Declaration

I do hereby declare that the dissertation entitled **"Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh"** submitted as a fulfillment of the requirements for the award of the degree of Doctor of Philosophy, at the Institute of Education and Research, University of Rajshahi, is exclusively the outcome of my own research work done under the direct supervision of **Dr. Md. Nazrul Islam Mondal, Associate Professor, Department of Population Science and Human Resource Development** and **Dr. Md. Nurul Islam, Professor, Department of Statistics, University of Rajshahi**.

I further declare that this dissertation has not been submitted in part or in full to any other academic institute or organization for the award of any degree or for receiving financial grant.

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Md. Abdul Kafi

Abstract

The present thesis entitled “Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh” explores the challenges of teachers and students faced in teaching and learning mathematics at secondary level in Bangladesh. The Government of Bangladesh likes to turn the students into human resource by providing them proper education at the secondary level particularly developing their mathematical skills as many of them give up their education after finishing secondary education. The study focuses on the things included in the textbooks which have made them interactive, feelings of mathematics teachers as well as of students for the textbooks, teachers’ skills and knowledge required for using` the textbooks successfully in the classroom, that teachers are really doing with the teaching materials in textbooks, their problems and difficulties in using the textbooks, the ways of overcoming these difficulties, the training available for improving teachers’ teaching skills, students’ difficulties in using the textbooks and the means of overcoming teachers’ as well students’ difficulties in using the textbooks successfully in the classroom to achieve the objectives mentioned in the preface of the textbooks. Therefore it was very crucial to carry on the research in order to know what is really happening in the classroom of mathematics.

The study was designed to investigate some key questions which were derived from its aims along with the question related to the objectives. Main objectives of the study are i) to find out the challenges of urban and rural mathematics teachers are facing in the classroom in teaching mathematics, ii) to find out the problems of urban and rural student are facing in the classroom in learning mathematics and iii) to find out the significant

factors that are affecting teaching and learning in urban and rural area. The study was qualitative in nature data were both qualitative and quantitative. All the Head teachers, Mathematics teachers and students of class nine and ten of Rajshahi district in Bangladesh constituted the population of the study. The required data have been collected from 40 secondary schools 20 from urban and 20 from rural of four upazila under the district of Rajshahi through questionnaires and interviews of the respondent's mathematics teacher and students and total sample size was 520. Study area, schools and teachers are selected purposively and students are selected by using Simple Random Sampling (SRS) method through random number table. As the main focus in the study was on the teaching-learning process in the mathematics classroom, an observation checklist has prepared which contents 30 observation for selected schools in order to get a complete picture of how teachers and students are teach and learn and what really happens in the classroom.

Most of the teachers except a very few were found to enter the class without lesson plans, so their classes were not structured and the objectives of the particular lessons were far behind from being realized. On the other hand, where teachers had lesson plans, teaching went on smoothly, every task was done and students were happy. In most classes teachers failed to create healthy atmosphere as they did not use any warmer. A significant change was noticed in correcting students' mistakes. Students reported that their teachers are gentle, but they like to see their teachers more gentle in correcting mistakes and they don't like to be punished in the classroom. Most of the teachers entered the classroom with no smile on their faces and students were found fearful in these classes. In a few classes students were very lively and enjoyed their learning as their teachers were very friendly and smiling.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2008 are 20.339, 0.192, 0.177 and 0.916 respectively and these are positive in sign. The odds ratio educational qualification and type of schools have 6.809 and 2.500 times higher impact and time allocation have (1-0.577)x100=42.3% lower impact as compared to the coefficient professional training (reference category) on the SSC result of the year 2008 in the school of urban area. The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2009 are 20.107, 0.496, 0.288 and 1.792 respectively and these are positive in sign of urban area. The logistic regression coefficients of professional training, time allocation and type of schools on the SSC result 2010 are 19.476, 39.827 and 1.792 respectively and these are positive in sign and educational qualification is -38.727 negative in sign, of urban area. The regression coefficients of professional training, time allocation and types of schools are 17.765, 33.264, and 2.672 and educational qualification -31.892 respectively on the SSC result 2011 in the school of urban area. The odds ratio corresponding to the variables professional training type of schools and educational qualification are 3.729, 7.000 and 0.213 respectively. It indicates that the variables professional training and type of schools have 3.729 and 7.000 times higher impact and educational qualification has (1-0.213) x100=78.7% lower impact as compared to the coefficient time allocation on the SSC result of the year 2011 in the school of urban area. The regression coefficients of teacher corresponding to educational qualification and professional training are -0.693, -19.909 respectively and these are in negative in sign and time allocation 22.106 in positive sign of rural area. The odds ratio professional training has 2.258 times higher impact and educational qualification has (1-0.500) x 100=50% lower impact as compared to the coefficient time allocation on the SSC result of the year 2011 in the school of rural area

on the SSC result 2011 than that of variable time allocation (reference category). The regression coefficients of teacher corresponding to professional training, time allocation and type of schools are 1.552, 0.458 and 2.514 respectively and these are positive in sign and educational qualification -1.218 is negative in sign on the SSC result 2o12of urban area.

Finally it is conducted on the basis of the information as well as the opinions expressed by the respondents that the present contents of mathematics are hard which discourages the students to solve math problems. Moreover, students need to undergo extra labor and privet tuition to do well in the exam of mathematics subject. Secondary level is very important in the education system of Bangladesh. Many subjects taught at this level. Mathematics was one of the major subjects that were compulsory for all secondary students but the teacher who were teaching the subject did not have enough knowledge in modern teaching method. It may conclude that the challenges identified in this study are more or less similar in all over Bangladesh. The findings suggested that the concerned authority would take immediate measures to get rid of the challenges of teaching mathematics of the secondary level in Bangladesh.

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List of Abbreviations

A.D	:	Anno Domini
B. ED	:	Bachelor of Education
B.C	:	Before Christ
B.COM	:	Bachelor of Comerce
B.M.E.B	:	Bangladesh Madrasha Education Board
B.SC	:	Bachelor of Science
B.T.E.B	:	Bangladesh Technical Education Board
BA	:	Bachelor of Arts
BANBEIS	:	Bangladesh Bureau of Educational Information and Statistics
BISE	:	Boards of Intermediate and Secondary Education
BNU	:	Bangladesh National University
BOU	:	Bangladesh Open University
D.F	:	Degree of Freedom
D.P.E	:	Directorate of Primary Education
D.S.H.E	:	Directorate of Secondary and Higher Education
E	:	Education
ESB	:	Education System of Bangladesh
HSC	:	Higher Secondary School Certificate
L.L.B	:	Bachelor of Law
M .ED	:	Master of Education
M PHIL	:	Master of Philosophy
M.A	:	Master of Arts
M.S.S	:	Master of Social Science
M.SC	:	Master of Science
MD	:	Mean Deviation
MOE	:	Ministry of Education
MOPME	:	Ministry of Primary and Mass Education
N.C.T.B	:	National Curriculum and Textbook Board
N.G.O	:	Non Government Organization
P.M.E.D	:	Primary and Mass Education Division
PH.D	:	Doctor of Philosophy
RCMPS	:	Research Centre for Mathematical and Physical Sciences
SD	:	Slandered Deviation
SSC	:	Secondary School Certificate
T.T.C	:	Teachers Training College
U.G.C	:	University Grand Commission
U.N.D.P	:	United Nations Development Program
V	:	Value

Chapter 1
Introduction

1.1 Introduction

Mathematics can be found in all walks of life from the worlds of business and technology, to the sciences, to medicine and even to environmental and management (Reilly, 2007). The subject of mathematics in the school has been called a "gateway" subject that opens the door to future opportunities (Herzif & Knott, 2005). In recent years, many attempts have been taken to try to improve mathematics education for students (Steen, 2003). In Bangladesh many students still fail to succeed in mathematics or, even if they do succeed they fail to see the value and uses of mathematics outside of the mathematics classroom (Romberge, 2004). Mathematics is a creative discipline. The language of mathematics is international. Mathematics equips pupils with uniquely powerful ways to describe, analyze and change the world. Secondary level is very important in the education system of Bangladesh. Secondary education is the terminal education of many of the students. A huge number of students leave schools before the Secondary School Certificate (SSC) examination and enter into different vocations. Internal efficiency rates at the secondary level (Grade 6-10) in school are very significant. In 2008, completion rate was 20.87% and dropout rate was found 43.55% (BANBEIS, 2008). Mathematics is one of the important subjects taught at the secondary level in the government and non-government schools, Madrasha and the SSC (Vocational) approved by the National Curriculum and Text Book Board (NCTB). It is observed that students of secondary level fail to understand mathematics because of lack of experienced and trained mathematics teachers. As a result, students are being deprived from learning a helpful and interesting subject. For building up a developed and prosperous nation, we have to develop our education system and improve the teaching and learning condition at the secondary levels. In this regard, it is needed to conduct a quality research to know the situation of mathematics

education in Bangladesh at secondary levels**.** The aim of teaching-learning process is to enable the students to earn livelihoods for them as well as to become useful member of society. The success of this process depends on the degree of interaction and communication between the teachers and learners (Woolfolk, 2004). Teachers act as guide and counselor in the modern school of thought (Kochar, 2002). It has been observed that students fall back from the study of mathematics even though it is the bed rock of science and technology. This shows the negative attitude and poor performance of students in mathematics. It is hoped that after conduction of this research, it would be possible to find out the problems of teaching and learning of mathematics subject at secondary levels. At the same time, considering the problems, looking into account of the recommendations of the research, it may be easy to take necessary steps so that teaching and learning of mathematics subject at secondary levels may be fruitful.

1.1.1 Mathematics and Its Nature

Mathematics is the science of measurement, quality and magnitude. Mathematics in a strict sense, is the obstruct science which is the elementary conception of spatial and numerical relations (New English Dictionary, 2009). Mathematics has also been defined as the science of number and space. Its Hindi or Punjabi name is “Ganita” which means the science of calculation. It is a systematized, organized and exact science (Bashir, 2000). Mathematics is a discipline of clear and logical analysis that offers us tools to describe, abstract, and deal with the world (and later, world ideas) in a coherent and intelligent fashion. (Schoenfeld, 2005)

1.1.2 Mathematical Concept in Bengal

The conceptions of mathematics in India are contained in vast literature she has produced since second millennium BC is well known. The Vedas (1500-800 BC), Vedanga-Jyotisa (800 BC), Shulba-sutras (800-500 BC), Suryaprajnapti (500 BC), Candraprajnapti (500 BC), Jambudvipaprajnapti (500 BC), Tattarthadhigamabhasya (100 AD), Anujogadvara

sutra (100 BC), Bhagavati-sutra (300 BC), and so on, belonging to the pre-Christian era, contain mathematical conceptions and ideas, although in scattered form. That the decimal system of numeration with place-value and zero was discovered in India in or around 1st century is almost certain, although the symbol zero (0) for the first time appeared in 428 AD in Mankuwar stone inscription. India's contribution to the growth and development of mathematics in general is immense, which can be found in the Bakshali Manuscript (300 AD), Aryabhatiya (499 AD), Brahmasphutasiddhanta (628 AD), Patiganita and Trishatika (750 AD), Ganita-sara-sanggraha (850 AD), Ganitatilaka (1056 AD), Lilavati and Bijaganita (1150 AD), Tantrasanggraha (1500 AD), Karanapaddhati (1500 AD), and so on. The great mathematicians, Aryabhata (born in 476 AD), Brahmagupta (born in 598 AD), Sridhara (flourished in 750 AD), Mahavira (flourished in 850 AD), Bhaskara II (1150 AD) etc, had contributed much to the development of arithmetic, algebra, geometry, trigonometry and calculus. Their treatments of several types of equations, of indeterminate equations of first and second degree, of the theory of interpolations, of the theorem of cyclic quadrilateral etc, are highly valued in the worlds; even their anticipation of the concept of calculus and of Taylor series, Gregory-Leibnitz series etc be regarded as surprise to the world of mathematics.

Upto the first half of the 20th century (1947), Bangali mathematicians have made valuable contributions to geometry, theory of numbers, theory of functions and infinite series, differential equation, algebra, relativity, statistics and so on. A few names that can be mentioned here are Shyamadas Mukherjee, RC Bose, HN Datta, NB Mitra, NN Ghosh, SK Bhar, AB Datta, SC Dhar, PC Mahalanabish, NR Sen, Satyendra Nath Bose, so on.

1.1.3 Mathematics in Bangladesh

The mathematical sciences have developed and progressed well since the emergence of Bangladesh as an independent and sovereign country. Imbued with the spirit of the war of liberation, Bangladeshi mathematicians founded Bangladesh Mathematical Society in

1972, with the aim of promoting mathematical research and education at all levels. Since 1974 it has organized twelve national mathematical conferences (with international participation), a number of regional meetings and quite a few research workshops. It regularly publishes Ganit Parikrama, an educative college-level journal in Bangla, and a research journal Ganit: Journal of Bangladesh Mathematical Society in English.

In recent times curricula from primary to higher secondary levels have been revised quite substantially and new textbooks have been written. The new curriculum portrays mathematics as a living and useful subject; visualization and active participation by the pupils in the learning process are encouraged and emphasized. Some features of the new curriculum are worth mentioning: consistent use of decimal (metric) units, rendering arithmetic to almost a child's play, with the subsequent abolition of the time-honored "method of practice", restriction of pure arithmetic to the first eight years of schooling; early introduction of geometric and algebraic ideas. On the whole, the curriculum at the higher secondary level has undergone the most significant changes since the introduction of elementary Calculus four decades ago. An innovation is the introduction of 'mathematics practical' as an essential component of the elective mathematics course at the secondary school certificate level and the higher secondary level.

Mathematics curricula at the universities are subject to periodic review and revision. Often special papers, especially at the Master's level, are introduced reflecting recent developments (Fuzzy Mathematics) or specialization of faculty members (eg Lattice Theory, Geometry of Numbers). The most recent curricula change provides for four-year integrated Honors course at the universities. The level and content of the present curriculum for this course compare favorably with those in advanced countries. In recent year’s subjects having direct relevance to real-life problems, like Linear Programming, Operations Research has been introduced. In order to further emphasize this aspect and equip the students with tools for solving concrete

problems with real-life data, Mathematics Practical has been introduced in the Honours curriculum. It provides for the use of computer for problem solving. With the introduction of Honours course even in district and upazila level colleges in recent years, the number of students studying mathematics increased significantly during post-liberation period. This encouraged the writing of university (mostly undergraduate) level textbook (mostly in English, some in mixture of Bangla and English) by eminent mathematicians of the country. The Textbook division of Bangla Academy has brought out a number of good qualities Bangla books on various branches of mathematics.

During the nineteen fifties and sixties not much research work were carried out even in the universities. With the emergence of independent and sovereign Bangladesh the situation began to improve gradually. In the mid-seventies the research degree of M. Phil, was introduced which involves both coursework and a dissertation. Up to now more than a dozen Ph.D degrees in mathematics have been awarded by Dhaka and Rajshahi universities. An important event in the development of mathematical sciences in Bangladesh in recent years has been the establishment in 1986 of the Research Centre for Mathematical and Physical Sciences (RCMPS) at the University of Chittagong. The Centre regularly organizes national and international conferences, symposia and workshops over a very wide-ranging spectrum of subjects in the mathematical sciences and adjoining areas, from foundations of mathematics to chemical physics or bio-statistics or mathematical economics. The establishment of the Centre owes a great deal to the support extended to it by late Abdus Salam who shared the 1979 Nobel Prize for Physics with S Weinberg and S Glashow. The main thrust of the Centre was to provide opportunities for research leading to M. Phil and Ph.D degrees. Research papers by Bangladeshi mathematicians are regularly published in national and international journals. Besides Ganit: Journal of Bangladesh Mathematical Society the house journals published by the universities provide adequate publication opportunities to local

researchers and authors. The Journal of Bangladesh Academy of Sciences, the Bangladesh Journal of Scientific Research and Bangladesh Journal of Science and Technology are, like Ganit whose authorship is open to all (local or foreign authors) and which publish papers in all scientific disciplines. Though many Bangladeshi mathematicians have excellent foreign contacts, Bangladesh as a country is yet to enter the international mathematical forum as embodied in the International Mathematical Union (IMU). which is an organ of the International Council of Scientific Unions (ICSU). The primary requirement is the existence of an active body of research mathematicians, having publications in international journals. Despite the fact that Bangladeshi mathematicians can boast of well over one hundred international publications over the past few years, Bangladesh has not yet applied for membership of IMU. The International Mathematical Union celebrated the year 2000 as World Mathematical Year, with the principal objective of fostering the image of mathematics as a living and growing subject of ever greater significance. Bangladeshi mathematicians are contributing their efforts for different national issues like economic planning, population planning, flood protection planning, computerization and automation of management systems, etc. In the years to come, in addition to carrying out research works with increasing depth and significance, Bangladeshi mathematicians should strive to fulfill their obligation to the society as well.

1.1.4 Importance of Mathematics in Past and Present

Mathematics is a universal, utilitarian subject so a participating member of our society must know basic mathematics. Mathematics also has a more specialized, esoteric and esthetic side. It optimizes the beauty and power of mathematical reasoning. Mathematics embodies the efforts made over thousands of years by every civilization to comprehend nature and bring order to human affairs (Anwar, 2004). More mathematics has been created since the end of the World War II than in all pervious human history. Today, knowledge of mathematics is one of components that separate people who have choices

from people without choices. The computer revolution has made mathematics a more integral part of insurance industry, medical research, government transportation, manufacturing and construction. Mathematical models of traffic patterns are used to plan road construction. Mathematical literacy leads to muddled personal decisions and miss-informed government policies. Children born today will enter a work force where knowledge of mathematics is crucial to their career opportunities, their participation in society, and the conduct of their private lives. Any person who does not have a broad understanding of mathematics will have limited career opportunities (Johnson and Johnson, 2007). Mathematics has played a key role in science, technology, industry, business, and agriculture (Gall and Hicks, 2006). Its study has been associated with habits of effective thinking, intellectual independence, aesthetic appreciation and creative expression. Yet we allowed these objectives and opportunities to become stagnant until the challenges of the modern world startled as out of our complacency. In the modern world, mathematics is being increasingly us in science, technology, industry, government, education and economics. If a country wishes to produce men and women able to cope with the subject at these higher levels, then it must make sure that the proper foundations are provided at secondary level (Farooq, 2005).

1.1.5 Goals, Aims and Objectives of Mathematics Education

To prepare students to live in the 21st century, we must move away from computation-dominated mathematics curriculum in which students learn isolated procedures by rote to a curriculum that stresses mathematical reasoning, communicating mathematics' problem solving, understanding, and applications (Johnson and Johnson, 2007). The national council of teachers of mathematics' has identified five broad goals required to meet student's mathematical needs for the 21st century:

To Value Mathematics: Mathematics must be taught in ways that result in students believing that mathematics has value for them, so they will have the incentive to continue studying mathematics as long as they are in school or beyond. Students should appreciate the cultural, historical, and scientific evaluation and importance of mathematics. A key to valuing mathematics is personal support and encouragement for learning mathematics from valued others.

To Reason Mathematically : To clarify complex situations, students must learn to gather evidence, make conjectures, formulate models, invent counter-examples, and build sound arguments. In so doing, they will develop an informed skepticism and sharp insight characteristic of mathematical prospective. Sound reasoning should be valued as much as student's ability to find correct answers.

To Communicate Mathematics: Students must learn to read, write and speak about mathematics. As students strive to communicate their ideas, they learn to clarify, refine and consolidate their thinking.

To Develop Confidence in Their Ability to Reason Mathematically: Ability to cope with the mathematical demands of everyday life depends on the attitudes student develop toward mathematics. To learn and use mathematics, students must have self-confidence and self-efficiency built on success. Students should realize that mathematics is a common, familiar human activity.

To Solve Problems: Students should learn to use a wide variety of mathematical methods to solve problems. Students need to be given a variety of problems differing in context, length, difficulty and methods. Students need to recast vague problems in a form amenable to analysis, to select appropriate strategies for solving problems, to recognize and formulate several solutions when that is appropriate, to work with others in reaching consensus on

solutions that are effective as well as logical. Skill in problem solving is essential to productive citizenship. Serieux (2000) has given following goals of mathematics education:

- To develop the feeling that mathematics is useful and worth learning.
- To provide mathematical experiences that will enable student to cope with, interpret and appreciate their environment.
- To develop mathematical problem-solving skills.
- To foster a sense of a accomplishment and success in mathematics.
- To provide the kind of learning experience that stimulates interest in
- To develop the ability to think critically and reason logically.

1.2 Statement of the Problem of this Study

Mathematics occupies a very important place in the educational curriculum of Bangladesh. It enjoys the status of a compulsory subject is all the ways from the primary to the secondary levels. So, it is expected that the Bangladeshi students will able to have a very good knowledge of mathematics after having studied it from class one to class ten in 10 years of schooling. But students' performance in mathematics is deplorable. Every year a large number of students fail in mathematics in the secondary levels. Many of them pass with grace marks in them. Those who go to studies in science face a host of problems because of their lack of knowledge mathematics. The philosophy of mathematics is at a crossroads right now. There are two major camps building. On one side are the old school mathematicians who see mathematics as a foundation of science. On the other side is a small but growing group of scholars made up of cognitive psychologists, linguists, and neural biologists (and some mathematicians as well) who see mathematics as a function of the brain. The maximum teachers in Bangladesh do not have adequate knowledge in mathematics. They go on their syllabus keeping up with their tradition i.e., they want to teach the students following note books and their own experienced earned from their forefather’s. It has been observed that sometimes students leave the institutions for anxiety of mathematics. They are not interested in mathematics. Even those who are brilliant students do not want to take mathematics as their compulsory subject. So, the researcher

considers the matter that teaching and learning mathematics in our country is a problem, especially it is acute at the secondary level in Bangladesh. That is why teaching and learning mathematics at secondary level in our country is a problem and researcher should be made on the field so as to facilitate the institutions providing trained teachers to make the future generations productive, genius and competent to mitigate the global needs. Some acute problems in teaching mathematics have been marked. Really the problems are the obstacles to teaching and learning mathematics for the students of SSC level. The major observation was looked into institutions and found that the shortage of efficient mathematics teacher in maximum schools. So, the field of research which has been chosen is significantly important.

1.3 Rationale of the Study

Everybody in the educated society of our country knows that teaching and learning mathematics is a general problem. There are many causes behind this. The study will explore the reasons why teaching mathematics is a problem and how we can solve this problem scientifically so that students and teachers enjoy mathematics equally. Research work on this field is not adequate comparatively that of other fields of education though no one can step a single step without mathematics. Most of the subjects of science group are depended on mathematics. While a comprehensive philosophical definition of mathematics is not really possible, philosophers have been working on it for millennia without success, these new neurobiological/ linguistic/ cognitive theories show promise in helping us understand how we learn and understand mathematics. If we better understood how the brain handles mathematics, we could find approaches to teach mathematics more effectively. That mathematics is often described in metaphorical terms is not the problem. The real problem is that mathematics does not have a good description of what it really is except in metaphorical terms. Details in this way: Mathematics is also seen by many as an analogy. But, it is implicitly assumed to be the analogy that never breaks down. Our experience of the world has failed to reveal any physical phenomenon that cannot be

described mathematically. That is not to say there are not things for which a description is wholly inappropriate or pointless. This state of affairs leads us to the overwhelming question: Is mathematics just an analogy or is it the real stuff of which the physical realities are but particular reflections. This leads us to our first glimpse of the mysterious foundation of modern science. It uses and trusts the language of mathematics as an infallible guide to the way the world works without a satisfactory understanding of what mathematics actually is and why the world dances to a mathematical tune. It would be hoped that after completion the study, the researcher would be able to chalk out the weaknesses of the mathematics and give time befitting recommendations in the context of our country so as to make the subject more interesting to teachers and students and develop the mechanism of mathematics at the secondary level successfully. This research would have the possibility to help the policy makers and future researchers as a source of materials to make reliable research on mathematics.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of the study is to identify the challenges of teaching-learning mathematics at secondary schools.

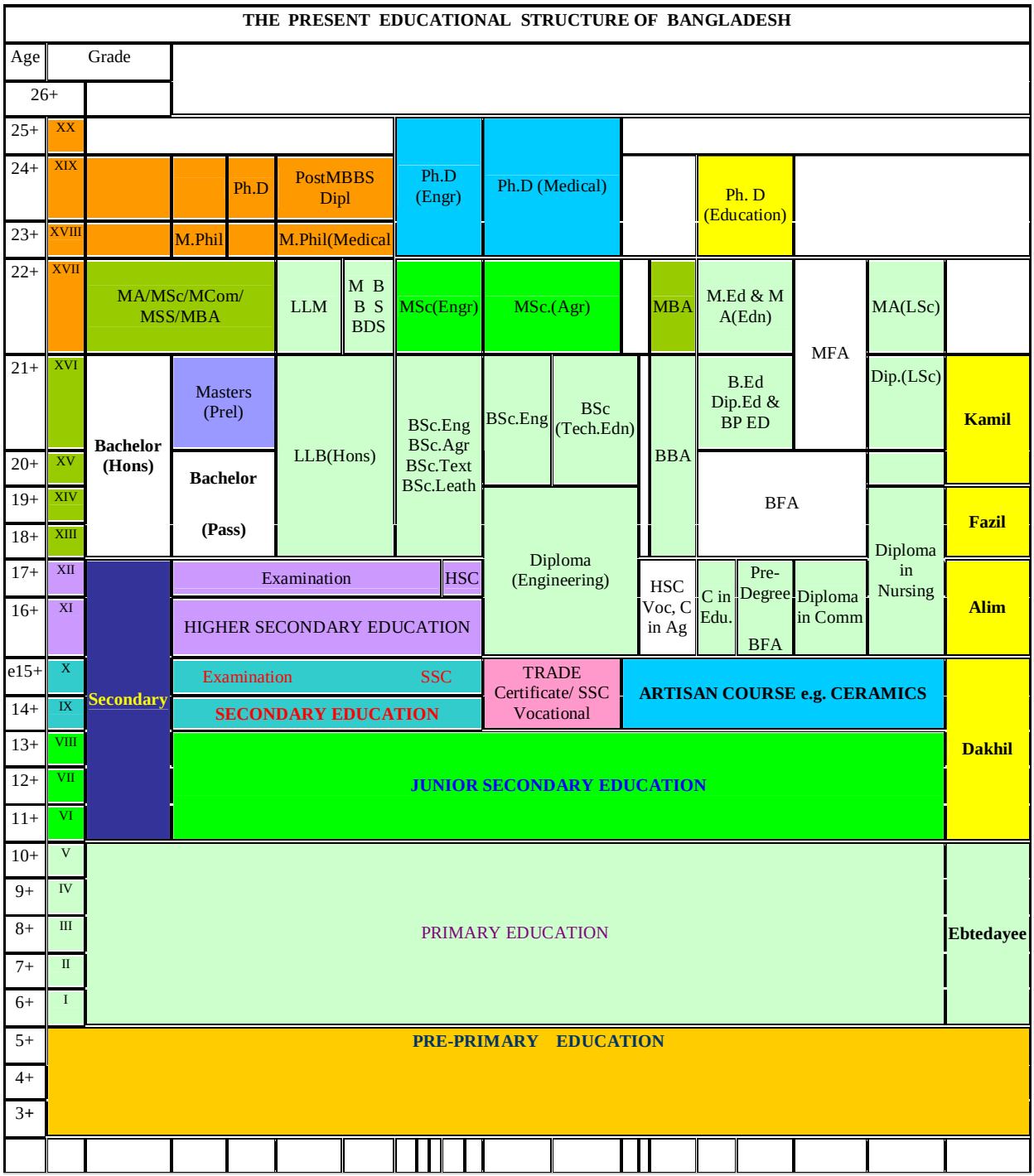
1.4.2 Specific Objectives

Specific objectives of this study are

i. To find out the challenges of urban and rural mathematics teachers are facing in the classrooms in teaching mathematics,
ii. To find out the problems of urban and rural students are facing in the classrooms in learning mathematics and
iii. To find out the significant factors that are affecting teaching and learning mathematics in urban and rural area.

1.5 The Present Education System in Bangladesh

Figure 1.1 The Present Educational Structure of Bangladesh



Source: BANBEIS, 2009

1.5.1 Description of the Present Education System in Bangladesh

The present education system of Bangladesh may be broadly divided into three major stages, viz. primary, secondary and tertiary education. Primary level institutions impart primary education basically. Junior secondary/secondary and higher secondary level institutions impart secondary education. Degree pass, degree honors, masters and other higher-level institutions or equivalent section of other related institutions impart tertiary education. The education system is operationally categorized into two streams: primary education (Grade I-V) managed by the Ministry of Primary and Mass Education (MOPME) and the other system is the post-primary education which covers all other levels from junior secondary to higher education under the administration of the Ministry of Education (MOE). The post-primary stream of education is further classified into four types in terms of curriculum: general education, madrasah education, technical-vocational education and professional education.

1.5.1.1 General Education

a) Primary Education

The first level of education is comprised of 5 years of formal schooling (class / grades I - V). Education, at this stage, normally begins at 6+ years of age up to 11 years. Primary education is generally imparted in primary schools. Nevertheless, other types of institutions like kindergartens and junior sections attached to English medium schools are also imparting it.

b) Secondary Education

The second level of education is comprised of 7 (3+2+2) years of formal schooling. The first 3 years (grades VI-VIII) is referred to as junior secondary; the next 2 years (grades IX -X) is secondary while the last 2 years (grades XI - XII) is called higher secondary.

There is diversification of courses after three years of schooling in junior secondary level. Vocational and technical courses are offered in vocational and trade institute/schools. Moreover, there are high schools where SSC (vocational) courses have been introduced. In secondary education, there are three streams of courses such as, Humanities, Science and Business Education, which start at class IX, where the students are free to choose their course(s) of studies. High schools are managed either by government or private individuals or organizations. Most of the privately managed secondary schools provide co-education. However, there are many single sex institutions in secondary level education. The academic programmed terminates at the end of class X when students are to appear at the public examination called SSC. The Boards of Intermediate and Secondary Educations (BISE) conduct the S.S.C. examination. There are eight such Boards at different places in Bangladesh namely: Dhaka, Rajshahi, Jessore, Comilla, Chittagong, Sylhet, Barisal and Dinajpur. The secondary education is designed to prepare the students to enter into the higher secondary stage. In higher secondary stage, the course is of two-years duration (XI - XII) which is being offered by intermediate colleges or by intermediate section of degree or master colleges.

c) Tertiary Education

i) College

The third stage of education is comprised of 2-6 years of formal schooling. The minimum requirement for admission to higher education is the higher secondary certificate (HSC). HSC holders are qualified to enroll in 3-years degree pass courses while for honors, they may enroll in 4-year bachelors' degree honors’ courses in degree level colleges or in the universities. After successful completion of a pass / honors’ bachelors' degree course, one can enroll in the master's degree course. Master degree courses are of one year for honors’ bachelor degree holders and 2 years for pass bachelor degree holders. For those aspiring

to take up M. Phil and Ph. D courses in selected disciplines or areas of specialization, the duration is of 2 years for M. Phil and 3-4 years for Ph. D after completion of master's degree. Higher education is being offered in the universities and post HSC level colleges and institutes of diversified studies in professional, technical, technological and other special types of education.

ii) University

There are 73 universities in Bangladesh. Out of these, 21 universities are in the public sector, while the other 52 are in the private sector. Out of 21 public sector universities, 19 universities provide regular classroom instruction facilities and services. Bangladesh Open University (BOU) conducts non-campus distance education program especially in the field of teacher education and offers Bachelor of Education (BEd.) and Master of Education (MEd) degrees. BOU conducts 18 formal courses and 19 non-formal courses. Bangladesh National University (BNU) mainly functions as an affiliating university for degree and post-graduate degree level education at different colleges and institutions in different field of studies. But in case of fine arts this university also offers Pre-Degree BFA Course (which is equivalent to HSC). After successful completion of the specified courses, it conducts final examinations and awards degree, diplomas and certificates to the successful candidates. The degrees are Bachelor of Arts (B.A), Bachelor of Social Science (B.S.S), Bachelor of Science (B. Sc), Bachelor of Commerce (B. Com). (Pass & Honors) BFA (Pass), Master of Arts (M.A), Master of Science (M. Sc), Master of Social Science (M.S.S), Master of Commerce (M.Com) and MFA. Moreover, this university also offers Bachelor of Law (LL.B), and other degrees. Bangladesh National University (BNU) offers part-time training to university teachers. There is only one medical university namely, "Bangabandhu Sheikh Mujib Medical University", like other public universities, offers courses on a different system where FCPS Degree is offered in the

disciplines of medical education; diploma courses are offered in 12 disciplines. MD degree in 15 subjects and MS courses on 8 subjects are also offered.

1.5.1.2 Madrasah Education

The old scheme of madrasah education was introduced in 1780 with the establishment of Calcutta Madrasah. In madrasah education, one can learn Islamic religious education along with the general education as complementary to each other in the system of education. The madrasah education system has been continuing with some modifications according to the demand of the time, and many madrasahs grew up in this sub-continent. The government has been providing government grants to the teachers and employees of the non-government madrasahs like other non-government education institutions (schools and colleges). There are five levels in the madrasah education system, namely:

a. Primary Level or Ebtedayee Education

This is equivalent to primary level of general education. The first level of madrasah education is comprised of 5 years of schooling (grades I - V). Normally, the children of 6 years of age begin in class 1 and finishes class V at the age of 11 years. Ebtedayee education is imparted in independent ebtedayee madrasahs and ebtedayee sections of dhakhil, alim, fazil and kamil madrasahs. It is also imparted in some of the private quami - kharizi madrasahs.

b. Secondary Level

The secondary level of madrasah education is comprised of 7 (5+2) years of formal schooling. It takes five years in dhakhil stage (SSC level) from grade VI - X while the last 2 years in alim (higher secondary) stage. Dhakhil level education is imparted in dhakhil madrasahs and in dhakhil level of alim, fazil and kamil madrasahs. Alim is equivalent to HSC education imparted to alim madrasahs and in alim level of fazil and kamil

madrasahs. There are diversification of courses after three years of schooling in secondary level of education from grade IX of dhakhil stage and grade XI of alim stage. There are streams of courses such as humanities, science and business education, where students are free to choose their courses of studies. Private individuals or private bodies manage all madrasahs of this level. Most of these madrasahs provide co-education. However, there are some single gender madrasahs in this level of madrasah education. There are two public examinations namely; dhakhil and alim after the completion of 10 years of schooling and twelve years of education, respectively. The Bangladesh Madrasah Education Board (BMEB) provides these two certificates.

c. Tertiary Level of Madrasah Education.

This level is comprised of 4 (2+2) years of formal education. The minimum requirement for admission to higher level of madrasah education is the alim (equivalent to HSC) certificates. Alim pass students are qualified to enroll in 2-year fazil education. This level of education is imparted in fazil madrasah and in fazil level of kamil madrasahs. After successful completion of fazil degree one can enroll in 2 year's kamil level education. There are four streams of courses in kamil level education; streams are hadis, tafsir, fiqh and adab. The BMEB conducts these two fazil and kamil examinations and award certificates. After successful completion of the specified courses one can appear these examinations out of the total kamil the government manages madrasahs only three madrasahs and others are managed by either individual or by private bodies. However, there are few girls' madrasah for girl students.The Bangladesh Madrasah Education Board has the following functions as regard to madrasah education: grants affiliations to different levels of madrasahs from ebtedayee to kamil; prescribes syllabi and curricula; conducts public examinations (dhakhil to kamil) and scholarship examinations. Besides the public system of madrasah education there are a good number of private madrasahs

for the Muslim students, namely: hafizia, qiratia, quami and nizamiah. Most of these madrasahs are residential. This types of madrasas are sometimes called kharizia as these are beyond the purview of the general system of education. Recently, these quami madrasahs have been organized under the umbrella of a private board known as 'Befaqul Madaris or Quami Madrasah Board which constitutes curricula and syllabi of quami madrasahs, conducts examinations and awards certificates and degrees.

1.5.1.3 Technical – Vocational Education

For the students whose interest is not strictly academic may find technical-vocational programmed more interesting and more valuable for their future. Government tries to ensure that the course curriculum should be relevant to students' interest and aspirations while at the same time it should address the needs of the job market.

a. Primary Level

There is no technical-vocational institution in primary level of education. Ebtedayee in the first level (Primary level) of madrasah education has no scope for technical-vocational education. Accordingly, technical - vocational education in Bangladesh is designed in three phases under two major levels of secondary and tertiary level of education.

b. Secondary Level

Vocational courses starts from secondary level. The certificate courses prepare skilled workers in different vocations starting from ninth grade after completion of three years of schooling in secondary school. At this level the courses are diversified in different vocations spread over 1 to 2 years duration. Recently, 2 years duration vocational courses have been introduced at the higher secondary level in government managed vocational training institute (Renamed as Technical School & College). Diploma courses prepare the diploma engineers at the polytechnic institutes. This course spread over 4 years duration

after passing the secondary school certification examination. There is a technical education board called Bangladesh Technical Education Board (BTEB), which grants affiliation to the technical institutes. It conducts examinations of the students completing different courses in different vocational and technical education, and awards certificates to the successful candidates.

1.5.1.4 Professional Education

The College of Textile Technology and College of Leather Technology offer four -year degree courses in Textile Engineering and Leather Technology respectively after completing Higher Secondary Education. The minimum requirement to be admitted to Teachers Training Colleges (TTCs) for Bachelor of Education, Bachelor of Physical Education in Physical Education College is graduation degree. Generally, in-service teachers undertake this professional training course along with some unemployed graduates. Professional education also imparted in Medical Colleges, Dental Colleges, Nursing College, Homeopathic Colleges, Law Colleges etc.

1.6 Conceptual Frame Work

Some key terms related to this study are given in below:

1.6.1 Challenges

Today's mathematics teachers are experiencing major changes not only in the mathematics content they teach, but also in the way they teach. Fear for learning Mathematics is a challenge for contemporary math educators to deal tactfully in a classroom. The poor performers is using a selective study approach and appreciating even small things which these students are able to do. It enhances their motivation level and keeps the working with higher spirits than developing a fear. Basically, students can't learn math as their "first language" if parents don't "speak" it. Administrators are not

embarrassed to say that they are not good at math, and excuse a lack of effort on the part of students. Mathematics is not a priority, but art and music and sports are. Many elementary teachers is that they went into teaching because they want to work with young children and to help them learn to read, but when it comes to math, they share their phobias and dislike of the subject. Addition and subtraction takes forever without a calculator. While calculators provide a definitive answer, this answer can be wrong if the user is not careful. The over-dependency on calculators has erroneously eliminated the need for students to step back and think about whether their solution is correct or not. Once they are set on their thinking on how to solve a problem, if they get an answer from the calculator, they will assume it is correct even when the answer defies a logical sense. This over-dependency is mind-boggling. Mathematical skills need to be learnt by writing and understanding of algorithms is essential. Use of calculators and other technology tools may be used for analyzing situations like graphical analysis. Especially at secondary level, children should not use calculators. All that need is deep knowledge of concept. So, over dependency on technology is a challenge for Math teachers. Catering to needs of variety of learners is indeed the biggest challenge. A classroom is a blend of all types of students. A teacher has to maintain a balance to keep up all working. The strategy which teachers using are giving specially prepared worksheets/assignments according to individual needs of learners. To reduce "Mathematics Phobia" among students is the greatest challenge for Math Teachers. It is generally believed that math is dry and abstract subject. But it is rather difficult to teach each and every topic with the real-world situations like the topics of Algebra. Many students think that little mathematical knowledge is sufficient to enter into different careers. They don't know the wide applications of it.

Problems or obstacles, the practicing teachers, students, education administrators and policy makers are facing to implement the teaching and learning mathematics are the challenges in this study.

1.6.2 Secondary Level

Secondary education is any education that follows a primary education. High school is usually referred to as the secondary education. In this study secondary level will focus only the class nine and ten though it covers from class six to ten in our curriculum.

1.6.3 Mathematics

The word mathematics comes from the Greek word (máthēma), which, in the ancient Greek language, means "that which is learnt. The word máthēma is derived from the word (manthano), while the modern Greek equivalent is (mathaino), both of which mean "to learn." In Greece, the word for "mathematics" came to have the narrower and more technical meaning "mathematical study" even in classical times. Its adjective is (mathēmatikós), meaning "related to learning" or "studious", which likewise further came to mean "mathematical". In Latin, and in English until around 1700, the term mathematics more commonly meant "astrology" (or sometimes "astronomy") rather than "mathematics"; the meaning gradually changed to its present one from about 1500 to 1800.

Aristotle defined mathematics as "the science of quantity", and this definition prevailed until the 18th century. Starting in the 19th century, when the study of mathematics increased in rigor and began to address abstract topics such as group theory and projective geometry, which have no clear-cut relation to quantity and measurement, mathematicians and philosophers began to propose a variety of new definitions. Some of these definitions emphasize the deductive character of much of mathematics, some emphasize its abstractness and some emphasize certain topics within mathematics. Today, no consensus

on the definition of mathematics prevails, even among professionals. There is not even consensus on whether mathematics is an art or a science. A great many professional mathematicians take no interest in a definition of mathematics, or consider it indefinable. Some just say, "Mathematics is what mathematicians do. An early definition of mathematics in terms of logic was Benjamin Peirce's "the science that draws necessary conclusions" (1870). In the Principia Mathematica, Bertrand Russell and Alfred North Whitehead advanced the philosophical program known as logicism, and attempted to prove that all mathematical concepts, statements, and principles can be defined and proven entirely in terms of symbolic logic. A logicist definition of mathematics is Russell's "All Mathematics is Symbolic Logic" (1903). Intuitionist definitions, developing from the philosophy of mathematician L.E.J. Brouwer, identify mathematics with certain mental phenomena. Formalist definitions identify mathematics with its symbols and the rules for operating on them. Haskell Curry defined mathematics simply as "the science of formal systems". A formal system is a set of symbols, or tokens, and some rules telling how the tokens may be combined into formulas. In formal systems, the word axiom has a special meaning, different from the ordinary meaning of "a self-evident truth". In formal systems, an axiom is a combination of tokens that is included in a given formal system without needing to be derived using the rules of the system. Mathematics means general mathematics which is a compulsory subject at the secondary level in Bangladesh. The study means it as an important subject for the S.S.C level of students.

1.7 Limitations of the Study

- The study is confined to a few selected schools in nine Upazila under the district of Rajshahi.
- The study is limited to the ix and x class mathematics pupils

- The study is concentrated on a selected number of problems such as difficulty and suitability level of the lessons, implementation of student's activities, execution of exercises, problems of context and teaching methods, attitude of teachers towards mathematics teaching and some personal and demographic variables of the teacher.
- In this study the researcher considers the government and non-government secondary schools only.
- The research studied the attitudes, trends and the motivation of the secondary mathematics teachers as well as students.
- In Bangladesh, maximum teachers are weak in mathematics subject. So, it may be difficult to collect data from them fruitfully. Yet, the researcher will try to overcome all the limitations of the research following necessary guidelines of the sincere and expert supervisor.

1.8 Organization of the Study

In order to furnish a meaningful explanation and representation of this study, the complete work of this dissertation has been organized into six chapters. First chapter is introduction which contains a brief description about mathematics and its nature, history of mathematics education, mathematical concept in Bangladesh, importance of mathematics education, importance of mathematics in past and present, goals aims and objectives of mathematics education, statement of the problem, rationale of the study objectives of the study, present education system in Bangladesh and review of mathematics curriculum in Bangladesh.

The second chapter contains literature review. Chapter three contains description about nature of study, sources of data, subject and study area, Rajshahi district at a glance, list of the visited schools, population, sampling techniques and sample size, research tools or instrument, questionnaires for students, questionnaire for teacher, classroom observation,

data analysis technique, potential ethical issues / considerations, validity and reliability of the questionnaires and designing instrument for the study. Chapter four contains distribution and association among the variables, results of head teachers' interviews, results of teachers' interviews, professional training, lesson plan, teaching aids, teaching-learning approach in the mathematics classroom, use of different method for effective teaching mathematics, use of different method under the study area, result from mathematics teacher of some characteristic, job satisfaction, results on students' interviews, students interviews results for some characteristic, results of students interviews, results in the last mathematics examination and satisfied getting mathematics teacher, guardians' information, students' fathers' / guardians' occupation, students' mothers' occupation, students fathers' and mothers' organization/institution, students' fathers' academic qualifications, percentages of students' fathers' academic qualifications, monthly income of the respondent of students' guardians, research findings on the interviews with curriculum expert, administrator, teacher trainers, head teacher and senior teacher, classroom observation, results of classroom observation, Mean and SD of the classroom observation of urban area, Mean and SD of the classroom observation of rural area and chapter six contains findings discussion and policy implication.

Chapter 2
Literature Review

The main purpose of literature review is to identify the hiatus or gap in the field of proposed research. To the best of my knowledge no one had done the proposed study "Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh". The publications related to the proposed study are very few in number. The researcher has already reviewed related researches to find out the gaps of the researches done by other researchers and scholars. Some reviewed literatures with their views and objectives have been mentioned below;

Teaching and Learning

Al-Amin (2012) proves that there is no age-limit of achieving education. Man can achieve education at any age, any time. Childhood is the main proper time of acquiring education specially the formal education. From the age of six the children of Bangladesh begin to achieve education through institutions. Bangladesh is a very fertile land of education since human civilization. The Buddhist religion played a great role to spread education in our country. It has been found from the study that all of the types of ancient educational systems where Formal, Non-formal and informal mode of education. The government has formed several commissions and task forces, which aim at ensuring proper development of education to meet the demands and challenges of the 21st century or to achieve the Millennium Development Goals. An educate nations con reach at the expected level of success overcoming all hindrance. There is no alternative of education for socio-economic development of the country. The study has proved that the formal education has a positive impact on socio-economic issues in Bangladesh context. The Post S.S.C respondent enjoying better life including modern equipment than the below S.S.C

respondents and it has been achieved possible for formal education system. The study has successfully done on the basis of the impact measurement on the socio-economic factors of both posts S.S.C and below S.S.C respondents.

Urenje (2005) is an interpretive case study which investigated the relationship between the development and use of the teaching and learning support material, “A Year of Special Days”. An in depth investigation was conducted in South Africa and Zimbabwe where developers and users of the booklet were asked to contribute their experiences with the booklet through questionnaires, semi-structured interviews and workshops. Developers contributed on the purpose for which the booklet was produced while the users explained how the booklet was being used in different contexts. The research also tracked the development and use of booklet in the Southern African Development Community (SADC) region through a workshop held at the Environmental Education Association of Southern Africa (EEASA) Conference in Lusaka, Zambia, in May 2005. Some personal interviews and informal encounters with people who have used it in the past and those using it now were also conducted at EEASA. This case study explored the axes of tension between the development and use of the resource material, “A Year of Special Days”, with the view to informing development and use of materials at the SADC Centre. A long-term intention is to use the framework developed, for similar work in the wider SADC region. The research recommended on how the SADC Centre can track the relationship between the materials developed at the Centre and their use in different contexts. The study established that the booklet “A Year of Special Days” was initially developed for informal education by faith communities mainly in the Anglican Church but turned out to be a resource more applicable for formal education mainly in the national school system of South Africa for environmental learning. It is important for resource materials developers to facilitate the participatory monitoring and evaluation of resource materials when they are in use the

study also established that SADC resources materials are easily adaptable and that the process of resource materials development offers important networking opportunities which allow the adaptation to Mathematics. So, being an important study on mathematics it lacks some important issues related to the present study. There have many lack of all the projected study. No one had done the proposed study "Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh."

Ernest (2007) has recommended the adoption of a problem solving approach to the teaching of mathematics. Such reforms depend to a large extent on institutional reform: changes in the overall mathematics curriculum. They depend even more essentially on individual teachers changing their approaches to the teaching of mathematics. However the required changes are unlike those of a skilled machine operative, who can be trained to upgrade to a more advanced lathe, for example. A shift to a problem solving approach to teaching requires deeper changes. It depends fundamentally on the teacher's system of beliefs, and in particular, on the teacher's conception of the nature of mathematics and mental models of teaching and learning mathematics. Teaching reforms cannot take place unless teachers' deeply held beliefs about mathematics and its teaching and learning change. Furthermore, these changes in beliefs are associated with increased reflection and autonomy on the part of the mathematics teacher. Thus the practice of teaching mathematics depends on a number of key elements, most notably according to the context of the article: These factors are therefore those which determine the autonomy of the mathematics teacher, and hence also the outcome of teaching innovations likes problem solving - which depend on teacher autonomy for their successful implementation. But the article lacks with data in regards of structural development of the institutions, students attendance, teachers performance etc.

John (2006) has analyzed the tension between the traditional foundation of efficacy in teaching mathematics and current reform efforts in mathematics education. Drawing substantially on their experiences in learning mathematics, many teachers are disposed to teach mathematics by "telling": by stating facts and demonstrating procedures to their students. Clear and accurate telling provides a foundation for teachers' sense of efficacy--the belief that they can affect student learning--because the direct demonstration of mathematics is taken to be necessary for student learning. A strong sense of efficacy supports teachers' efforts to face difficult challenges and persist in the face of adversity. But current reforms that de-emphasize telling and focus on enabling students' mathematical activity undermine this basis of efficacy. For the current reform to generate deep and lasting changes, teachers must find new foundations for building durable efficacy beliefs that are consistent with reform-based teaching practices. Although the study provide productive new mooring for efficacy exist, research has not examined how practicing teachers' sense of efficacy shifts as they attempt to align their practice with reform principles. Suggestions for research to chart the development and change, mathematics teachers' sense of efficacy are presented scientifically.

Sutar (2006) has stated that the main goal of mathematics education in schools of the child’s thinking. Clarity of thought and pursuing assumptions to logical conclusions is central to the mathematical enterprise. There are many ways of thinking, and the kind of thinking one learns in mathematics is an ability to handle abstractions, and an approach to problem solving. Always of schooling has an important implication for mathematics curriculum. Mathematics being a compulsory subject of study, access to quality mathematics education is every child’s right. We want mathematics education that is affordable to every child, and at the same time, enjoyable. With many children exiting the system after Class VIII, mathematics education at the elementary stage should help

children prepare for the challenges they face further in life. On the other hand, mathematics education in our schools is beset with problems. Systemic problems further aggravate the situation, in the sense that structures of social discrimination get reflected in mathematics education as well. Especially worth mentioning in this regard is the gender dimension, leading to a stereotype that boys are better at mathematics than girls. It may be noted that a great deal needs to be done towards preparing teachers for mathematics education. A large treasury of resource material, which teachers can access freely as well as contribute to, is badly needed. Networking of school teachers among themselves as well as with university teachers will help. If accommodating processes like geometric visualization can only be done by reducing content, we suggest that content be reduced rather than compromise on the former. Moreover, we suggest a principle of postponement. Our vision of excellent mathematical education is based on the twin premises that all students can learn mathematics and that all students need to learn mathematics. It is therefore imperative that we offer mathematics education of the very highest quality to all children. They have emphasized only the geometrical improvement through their instruction but geometry is only a part of the mathematics.

Purdy (2012) includes the usage an evaluative tool, the Mathematics Teacher Educator (MTEd) Instrument, mathematics teacher education syllabi were analyzed to determine the extent to which practice lines up with research at the mathematics teacher educator level. Analysis revealed that only moderate evidence of research-to-practice was found. Technology and assessment were the only categories that were correlated across all combinations of the data set (elementary, secondary, full) to overall score. Consequently, technology and assessment may be overall indicators of the level of research-to-practice contained in mathematics teacher education courses. The elementary and secondary course syllabi only differed in the area of content knowledge (elementary evidenced higher levels).

This is consistent with literature, where more content knowledge may be necessary for pre-service elementary teachers. Finally, course hours were not related to overall score. Therefore, more course hours may not be the panacea for ensuring a research-to practice connection is forged during pre-service mathematics teacher education courses. The thesis has not considered the problems of Mathematics teaching and learning at secondary level. Moreover, it does not fulfill the total expectation of the recommendations in respect of development the subject and its necessity in educational institutions.

Oswalt (2012) focuses on a professional development workshop designed to train high school teachers on how to successfully use mathematical modeling in their classroom by providing them with guidelines on how to use modeling tasks effectively, sample tasks that can be used, and instruction on how to develop modeling tasks for their classroom. The goal is to affect change in the daily routines of high school mathematics classrooms by providing teachers with compelling reasons why changes are necessary, steps on how to make the necessary changes, and good examples of problems to be used in class.

Akhtaruzzaman (2011) in his thesis argued that information and communication technology learning English is essential for us. It is a must to maintain our political, economic and cultural relations with other countries and to solidify our position in the arena of international affairs. So, there is no alternative to learning English. In fact, it goes without saying that we must learn English well to keep pace with the advancing world. After independence seven education commissions (Qudrat-E-khuda Education Commission, 1972, Education Policy, 1978, Mofizuddin Education Commission, 1988, Shamsul Haque Education Commission, 1997, Bari Education Commission 2002, Moniruzzaman Mia Education Commission, 2003 and Education Policy, 2010) have already been formed to make education time-befitting. A lot of efforts have been made to

boost up English education. CLT has been introduced. Despite the Sea-change in teaching and learning of English, there has been no noteworthy improvement in the field. English, a compulsory discipline from the primary to the undergraduate phase in Bangladesh now, is always a subject exuding tremendous phobia among the rural school children of our country irrespective of past and present. English phobia implies violent fear of English unnerving students. As a consequence, most of the students do badly in English. According to Bangladesh Statistical Book (1995), in S.S.C exams, among the failures about 90% fail in English. It suggests that there is something wrong with the teaching and learning of the language. It appears that in Bangladesh most of the rural high school children cannot learn English well mainly due to phobia engendered by some causes pertaining to pedagogy and to social implications. Therefore, English education at the high school level especially in the rural areas is besieged with some very acute problems. The principal problems seem to be of two types: (1) pedagogical problems: shortage of competent teachers, unsuitable teaching materials, unfavorable class-room atmosphere and lack of motivation on the part of the students, (2) societal problems: socio-economic barriers.

Tawhidul (2012) in his research explore social changes among the three generations (first, second and third) have been shown on the basis of availability of educational facilities. Generally we know that education plays the role of a catalyst to bring about positive social change. Its influence on one's life style, social consciousness, political participation, socio-economic participation, and health awareness is universally appreciated. However, this research shows that educational facilities facilitate social mobility. Social mobility is the movement of individual or sometimes groups between different positions in the hierarchies of stratification within any society. The development of education sector depends on providing educational facilities. But the general educational facilities are not available for all in Bangladesh. To educate the huge

population we need more and more educational institutions. But the education sector of our country is still facing various types of problems like shortage of funds, poor structure of school buildings, lack of books, furniture, playground, transportation, communication, entertainment facilities and also shortage of skilled teachers. It can be mentioned here that the facilities enjoyed by the respondents differ considerably. The respondents from first and second generation faced deficiency of educational facilities which affected their educational achievement. But respondents of the third generation did not face as much problems as compared to them. They have received these facilities and that is why they are more educated than the other two generations. So the trend of social mobility differs from one generation to the next generation. Socio-economic development of third generation is faster than the first and second generations. It can also be mentioned here that socio-economic development and trend of receiving educational facilities are not equal everywhere. This study shows that nearly 35% respondents of the first generation, 40.6% of the second generation and 70% respondents of the third generation received educational facilities adequately. Though the trend of receiving educational facilities increased from one generation to the next, it was not enough to ensure proper education and upward social mobility. Besides, people of urban areas receive more educational facilities than the people living in rural areas. The development activities of urban and rural areas are not the same due to this disparity. On the basis of some rural-urban comparison, this study suggests to reduce discrimination between rural and urban area in terms of access to educational facilities. If we can ensure equitable distribution of these facilities we may get a healthy, wealthy and educated nation in the near future**.**

Shava (2010) estimates inquire, from a didactical perspective, into the question of teaching mathematics for mathematical literacy in secondary and high schools in the district of Maseru, Lesotho. In the study, mathematical literacy and didactical practices

relating to mathematics are viewed as related variables that directly impact upon each other. In order to appropriately place the concept of didactical practices in school mathematics education, the study engages support from literature to explore a range of related areas in mathematics education and in mathematical literacy. The investigation itself seeks to establish the current didactical practices relating to mathematics, which are employed in secondary and high schools in the district of Maseru, Lesotho, and to determine the extent to which these didactical practices correspond to and correlate with indicators of teaching mathematics for mathematical literacy.

Majeda (2008) narrated the issue of five important indicators of learning mathematics expressing the idea of different theories applied by various scholars. Cognitive load theory uses the immense size of human long-term memory and the significantly limited capacity of working memory to design instructional methods has at secondary levels but in general education sectors.

Chitkara, (2007) Conducted research studies for the improvement of learning and teaching of school mathematics. This shows the need for education department researchers and mathematics department educators to take the initiative in research for learning and teaching of school mathematics.

Feroz (2011) in his research he was attempting to study the challenges and prospects of Geography teaching at the secondary level of education in Bangladesh and to suggest some ways out. Through the study was based on the status and challenges of Geography teaching in Bangladesh, in the course of the study the researcher has tried to identify needs for teaching Geography in schools as well as needs for Geography teachers for professional development. This study employed questionnaires survey, face-to-face interview, document analysis and observations to collect data. Sample size was 240

(Students: 200, Geography teachers: 20, Head teachers: 20). Random sampling procedure was used to select the respondents from students of class nine and ten. All the Geography teachers, head teachers were selected from each study schools. The study showed that secondary school geography teachers in Bangladesh faces many challenges i.e did not have separate post for geography teachers, separate geography class room (Since the subject have practical classes so they need separate classroom), available teaching aids, teachers with geography background, poor curriculum and teaching materials, lack of subject based training and position of subject at daily class routine.

Teaching Performance

Duran (2010) find out the competence of mathematics teachers and its relation to the performance of students in mathematics in the National High Schools of the Division of Dapitan City, Zamboanga del Norte, Mindanao, Philippines during the school year 2003-2004. This was to ensure the preparedness and competence of these teachers in carrying out the focal goal of the 2002 Basic Education Curriculum (BEC) in the country, which is the development of functional literacy among the learners. The output of the study was envisioned to become a useful basis in generating an evaluation tool for teachers' competence to supplement the usual appraisal system for teachers' performance. There is no significant relationship between the competence of mathematics teachers and the performance of students in mathematics. The study employed the descriptive method of research with the use of researcher-prepared questionnaire, documentary technique, and correlation technique. The prepared questionnaire, which was a checklist rating scale, consisted of 25 items equally divided into five areas. These areas were: (1) Communication Skills, (2) Problem Solving and Critical Thinking, (3) Sustainable Use of Resources and Productivity, (4) Development of Self and a Sense of Community, and (5)

Expanding One's World Vision. The number of student-respondents, on the other hand, was taken from the actual total fourth year population of 899, sampled through Slovin's sampling and simple proportionate sampling techniques. To settle quantitative and qualitative treatments of data, each of the ratings in the questionnaire, in a scale of 1 to 5, was treated as score with corresponding interpretation. On the other hand, each grade of the students during the first and second grading periods, which was used as basis in measuring students' performance, was scored accordingly from 1 to 5 with corresponding interpretation. To settle statistical treatments of data, weighted mean technique was used to answer research problems 1 and 3, t-test technique was applied to answer research problem 2, while Pearson product-moment coefficient of correlation technique was utilized to answer research problem 4. To test the significance of the result from the computation of Pearson product-moment coefficient of correlation, t-test technique was again employed. The principal purpose of this study was to find out the competence of mathematics teachers and its relation to the performance of students in mathematics in the National High Schools. So, the study lack about teaching learning environment and teaching aids etc.

Ball (2005) described a program of research they have been developing for more than a decade into the mathematical knowledge and skills that are used in teaching. Their research begins with examining the actual work of teaching elementary school mathematics and noting all of the challenges in this work that draw on mathematical resources; this is followed by analyzing of the nature of such mathematical knowledge and skills how they are held and used in the work of teaching. Through this type of analyses, they've derived a practice-based portrait of what they call "mathematical knowledge for teaching." This article has traced the development of these ideas and described this professional knowledge of mathematics for teaching. So, the article may

lack the issues taken in the present research to identify the total facts related to mathematics teaching and learning problems according to our country.

Heather (2004) has existed that U.S. teachers need improved mathematics knowledge for teaching. Over the past decade, policymakers have funded a range of professional development efforts designed to address this need. However, there has been little success in determining whether and when teachers develop mathematical knowledge from professional development, and if so, what features of professional development contribute to such teacher learning. This was due, in part, to a lack of measures of teachers' content knowledge for teaching mathematics. This article attempts to fill these gaps. In it we describe an effort to evaluate California's Mathematics Professional Development Institutes (MPDIs) using novel measures of knowledge for teaching mathematics. Our analyses showed that teachers participating in the MPDIs improved their performance on these measures during the extended summer workshop portion of their experience. This analysis also suggests that program length as measured in days in the summer workshop and workshop focus on mathematical analysis, reasoning, and communication predicted teachers' learning. This article emphasizes on the measures of teachers' content knowledge for teaching mathematics and program length only. That is why, there are many important issues related to mathematics teaching and learning factors have been neglected.

Elizabeth (2011) studied how complex conversations might offer pedagogical and theoretical considerations in a teacher education course on mathematics. In order to unpack the impact of these words, the researcher engage in research based on inquiry, historical analysis, and personal reflections, all of which use in an eclectic, thoughtful, and explorative manner. The two main research questions explore in this dissertation involve effort by “teacher” and “student” in which both are learners, knower’s and

participants. The first question is how can complex conversations—those involving multiple perspectives—aid pre-service teachers in becoming reflective practitioners, effective professionals, and inquiring pedagogues.

Reilly (2007) sought to address a research gap by studying students who had been taught mathematics using writing. The purpose of this study was to provide an analysis of students' perceptions of the benefits and drawbacks of this pedagogical approach. The types of writing students performed in mathematics classes were described, and students' preferences regarding these tasks were analyzed. Finally, a comparison was made between female and male students' responses in order to see whether gender played a significant role in shaping students' perceptions of writing as a tool for learning mathematics. Using a mixed method design, data were collected from 293 middle school students in Western Pennsylvania. A survey was used to collect quantitative data. Qualitative data were collected from the student participants in the form of five open-ended questions. Students also submitted samples of writing from their mathematics classes. Based on the results of the data analysis, it can be concluded that students had a positive attitude towards writing in mathematics classes. This was particularly evident among students who were struggling with mathematics. Students with lower letter grades (C, D, and F) indicated that they were much more in favor of mathematics classes that use writing. The results also indicate that there is evidence of students' mathematical knowledge growth in the students' writings. In their responses to the open-ended survey questions, the students gave detailed explanations of how their approach to mathematics learning and their understanding of mathematical concepts had changed. Students' writing samples showed how the students were learning to use writing to explore alternative solutions to problems and also to check and reflect on their understanding of new mathematical concepts. Finally, the findings of the study also suggest a clear benefit

to female mathematics students from the use of writing as a tool for learning mathematics. This study shows that writing is the solution for which mathematics teachers have been searching.

Kopolo (2009) emphasis only salary structure; teaching still remains a low-paid profession. The researcher state that an education graduate's salary package continues to compare unfavorably with that of other graduates in fields like economics and the natural science. He states that statistics will reflect high numbers of young classroom teachers leaving the profession. He goes on to state that relatively low salaries seemed to be a significant factor in low status accorded teachers. His opinion is that South Africa is indeed faced with the challenge of unqualified and under qualified teachers. These co-authors describe the concept of unqualified teachers as those who do not have a certificate in teacher preparation, they may, for example, have degrees but not a teaching qualification, and under qualified teachers as those whose teaching qualifications are not adequate for the position they hold.

Camellia (2007) evaluate of a short program to develop skills of Bangladeshi preschoolers' was to examine the efficacy of a 6-week mathematics intervention with rural Bangladeshi preschoolers with the intention of increasing their basic mathematics skills. Eighty preschoolers from five randomly selected preschools received the program and their skills were compared with the same number who received the regular math program. Both the groups attended daily 40-minute math classes over 6-weeks using a math bag to practice math concepts. The intervention group participated in math games while the control group learned similar concepts in a more teacher-directed way. Before and after the program, a 77-item test was administered to assess skills of enumeration, patterns, shapes, measurement, sorting, comparing, and operations. Results confirmed significantly greater achievement of math skills by the intervention children compared to

the control group. The score of the intervention children increased from 25% to 60% while the control group increased from 30% to 43%. The findings demonstrate that with lesson plans, everyday materials and training, paraprofessional teachers are able to implement activities that helped children learn Mathematical concepts.

School Environment

Kabir (2011) showed that the enrolment of science stream students both at the secondary school certificate (SSC) and higher secondary certificate (HSC) level is remarkably decreasing. On the contrary, business studies stream students are notably increasing at both the above levels. Humanities students show no noticeable change at the SSC level; rather we detect a noticeable decrease at the HSC level. The success rates in recent years are increasing remarkably both in the SSC and HSC examinations. Girls' participation in the entire three streams is noticeably increasing day by day, but girls' success rates are lagging compared to their boys counterpart during the years from 2001 to 2008 both in the SSC and HSC exams. According to the evaluation of the headmasters regarding the 30 competencies of the science teachers performing their duties and professionalism as provided, science teachers perform fifteen competencies sometimes, five perform often, five perform sometimes and often and the rest five perform sometimes and rare. The teachers seem to be heterogeneous in regard to performing the 30 competencies. Students' entrance to secondary education with weak primary education is the main reason that discourages the students to study science remarked by most of the headmasters. Moreover, lack of laboratory facilities and modern science equipments, unconsciousness of the guardians, absence of extra benefit for the science students in the job market etc. are also the reasons for the declining of the enrolment in science stream. Science teachers were evaluated through the structured as well as open-ended

questionnaires. Reliability coefficient of career advancement program is found to be 0.63 which is positive and substantial and indicates that the science teachers had advantages of different professional advanced programs like Radio/TV programs concerning science, association with debate and discussion on science topics and science hobby clubs, editing science magazines etc. Reliability coefficient of the school environment is found to be 0.80 which is positive and high and shows that the school environment is substantially related to the excellence in science education. Reliability coefficient of interest in professional and competency of science teachers is found to be 0.56 which is positive and moderate and confirms that science teachers' interest in their profession has a direct relationship to the competency of science teachers. Majority of the students responded that deciding the group in class IX is influenced by the school teachers.

Bert (2011) examines the impact of the quality of facilities on the educational environment in high schools located in northeast Texas. The intent of this research study was to determine the relationship between school facilities and the school-learning environment. This study was a mixed method research that used questionnaires and interviews to identify and appraise school facilities and learning environment. The problem was that school facilities were negatively impacting student learning and faculty, and administrators were not properly supporting stronger facility management. The poor condition of some schools raised serious concerns about teacher and student safety. Educators must understand and find ways to help increase student performance. This study used descriptive statistics to analyze the data. The independent z-test was conducted to determine the difference in student performance before vs. after the new facility. The results of the data analysis findings indicated that quality and educational adequacy of educational facilities were statistically significantly associated with student performance and teacher turnover rate showing a statistical change also. The paper has mentioned the

important role of environment of education especially at secondary level but it lacks the other important issues like, placement of institutions, classroom facilities etc.

Silvia (2010) investigated how the students and the teacher worked together in the middle school mathematics classroom and how this influenced students' mathematical proficiency and mathematical dispositions only.

Marie (2007) has described that the teacher's use of motivational strategies is generally believed to enhance student motivation, yet there is scant empirical evidence to support this claim. This classroom oriented investigation focused on how the motivational practices of EFL teachers in South Korea related to students' L2 motivation and motivated classroom behavior. In a first phase, the motivation of over 1,300 students was measured by a self-report questionnaire, and the use of motivational strategies by 27 teachers in 20 different schools was examined with a classroom observation instrument specifically developed for this investigation, the Motivation Orientation of Language Teaching (MOLT). The MOLT scheme, along with a post hoc rating scale completed by the observer, was used to assess the teachers' use of motivational strategies. The MOLT follows the real-time coding principle of Spada and Fröhlich's (1995) Communication Orientation of Language Teaching (COLT) scheme, but uses categories of observable teacher behaviors derived from Dörnyei's (2001) motivational strategies framework for foreign language classrooms. The results indicate that the language teachers' motivational practice is directly linked to increased levels of the learners' motivated learning behavior and their motivational state. In a second phase, three high- and three low-motivation learner groups (selected from the initial sample) were compared in order to uncover the students' interpretations and understandings of the quality of their L2 instructional contexts in relation to their motivation and motivated classroom behavior. Results based

on quantitative and qualitative datum (which were obtained using three new instruments specifically designed for this study) indicated that the motivational practices coexisting with different levels of motivation were woven into the contents and processes of L2 instruction and instruction in general. These contents and processes seemed to stem from teachers' and students' beliefs about what counts as learning in the L2 classroom and what is the best way to learn an L2. The study illustrates that motivational strategies is generally believed to enhance student motivation.

Mary (2007) has synthesized the applied linguists and mathematics educators to highlight the linguistic challenges of mathematics and suggest pedagogical practices to help learners in mathematics classrooms. The linguistic challenges include the multi-semiotic formations of mathematics, its dense noun phrases that participate in relational processes and the precise meanings of conjunctions and implicit logical relationships that link elements in mathematics discourse. This research on pedagogical practices supports developing mathematics knowledge through attention to the way language is used, suggesting strategies for moving students from informal.

Elbers, (2007) contribute to the theory of mathematics instruction by highlighting and analyzing as a teacher in a primary school. Elberse discussed as part of a recent wave of educational innovations using the idea of learning communities. The researcher present a case study of a lesson co-taught a primary school teacher (students between 11 and 13 years of age). The researcher addressed the students as `researchers' and gave them realistic problems to work on. Since they provided occasions for increasingly sophisticated solutions, the tasks given to the students stimulated processes of mathematics. The students' role as researchers required them to construct novel ideas and present these to their classmates. The various solutions proposed by the students were

used by the teachers to structure the learning activities in the classroom. The study has illustrated the interaction process between the common understandings in the classroom and the learning process of individual. Students show that the classroom activities amount to a process of collective reflection.

Banda (2005) investigated teachers' perceptions of classroom assessment in mathematics and their current classroom assessments practices. Specifically, the study sought to gain an understanding of the extent to which teachers use different classroom assessment methods and tools to understand and to support both the learning and teaching processes.

Chris (2005) suggested that, for a context to be of great value for teaching a mathematical concept, the physical activity should act as a metaphor for the intended mathematical activity. This thesis includes the learning in the classroom principles of naturalistic enquiry but lacks many related issues like the indicators taken by the present thesis.

Jain and Burad (2003) found the following causes as responsible for low results in secondary Mathematics in Rajasthan; non-availability of Mathematics teachers due to late appointment and frequent teacher transfers; lack of appropriate classroom, black board and other physical facilities; non-availability of text books; lack of timely correction of home work; over burdened and uninteresting curriculum; insufficient periods for teaching Mathematics and lack of suitable teaching aids. They have however, not analyzed why these causes affect Mathematics more than other subjects.

Song (2002) stated that with the tremendous growth of the use of computers in schools, sound research is needed on how to design interactive learning environments that effectively help children by promoting reflective cognition and better learning. The research described in this thesis addresses the following questions in designing interactive

mathematics learning environments for children: a) How should a learning environment motivate children to explore the underlying mathematical concepts b) How should the user interface be designed to support children's learning of mathematical concepts c) What are some design features that are effective in promoting reflective cognition and better learning. d) How should a learning environment meet children's affective needs. What are some design features that can make children's learning of mathematics more enjoyable. Bubble Puzzle, a game-based interactive learning activity aimed at assisting elementary school children in understanding fractions was developed. Techniques such as visual feedback and scaffolding were used in the design to promote reflective cognition. Two studies with 47 elementary school children were conducted to evaluate the educational effectiveness and the design features of Bubble Puzzle. It was found that playing the game helped children gain a better understanding of the underlying mathematical concepts, and led to statistically significant improvements on test scores. The results suggest that Bubble Puzzle provided a motivating learning environment, and that the entertainment features of the game matched children's interests and were conducive to children's enjoyment of the learning activity.

Attitude

Sylvia (2011) fined out students' attitude towards mathematics across gender with specific reference to objectives, content, methods and evaluation of mathematics curriculum. The study was conducted in public secondary schools in Kisumu East District and employed correlation design in which the dependent variable was performance and independent variable was attitude. The study sample was 986 Form 4 students, representing 33% of the population. The researcher stated that Mathematics is one of the core subjects in secondary school curriculum. Performance in the subject is crucial for

students' admission to scientific and technological professions. However, there has been persistent poor performance in this subject particularly in Kisumu East District as revealed by the Kenya Certificate of Secondary Education examination results for the years 2006 to 2008 with mean scores of 3.2282, 3.3691 and 4.0660 respectively. This may deny students access to the competitive professions. Factors contributing to this poor performance have not been exhaustively studied.. Data collection instruments were Students Questionnaire (SQ) and Mathematics Test (MT). Quantitative data was analyzed using descriptive and inferential statistics. Pearson Product Moment Correlation Coefficient was used to determine the strength and direction of the relationship. The findings established that both girls and boys showed a neutral attitude towards Mathematics curriculum. Based on the results it is advisable that students' attitude be enhanced as this will translate into improved academic achievement in the subject. This study has denied the students access to the competitive professions. Factors contributing to this poor performance have not been exhaustively studied. So, the present study requires the demand of conducting such research for the improvement of Mathematics studies in Bangladesh.

Perry (2007) studies a quantitative study with a sample of pre-service elementary teachers from four universities in Kentucky. The purpose of this study was to investigate pre-service elementary teachers' achievement goal orientations for learning mathematics and the relationship of those goals and their attitudes toward mathematics. A second goal of this study was to explore differences in the types of achievement goals and attitudes between rural pre-service elementary teachers and their non-rural counterparts. Self-report instruments were administered to assess the level of three achievement goals mastery, performance-approach, and performance-avoid, and three constructs of attitude – confidence in learning mathematics, usefulness of mathematics, and mathematics as a

male domain. The participants also completed a questionnaire designed to determine their rural non-rural educational background. The sample was divided into four subgroups based on locale: Appalachian rural, other rural, urban, and other non-rural. Results indicated that pre-service elementary teachers were significantly higher in mastery goals than in performance goals, and that performance-avoid goals were significantly higher than performance-approach goals. These pre-service teachers were also less confident in learning mathematics than a sample of female students pursuing a variety of majors. Mastery goals were weakly to moderately correlate to all three constructs of attitude. A statistically significant difference between the Appalachian rural group and the other non-rural group for confidence in learning mathematics was also found, with the Appalachian rural group displaying less confidence. Furthermore, rural pre-service teachers had less confidence and were more likely to view mathematics as a male domain than non-rural pre-service elementary teachers. Since mathematics classes are traditionally performance-oriented, the result that Pre-service elementary teachers are high in mastery goals suggests a mismatch between personal and classroom goals that could result in negative attitudes toward mathematics and the adoption of maladaptive performance-avoid goals. The findings of this study suggest that mathematics educators teaching mathematics content courses for pre-service elementary teachers from all locales should create a classroom climate that supports and encourages mastery goals.

Moynihan (2004) identified as one of the National Council of Teachers' of Mathematics curriculum standards in 1989, communication in mathematics has been highlighted as an important goal for all students. The ability to communicate mathematically is seen as crucial in fostering the development of competent problem-solvers capable of inquiry and the conveyance of thoughts. These capabilities are seen as critical in today's world as well as in the future. The related areas of communication including reading, writing, speaking,

and listening both across the curriculum and in mathematics were reviewed. These seemingly discrete components were unified in a model of the role of communication in the mathematics learning process. This model was built upon the child as a communicative being at the core of the learning process that involves the communication of cognitive and affective elements through various channels to a communicative audience. A segment of the model was examined by investigating the relationship between increased communication through journal writing and sharing and mathematics achievement and attitude. The first part of the study included a pretest, instruction in standard cubic units, and a posttest in six fifth grade classrooms. Instruction in three experimental classes differed from that in control classes by being accompanied by journal writing and sharing. Two classes participated in the second part of the study that followed the same procedures for instruction in common fractions. An attitudinal measure was administered to students in all six classes. Five students from each of the six classes were interviewed. Major conclusions included: there was no significant difference between groups in achievement in standard cubic units; there was a significant difference between groups in achievement in common fractions for those students who had engaged in journal writing and sharing for a longer period of time; interview results pointed to meaningful differences between groups in affective variables connected to mathematics and communication. The thesis has emphasized on the segment of the model was examined by investigating the relationship between increased communication through journal writing and sharing and mathematics achievement and attitude.

Amjad (2010) in his thesis he explore that the present system of teaching and learning English is not bearing effective result because of not having favorable teaching and learning environment lack of efficiency of the teaching conductors and the school management body. However to excite the research sincere efforts have been given in the

communication of actual information about the present shape of teaching and learning English at SSC stage in our country. In this research the present system of teaching and learning English has been taken into consideration as one of the major elements to measure the outcome of communicative language teaching approach designed for the learners of secondary level. To run the new curriculum and syllabus in the SSC a lot many impediments have been predicated in the first chapter. NCTB has presented English for today for the learners of classes IX-X based on CLT approach consisting 22 units. In this thesis the text book for 1st paper and the book on grammar and composition for 2nd paper have been reviewed carefully keeping in mind to analyze how far the CLT elements has been produced in these books in the context of socio-economic ground of this country and also its limitation to implement this new curriculum and syllabus. The introduction of CLT is undoubtedly a positive attempt but there are certain limitations to implement it because of the lack of teaching materials dearth of skilled English teachers, weak management system, and environment problem and so on.

Smith (2010) estimate that the Comprehensive Framework for Teacher Knowledge provides a model that describes an approach to the secondary mathematics methods course, as described by Robert Ronau and P. Mark Taylor. The model includes the orientation of pre-service teachers toward mathematics and the teaching of mathematics, which includes the beliefs of the pre-service teachers. The first questions deal with identifying the methods used in the methods course to address beliefs. The second set of questions deal with the effects of the methods course on the beliefs that pre-service teachers hold on the learning and teaching of mathematics. The study included 16 different universities in the United States. The students completed the Mathematics Beliefs Instrument (MBI) before and after the course. The data used for analyses included the MBI, course syllabi and interviews with instructors and course textbooks. Qualitative

analysis was conducted on the syllabi and interviews to assist in creating a rubric to score the syllabi, interviews and textbooks. Correlation and linear regression analysis was used along with the Wilcoxon signed-ranks test for the statistical analysis. Pre-service teachers' beliefs about the learning and teaching of mathematics were found to become more reform-oriented during the course of the methods course. A significant positive relationship was found between the number of methods used in the methods course to challenge student beliefs and the improvement between pre and post tests but has not care about the teachers' skills and student's performances.

Siddiqui (2010) designed to study the instructional process competencies through class room observations. The major purpose of the study was to identify essential teacher competencies for school effectiveness and find out class room practices used by workers welfare model schools teachers in Pakistan. A mixed method approach was adopted to study the state of school effectiveness. Major findings of the study indicated that though most of the teachers are aware of standards of teaching for school effectiveness to some extent but they are not implementing these standards in their classrooms. Also majority of the teachers are not using evaluation techniques properly. The teachers, however, agreed with two major characteristics of the teacher education for school effectiveness i.e. content knowledge and pedagogical competencies. Also a need emerges to find out as to why teachers, despite having knowledge of the required techniques, do not follow the standards of school effectiveness.

Alenezi (2010) suggested ways that might help to improve students' performance in mathematics. The first and the second steps focused on the students and the third step looked at the mathematics teachers and inspectors ideas about learning and teaching mathematics. This study also explored the attitudes of the students towards mathematics.

The importance of mathematics as a discipline; attitudes towards learning mathematics; confidence in mathematics classes; the relationship between attitudes and achievement; activities in mathematics classes, and opinions about mathematicians. The perceptions of mathematics teachers and inspectors were investigated to see the extent to which their views related to the findings from work with students. The results indicated that field dependent students with low working memory capacity perform badly in mathematics. This study also showed a clear evidence of a decline in attitudes with age and the excessively overloaded curriculum was a likely reason along with the perceptions that some topics were irrelevant. Furthermore, this study reflects the crucial role that the mathematics teacher plays in the formation of student attitudes towards mathematics.

Kabiri and Venkatesan (2009) investigated whether the CBGT has any impact on mathematics anxiety of high school students. The sample consisted of 16 subjects in the experimental group and 17 subjects in the control group who had high level of Mathematics anxiety on Mathematics anxiety rating scale (MARS). After the pre test of two groups, the intervention by CBGT was given to the experimental group in (15 sessions) for 1.5 hours – two times in a week and at the end of intervention, again the Mathematics anxiety evaluated. Analyses of data of pre and post test by repeated measures ANOVA has shown that CBGT was highly effective in reducing Mathematics anxiety and two subscales of this scale (test anxiety and numerical anxiety). Moreover, with respect to gender, there is a significant difference between boys and girls in mathematics anxiety in post test of experimental group. This study considers only the mathematics anxiety of the two groups of the students and found differences between two groups and they did not found any differences between girls and boys in this respect. It may be a part of research work but not be the totality of complete research work. of course, the work is scientific and the result of the work is logical one.

Schenkel (2009) expresses that students have many different perceptions of mathematics. Most business and athletics leaders will talk about how the individual's attitude directly affects their performance in the office or on the field. This study looked at how students and teachers attitudes impact the mathematics performance of the students in the classroom. one small private school in Southeastern Ohio was the focus of this study. Students and teachers both were surveyed by the researcher on their attitude towards mathematics education. It is the thesis on measuring attitudes of the student on Mathematics. So, a lot of gaps have been found relating to the present study.

Yara (2009) observe the attitude of students can be influenced by the attitude of the teacher and his method of teaching. Studies carried out have shown that the teachers' method of mathematics teaching and his personality greatly accounted for the students' positive attitude towards mathematics and that, without interest and personal effort in learning mathematics by the students, they can hardly perform well in the subject. The study adopted the descriptive survey design using simple frequency and percentages in analyzing the data. 1542 senior secondary two students randomly selected from 2 schools in each of the senatorial districts from the six states in the Southwestern part of Nigeria were used. One instrument (SAT) was used while three research questions were answered in the study. The results showed that the students' attitudes towards mathematics were positive and that many of them believed that mathematics is a worthwhile and necessary subject which can help them in their future career. The thesis recommended that the teacher should develop positive relationship with students and stress classroom activities that involve active teaching- learning process and students' participation in the class. Stakeholders should organize periodic seminars and workshops for students, parents and teachers designed to promote positive attitudes towards mathematics.

Onyebuchi, (2009) find out what aspects of the process of teaching and learning seem to be important in enabling students to grow, develop and achieve. The attention here is on the learner and the nature of the learning process. What is known about learning and memory is reviewed while the literature on specific areas of difficulty in learning mathematics is summarized. Some likely explanations for these difficulties are discussed. Attitudes and how they are measured are then discussed and there is a brief section of learner characteristics, with special emphasis on field dependency as this characteristic seems to be of importance in learning mathematics.

Yilma (2009) was to find how students' attitude and gender influence impact on their achievement in mathematics and how these affect the development of their ability to continue with school success in mathematics. The study put into consideration certain variables which are considered as being very important factors that can make or mar the continuous success of any child in mathematics or in his academic development. These include peer influence, motivation, teacher's attitude, parental influence, etc. The design for the study was a correlation X-post facto and the methods the researchers used are statistical correlation and ANOVA. To make the relationship between these factors and mathematics achievements of students to be clear six hypotheses were proposed, stated in null form and were tested at significance level of 0.05 margins, using Pearson correlation coefficient and multiple regression statistics. Results showed that the attitude can predict mathematics achievement. The regression analyses showed no significant difference in the attitudes of students from different homes towards the learning of mathematics. The finding of the study showed that female students have no significant difference in their mathematics achievement with boys.

Johnsen (2009) study of the classroom of eighth grade mathematics, the researcher investigated the use of cooperative learning groups and whether working in groups changed students' individual achievement and students' attitudes toward mathematics. He used his eighth grade class of 13 students along with two different types of group formations: teacher-formed groups and student formed groups. The researcher discovered that the type of group formation can have an impact on the attitudes of students and how well they work together. He also discovered that there was no real change in students' achievement, but the longer the group worked together the better they performed. As a result of this research, he plans to continue to find ways to incorporate cooperative group activities but keep groups together for a longer period of time. The study emphasized only individual attitude towards mathematics of the students.

Schroeder (2007) emphasize on the students' improvement through their attitude towards mathematics subject. Mathematics teachers instruct to improve students' attitudes toward mathematics. The pressures to cover the state-mandated curriculum drive teachers to instruct for procedural understanding with few connections. The lack of real-life connections results in students with low motivation toward mathematics and results in poor mathematics attitude. The research study involved an intervention in a Mid-South urban high school at the 9th grade level. All students who participated were enrolled in the middle track at the school, thus taking an Algebra I course. The intervention took place with four teachers in seven separate classes. Students were given the opportunity to regulate their own learning based on objectives for district and state requirements. In this pre/post design, students were surveyed for their mathematics attitude and achievement using the attitude toward mathematics inventory and a polynomial survey designed by the researcher. Teachers were surveyed and interviewed prior to the study to develop a sense of their teaching preferences. During the experiment classroom observations were

conducted to assist in developing themes in the intervention. Following the study, extensive interviews took place with each participating teacher. Data analyses revealed no statistically significant difference between the control and experimental group in regards to mathematics attitude and achievement. Qualitative analysis using constant comparative strategies revealed many teacher barriers and misconceptions. Teachers felt uncomfortable with the technique and were unable to allow the students to fully regulate their learning. The teachers imposed a timeline, quizzes, written tests, and direct instruction techniques on the students during the study. All of these created barriers to the students fully regulating their learning. Also, teachers' perceptions of learning and attitude were not valid. Teachers believed the students achieved at a lower level than with a traditional approach and viewed their attitudes as worse than normal. This was in direct contrast to the quantitative results. The purpose of this mixed-methods research is to examine self-regulated learning as an instructional technique aimed at increasing mathematical attitudes while also increasing achievement and to reveal barriers to its implementation in the classroom.

Anxiety

Rabalais (2008) has explained that the conceptualizations of mathematics anxiety, as well as factors that are empirically related to it were identified from the existing literature. These factors are test, evaluation, trait, and state anxiety, as well as gender and level of math ability. Differences in these factors were hypothesized to distinguish subtypes of highly math anxious individuals from one another. In order to determine whether subtypes exist, cluster analyses were performed on a sample of 96 highly math anxious college students. The results revealed three clusters distinguished by completion time on two versions of a math test and age. Furthermore, participants' responses on a variety of

self-report questionnaires, as well as performance on a math test, were assessed under stressful versus relaxing testing conditions. Stressful testing conditions produced a decrement in math test performance, and also resulted in an increase in state anxiety level, particularly for women. The obtained results supported the existence of math anxious subtypes; they also suggested that level of anxiety can be manipulated by instructions in a math testing setting. The study provides the only way to remove math anxiety of the students by manipulating instructions.

Elenchothy (2007) was to identify the level of mathematics anxiety and its relationship with form four students' achievement in Klang district. The study involved a sample of 182 male and 160 female students (n = 342) from ten daily schools in the Klang district. The Students Mathematics Anxiety Scale (SKMP) was used to measure mathematics anxiety level. Findings showed that the level of students mathematics anxiety were on moderate level (mean = 2.37; SD = 0.74). In details, all the underlying dimensions of mathematics anxiety, that are class climate (mean = 2.03; SP = 0.78), incapability (mean = 2.41; SP = 0.76), abstraction of mathematics (mean = 2.33; SP = 0.86), and mathematics achievement test (mean = 2.65; SP = 0.97) on moderate level. The findings showed that 52.9% of respondents had experienced the physical symptoms during the mathematical situations in moderate level. Analyses on perceptions of mathematics showed value of mathematics (mean = 1.74; SD = 0.79), self confidence (mean = 3.42; SD = 1.05) and enjoyment of mathematics (mean = 3.17; SD = 1.04) in mathematical situations were low. Study also showed there was a significant relationship between students' perception and their mathematics anxiety (r = 0.50). In detail enjoyment of mathematics (r = 0.43), self confidence in mathematical situations (r = 0.40) and value of mathematics (r = 0.21) showed a moderate relationship with mathematics anxiety. The findings have shown there was a significant relationship between mathematics anxiety

and the occurring of physical symptoms during the mathematical situations ($r = 0.61$). An analysis of variance among groups of pure science ($n = 117$), technical science ($n = 111$) and humanities science ($n = 114$), revealed that these groups differed significantly ($F(2,339) = 8.38$, $p < 0.05$). The findings of a one-way ANOVA indicated a significant difference between science humanities group with pure science group and the science technical group respectively. Yet, a no significant difference was found between the findings and several suggestions. As an outcome, the study can be used as a resource in planning and implementing quality teaching and learning of mathematics. This aspect should be instilled in the teaching approach in order to enhance the quality of teaching and learning in secondary school especially the schools in rural area.

Chernet (2005) reviewed the current school mathematics curriculum in Ethiopia is not producing competent mathematics students. Many mathematicians in Ethiopia and other part of the world have often expressed grief that the majority of students do not understand mathematical concepts, or do not see why mathematical procedures work, or do not know when to use a given mathematical technique. According to Cuoco, for generations, school students have studied something in school that has been called mathematics but has very little to do with the way mathematics is created. Much of the failure in school mathematics is due to the tradition of the curriculum design and inappropriate teaching to the way student learns. The mathematics curriculum has a great influence on how teachers teach in a classroom. In a traditional curriculum where a traditional teaching model is being employed a teacher demonstrates an algorithm or technique, assigns a set of problems for students to do on their own, and tests a student a week or two weeks later on accumulation of their skills. On the other hand Interactive Mathematics Curriculum (IMC) is designed around the process aspect of mathematics in contrary to the curriculum we have at hand nowadays in schools. A curriculum designed

around habits of mind comprises both the content and the process The existing mathematics Curriculum that is underway in Ethiopia can be labeled as traditional for its main organizing principle is the content that needs to be covered for a given grade level in a given academic year rather than the habits of mind that the students need to develop. Part of the solution to this problem could be adapting IMC to all school levels. This thesis is also lacks the identification of those important indicators responsible for fruitful learning mathematics at secondary levels and teachers' limitations.

Baloglu (2005) found that the personal effects of mathematics anxiety are investigated as immediate and long-term. He cites several researchers who consider lowered achievement as one of the immediate effects. In addition, avoidance, low self-esteem, learned helplessness; cautiousness and compulsive behaviors can be considered some of the long-term effects. Math anxiety is a pervasive dread of mathematical problem solving and mathematics classrooms. The effects are intrusive thoughts of inadequacy and failure that lead to a cycle of math avoidance. Math anxiety disrupts on-going activities of working memory, making mathematical performance less accurate and more time consuming.

Kabiri and Kiamanesh (2002) was designed in order to investigate the role of personal variables on students' math achievement. To achieve this goal, four variables, i.e., math self-efficacy, mathematics anxiety, math attitudes and prior math achievement were identified on the basis of theoretical principles and research findings. The studied sample comprised 366 Iranian eighth graders and the instrumentation consisted of Pajares' Questionnaire (1995 & 1996), Shokrani's Questionnaire (2002), the revised edition of Fennema's Questionnaire (2000) and the students' mathematics score in the previous academic year. It is worth mentioning that the collected data were analyzed using Path Analysis. The obtained results indicated that prior math achievement and mathematics

self-efficacy played the most important role in students' mathematics achievement, respectively. Furthermore, the mediator role of self-efficacy between math achievement and math attitude was confirmed. Math anxiety mediates the role of math self-efficacy and mathematics attitude on the one hand and the role of math achievement on the other hand. The results also showed that previous math achievement has strong direct and indirect effects on students' mathematics achievement through math attitudes, mathematics self-efficacy and math anxiety. Math attitude has an outstanding effect on math anxiety. The thesis has mentioned the direct and indirect effects of math attitude.

Preis and Biggs (2001) reported that instructors can emphasize that learning mathematics is partially like learning a foreign language, with its own vocabulary and symbols. In writing they can encourage self-monitoring as described above, or they can ask students to explain in writing how they solved a given math problem. They can encourage students to keep journals where students can privately write to instructors to share their difficulties. Instructors can then address the concern long before the midterm or final. These journals can be motivating, providing a direct and private link to the instructor. Carefully thought-out journal prompts can help uncover areas of math anxiety and allow the instructor to work more effectively with the student. Textbooks must be carefully selected, with thorough explanations and several examples, and problem sets should include realistic and meaningful mathematical situations. Conceptual understanding leads to less math anxiety, with less memorization and drill and more “authentic math. The other side of this discussion is the fact that learners must take responsibility for their own learning. Math anxiety rarely goes away by itself; it must be addressed as a primary concern by the sufferer to see improvement. It exists in many forms, degrees and at many

levels. Learners must be participants in mathematical problem solving. Most importantly, instructors must believe that each student can learn math and must help students come to believe that they can do math.

Randel, Stevenson and Witruk (2000) stated that of basic concepts and operations in high school mathematics and a questionnaire involving beliefs, attitudes, and practices related to mathematics, their own abilities, and their psychological adjustment. Large differences were found between the two countries in the students' performance. The lower scores of the German students are attributed to three major areas of difference. Compared to Japanese students, German students were less critical of themselves and their academic ability, held lower standards for their performance, and were less likely to attribute excellence in performance to studying. Students in both countries expressed few indications of maladjustment. When differences were found the indices of maladjustment were more common among German than among Japanese students. Boys obtained higher scores on the mathematics test than girls, were more likely to spend more time studying mathematics, and placed more importance on going to college than did girls. The study emphasize only on the differences between girls and boys performance on mathematics.

2.1 Review of Mathematics Curriculum in Bangladesh

Curriculum involves the whole complex of philosophical, social and administrative factors of education. In other words, it is concerned with the planning, implementation, evaluation, management, and administration of an education programme. A syllabus is the subpart of curriculum which is concerned in specifying particular units of a language to be laught. It is customary that curricula make general statements regarding learning purpose, evaluation, teachers and learners' relationship etc. while a syllabus is more

localized and is founded on records of things that happen in the classroom level. In planning, implementing or evaluating a curriculum, a number of elements are to be considered, usually, needs and purposes of learners, setting goals and objectives, grading contents, organizing learning arrangements, learning tasks, learner grouping, evaluation tools, teaching institution management, developing materials, resources and their utilization etc. are such elements of a curriculum. Syllabus is a statement of what is to be learnt. Over the years; ideas about curriculum, syllabus design have undergone changes and evolution. This chapter discusses background, theories, key features and various approaches of the curriculum. It also focuses on syllabus definitions, syllabus design, grading content, goal setting, tasks and various models of mathematics syllabus.

2.1.1 Background of Curriculum

The word "Curriculum" has its origin in the running or chariot tracks of ancient Greece. In Latin it was called currer meaning "a running chariot ". Literally, it was a course. John Kerr defines curriculum as all the learning which is planned and guided by the school, whether it is carried on in groups or individually inside or outside the school. This offers two key features of curriculum.

(1) Plan in advance about what to achieve and how to proceed,

(2) Emergency of theory and practice to ideas of schooling.

Afterwards, there came four important ways of approaching the curriculum theory and practice which are-

- Curriculum to be transmitted as syllabus,
- Curriculum as product;
- Curriculum as process and
- Curriculum as practice

There subsequent ways of approaching curriculum theory and practice can be seen in the light of Aristotle's influential categorization of knowledge into three disciplines.

a) The theoretical

b) The practical

c) The productive

Here, we see some clear links between Aristotle's influential categorization of knowledge and the approaches of curriculum theory. The body of knowledge which is to be transmitted first is the "Theoretical" approach to knowledge. It is also called 'the canon'. Aristotle's "Practical" approach comes closer to the modern process and praxis models and the "Productive" approach reflects the modern product approach of curriculum.

2.1.2 Curriculum Transmitted as Syllabus

Many people still think that a curriculum itself is a syllabus. But basically, a syllabus, a syllabus means a concise table of contents of a discourse and the subjects of a series of lecturers. In the form, a syllabus is connected with courses leading to examinations. For example, we can take the Cambridge Board French GSCE exam. What we can see in such documents is a series of headings with some additional notes which set out the areas that may be examined. A syllabus generally does not indicate the relative importance of its topics or the order in which they are to be studied. Curzon (1985) points out that those, who compile a syllabus, tend to follow an 'order of contents', or a pattern which is prescribed by a 'logical' approach to the subject. Thus, the approach to curriculum theory and practice which focuses on syllabus is only concerned with the content and is seldom involved with the other factors of curriculum. Curriculum is a body of contents and subjects. Education, in this sense, is the process through which these contents are transmitted or delivered to students as syllabus by the most effective methods that can be

devised. So, people, who still equate curriculum with a syllabus, are likely to limit their planning by considering the content to be the whole curriculum.

2.1.3 Curriculum as a Product

The dominant modes of describing and managing education are put today in productive form. Education is most often seen as a technical exercise. Objectives are set, a plan is drawn up and applied, and the outcomes (products) are measured. Franklin Bobbitt (1918; 1928) and Ralph W. Tyler (1949) dominated theory and practice within the tradition of curriculum as product. In the curriculum Bobbitt writes- Human life, however varied, consists in the performance of specific activities. Education that prepares for life is one that prepares definitely and adequately for these specific activities--

These will show the abilities, attitudes, habits, appreciations and forms of knowledge that men need. These will be the objectives of the curriculum. This way of thinking about curriculum theory and practice was heavily influenced by the rise of management thinking and practice advocated by F.W. Taylor basically proposed in this conception of curriculum theory and practice was the involvement of detailed attention to what people need to know in order to work, to live their lives and so on. Such an approach can be found in many training programmed, where particular tasks or jobs have been analyzed, broken down into their component elements and lists of competencies are draw up. In other words, curriculum was not to be the result of 'armchair speculation' but the product of systematic study. In the late 1940s, the work of Ralph W. Tyler made a lasting impression on curriculum theory and practice. He shared Bobbitts emphasis on rationality and relative simplicity. His theory was based on four fundamental questions such as-

- What educational purposes should the school seek to attain
- What educational experiences can be provided that is likely to attain these purposes

- How can these educational experiences are effectively organized
- How can we determine whether these purposes are being attained

Like Bobbitt, Tyler also put emphasis on the formulation of behavioral objectives; He stated that the real purpose of education is to make the instructor perform certain activities but to bring significant changes in the students' pattern of behavior. So, the objectives of an institution should be the statements of changes to take places among students. With these concerns (Taba, 1962) prescribe a nicely ordered procedure as a recommendation to develop a comprehensive approach for a product mathematics curriculum design. Taba, in this regard, prescribes seven particular steps which are-

- Diagnosis of need,
- Formulation of objectives,
- Selection of content
- Selection of learning experiences
- Organization of learning experiences
- Determination of what to evaluate and of the ways and means of doing it.

This way of approaching curriculum theory and practice is systematic and has considerable organizing power. The central feature of the approach is the formulation of behavioral objectives providing a clear notion of outcome so that content and method may be organized and the results can be evaluated. Mathematics is a popular subject and important subject in Bangladesh. It has been found the position of Mathematics in the school curriculum is mostly unsatisfactory to some students. In the secondary schools the syllabus of mathematics is not so framed that it can be taught as an easy task of science. Mathematics teaching may be newly framed so that students can easily take it as easy task of their learning.

The syllabus of Mathematics should make up-to-date in conformity with the growing demands of the developing countries like ours. In this chapter, the researcher has discussed all things with opinion of the stakeholders and at the same time, critical analysis has been given to clear the curriculum concept especially.

2.1.4 Mathematics Curriculum: Past and Present

The first Education Commission in 1974 published their report giving some recommendations to form new syllabus of mathematics subject. The Commission also suggested reforming the education system of Bangladesh. Mathematics remained a compulsory subject at secondary level. The collaboration of the syllabus was as follows;

Table 2.1 Curriculums

1974	1995
Arithmetic	Algebra
Algebra	Geometry
Geometry	Trigonometry
	Parameter

2.1.5 Importance of Mathematics Curriculum

To implementation of aims and objectives of mathematics education from primary to secondary can be possible through mathematics curriculum. Mathematics is a subject that discusses about the world and its inhabitants and that is why it is established the main branch and the sources of knowledge. Mathematics knowledge is applicable for all. As a result, learning of mathematics is essential in entire life. So, we need well planned and selective mathematics curriculum. Secondary education is the gateway to higher education thus there is a scope to discuss different types of mathematics in this level. Hence, curriculum plays a vital role in every class. We can realize the importance of mathematics if we discuss the range and scope of mathematics. Mathematics curriculums help the students to understand these things. Mathematics is a dynamic subject. To

maintain its dynamism, the changes of curriculum are needed. Its influences are all over the life. Considering all, we can say mathematics curriculum is very important.

2.1.6 Objectives of the Mathematics Curriculum

The greater meaning of education is to desired change of behavior of students and to adaptation with environment (King and Morgan, Education Psychology, 1985, p-185). Education Commission Report-1995 mentioned the following objectives for mathematics subject at secondary level.

- To acquire mathematical knowledge and skill through confidence, content and pleasure.
- To acquire knowledge about inner beauties of mathematics
- To acquire ability on logical use of mathematics.
- To acquire knowledge on the concept of modern mathematics.
- To acquire knowledge on practical use of mathematics.
- To acquire ability on mathematical symbols and language.
- To increase ability on using correct methods of mathematics in respect of solving problems.
- To acquire knowledge on distinguish relation of mathematics to others subjects.
- To acquire knowledge on general concept to universal concept.
- To acquire values using mathematical logic to realistic solution.

2.1.7 Principles of Mathematics Curriculum

Curriculum is highly related with philosophy of education. Development of curriculum depends on some principles. This are;

- To make similarities with general of the objectives of education
- To influence of aims and objectives of education
- To adaptation principles of greater meaning of curriculum
- Principles of individual difference

- Principles of generous approach
- Principles of philosophy of education
- Principles of subjective knowledge
- Principles of creativity
- Principles of social centralization
- Principles of work centered
- Principles of change
- Principles of advancement
- Principles of rest and recreation
- Principles of undivided ness
- Principles of relationship among other branches
- Principles of presence of practical content

2.1.8 Position of Mathematics in the School Curriculum

Curriculum is a vast term. It is the blue print of particular stage of education system. According to the specialist, curriculum is the total effort of the school to bring about the desire, out of the school situation. Mathematics curriculum means the aims and objectives, contents, ideal of education, principles of appraisal, different aids and arrangement, responsibility of teacher and students work process etc. National curriculum and Text Book Board published their latest curriculum report in 1995. Secondary mathematics curriculum is located in 2nd part of the report. The report committee describes the curriculum as introduction, class based objectives with practical, learning outcomes, contents, distribution of numbers, direction to the writers, teaching-learning techniques (with teaching aids), evaluation etc.

2.1.9 Curriculum Planning and Course Development for Class Nine and Ten

Mathematics occupies an important place in the school curriculum. The construction of curriculum of Mathematics is a difficult task however it would be easier to contact a syllabus in Mathematics if we keep certain point in mind, while constructing the curriculum of Mathematics. The points are:

- Proceed from known to unknown
- use of Mathematical terminology based on home Mathematics
- Subject matter based on actual experience of the student
- Study in Mathematical ways
- Emphasis on physical and economic Mathematics
- International understanding
- Selection of subjects

In the present curriculum many of these are absent. Mathematics teacher's comments on the context are valuable. They make their opinion as

- Not satisfactory
- Difference of definition and explanation in different edition
- New topic should be added
- New thoughts of Mathematics should be included
- Importance and need of Mathematics should be focused with more importance
- Curriculum of Mathematics should be modernized
- Syllabus should be reduced
- Elaborated description of contents should be needed
- Give concepts of branches of Mathematics

Mathematics has been divided into four major groups. These are as follows;

a. Algebra

b. Geometry

c. Trigonometry

d. Parameter

Mathematics, which is compulsory for class nine and ten, included the following chapters including the following subjects.

a. Algebra

Chapter	Subjects
Chapter one	Set
Chapter two	Real number
Chapter three	Equation of Algebra
Chapter four	Exponent and Logarithm
Chapter five	Ratio and proportion
Chapter six	Mathematical open sentences including one variable
Chapter seven	Relation, Faction and graph
Chapter eight	Mathematical open sentences including two variables
Chapter nine	Progression

b. Geometry

Chapter	Subjects
Chapter-one	Primary concept and definition
Chapter-Two	Line, Angle, Triangle, Quadrilateral and the Theorem of Area
Chapter-Three	Triangle, Quadrilateral related problems
Chapter- Four	Theorem related to area
Chapter- Five	Theorem of Pythagoras and its applications
Chapter-Six	Theorem related to Pythagoras demonstration
Chapter-Seven	Ratio and Equiangular Triangle
Chapter-Eight	Theorem of area and ratio
Chapter-Nine	Theorem of Stateline
Chapter-Ten	Demonstration of Circle
Chapter- Eleven	Theorem of Circle
Chapter-Twelve	Trigonometry
Chapter-Thirteen	Parameter

2.1.10 Objectives of Algebra

Objectives of Algebra have been given below;

- To acquire knowledge on set and its function
- To acquire wide knowledge on real number and to solve the problems of exercises using or not using calculator
- To acquire knowledge on quantity of algebra and formula of algebra
- To acquire concept on exponent and logarithm
- To acquire concept of ratio and proportion and acquiring ability of its utilization
- To acquire knowledge of solve the problems of one variable mathematical open sentence and to acquire ability of its uses
- To acquire idea on relation and function
- To acquire knowledge of solve the problems of two variables mathematical open sentence and to acquire ability of its uses
- To acquire concept on sequence, progression, arithmetic progression, geometric progression and their uses

2.1.11 Subjects of Algebra

Heading	**Subject**
Set	Symbols of set, Sub set, null set, Universal set, Complement, Union and Disjoint set, Element of set, Power set, Finite and Infinite set, Ordered pair and Cartesians product, Exercise.
Real number	Number, Integer, Rational number, Irrational number, positive number, Negative number, Absolute value, Approximate value, Exercise.
Quantity of algebra	Quantity of algebra, Polynomial, Rational faction, Symbols of function, Some formula of algebra, Reminder theorem, Factor of algebra, Exercise.
Exponent and logarithm	Definition of Exponent and logarithm, List of log, Exercise.
Ratio and Proportion	Concept of Ratio and Proportion, Uses of Ratio and Proportion, Exercise
One variable Equation and Inequalities	Variable and domain of variable, Equation and variance, Uses of Linear and Quadratic equation, (i.e. $ax+b \geq cx$; $a^2x+bx+c>0$), Uses of inequalities exercise.
Relation, Function and graph	Relation and Function, Symbols of Function, Construct the graph of equation like; $ax+by+c=0$, $x=a$, $y=b$ and $(x-p)^2 + (y-q)^2=a^2$, Exercise.
Quadratic equation	Solution and solution set of equation, Dependent and independent variable, Solution of linear and Quadratic equation
Progression	Sequence and Series, Arithmetic and Geometric Progression, Determine r-th term and summation of n-th number.

2.1.12 Learning Outcomes of Algebra

Learning Outcomes of Set

- Learner will explain the concept of sets and will express sets using symbols
- Will identify whether it is an element or not element of the set
- Will form subset and will express subset with symbols
- Will describe the difference between finite and infinite sets
- Will explain the complement and universal set
- Will express and form union set
- Will tell what is intersection set, disjoint set and express these by using symbols
- Will clarify null set and disjoint set
- Will build power set
- Will explain ordered pair
- Will construct Cartesian product and express by symbols

Learning Outcomes of Real Number

- Will describe number, integer, rational number, irrational number and positive/negative number
- Will tell absolute value
- Will explain the decimal faction of rational number and irrational number
- Will calculate the approximate value
- Will able to solve exercise and problems by using / not using calculator

Learning Outcomes of Quantity of Algebra

- Will form quantity of algebra and will use it
- Will tell what is polynomial, power of polynomial and will able to adding, substituting and multiplication of polynomial

- Will clarify rational faction and will express its by proper / improper faction
- Will uses the symbols of function
- Will prove and apply these formula

$(p + x)(q + x) = pq + (p + q)x + x^2$

$(a \pm b)^2 = a^2 \pm 2ab + b^2$

$(a + b)(a - b) = a^2 - b^2$

- Will prove

  $(p + x)(q + x)(r + x) = pqr + (p\,q + q\,r + r\,p)x + (p + q + r)x^2 + x^3$ and will determine the formula from here

  $(a \pm b)^3 = a^3 \pm 3a^2b + 3ab^2 \pm b$

- Will establish and apply the following promises

  $a^2 + b^2 = (a \pm b)^2 \pm 2ab$

  $(a + b)^2 = (a \pm b)^2 \pm 4ab$

  $2(a^2 + b^2) = (a + b)^2 + (a - b)^2$

  $4ab = (a + b)^2 - (a - b)^2$

  $a^3 \pm b^3 = (a \pm b)^3 \pm 3ab(a \pm b)$

  $a^3 \pm b^3 = (a \pm b)(a^2 \pm ab + b^2)$

- Will illustrate and prove reminder theorem

Learning Outcomes of Exponent and Logarithm

- Will define a^n (where n is rational number)
- Will tell and apply the fundamental properties of exponent
- Will define logarithm
- Will explain and apply the formula of logarithm
- Will use the list of logarithm
- Will solve problems and exercise by using / not using calculator

Learning Outcomes of Ratio and Proportion

- Will clarify ratio
- Will tell what is proportion
- Will prove and apply different properties of ratio and proportion
- Will express the ratio to percentages
- Will uses and apply ratio and proportion to solve the real problems

Learning Outcomes of One Variable Equation and Inequalities

- Will tell what is variable and domain of variable
- Will illuminate solution and solution set of one variable equation
- Will explain the difference between equation and identical
- Will solve linear and quadratic equation
- Will form equation and inequality

Learning Outcomes of Relation, Function and Graph

- Will be able to give example of relation between two variables
- Will explain function and will able to example
- Will use the symbols of function and will determine its value
- Will enlighten graph and will construct graph
- Will draw the graph of the equation

$ax + by + c = 0$, $x = 0$, $y = b$ and prove that it is a straight line

- Will clarify the equation

$(x - p)^2 + (y - q)^2 = r^2$ and prove that it is a circle

Learning Outcomes of Progression

- Will define sequence and series
- Will identify arithmetic and geometric progression
- Will determine r-th term and will find out summation of n-th number of arithmetic progression

- Will determine r-th term and will find out summation of n-th number of geometric progression

Objectives of Geometry, Trigonometry and Parameter

- To analysis the primary concept of geometry
- To extend the knowledge of the prove of geometry and extending ability to apply these
- To be aware about the theorem of Pythagoras and its application
- To acquire knowledge on drawing circle and theorem of circle
- To gain and apply knowledge on equiangular triangle
- To acquire knowledge on trigonometric ratio
- To determine the measurement of plane surface and solid body

2.1.13 Learning Outcomes of Geometry

- Will analysis the primary concept of geometry
- Will highlight the concept of straight line and plane surface through promise
- Will describe the definition of line, angle, triangle, quadrilateral and polygon and will explain these by graph
- will describe the theorem on triangle and quadrilateral and will prove new theorem by using these
- Will describe the theorem of area and will prove new theorem using it
- Will construct the promise on area and will determine their validity
- Will draw promise about ratio and determine their validity
- Will explain locus and prove the theorem of locus
- Will describe and prove the theorem of Pythagoras
- Will describe and prove the inverse promise of Pythagoras
- Will prove and apply the promise of chord of circle and arc
- Will explain the concept of contact of circle
- Will explain the theorem of ratio including graph

- Will explain equiangular triangle
- Will apply these theorem and promise to solve the practical problems

2.1.14 Learning Outcomes of Trigonometry

- Will explain the trigonometric ratio of acute angle
- Will calculate the relation between any angle and its complement
- Will calculate the trigonometric ratio of 30^0, 45^0, 60^0
- Will determine the meaningful trigonometric ratio of 0^0 and 90^0
- Will prove and apply the easy trigonometric identification
- Will solve the problems of length and height by using trigonometric concept

2.1.15 Learning Outcomes of Parameter

- Will determine and apply the area of rectangle, parallelogram, trapezium and triangle
- Will measure and apply the various kind of size of rectangular cub, cylinder, cube, angled, and circular
- Will determine and apply the area of circle and length of circle
- Will solve the practical problems about parameter

There are many literatures on mathematics teaching and learning context but there has found no research related to the present study. They only suggested how to improve the collaboration of the mathematics in general. In this regard the present study offers to explore the real problems and reasonable solution of teaching and learning problems of mathematics. At the same time the study try to justify the total syllabus made for the secondary level. It would be hoped that the recommendations may help to arrange the Mathematics syllabus fit for the secondary level problems may be solved.

Chapter 3
Data and Methodology

3.1 Nature of Study

The study is both qualitative and quantitative in nature. A qualitative method is used to explore the objectives and some quantitative procedures were followed to support the qualitative data. For properly gathering data and information a multiple instrument approach was adopted such as questioner's interview and classroom observation.

3.2 Sources of Data

The required data of the study have been collected from mainly in primary source. In Rajshahi district of selected upazila have total 197 School (District Education Office Rajshahi, 2012). Primary data have been collected from 40 secondary schools (20 from urban area and 20 from rural area) of four upazila under the district of Rajshahi through questionnaires and interviews of the mathematics teachers and students. The schools were also selected purposively after categorizing the urban and rural area, the north, south, east and west side of the district. All the students were selected in simple random sampling (SRS) through random number table. There are 40 head teachers, 80 mathematics teachers and 400 students from both of the urban and rural area have been selected to collect data for this study. Ten students (five students from class nine and five students from class ten) and two mathematics teachers were taken from each school randomly. An observation checklist has prepared for selected schools.

3.3 Subject and Study Area

The subjects of the study are all the students of class nine-ten and mathematics teachers of secondary level in Bangladesh. But the sample was selected only from the district of Rajshahi. It was not possible for the researcher to take sample from all over the country due to some limited time and budget.

Rajshahi district has been selected as the study area of the research. Four Upazila of Rajshahi district have been studied. Rajshahi district is called education city and there are numbers of Secondary Educational Institutions at Rajshahi district compared to other districts of Bangladesh. Besides, Rajshahi district has an easy access and well communicated by bus and other vehicles. Moreover, there is Secondary and Higher Secondary Education Board here. So, it may be hoped that data collection would be suitable and adequate data may be found here for this study.

3.3.1 Rajshahi District at a Glance (Education Perspective)

Rajshahi District with an area of 2407.01 sq km is bounded by Naogaon district on the north, West Bengal of India, Kusthia district and the Ganges on the south, Natore district on the east and Nawabganj district on the west. The region consists of Barind Tract, Diara and Char lands. Main rivers are Padma (Ganges), Mahananda, Baral and Barnai. Annual average temperature: maximum 37.8°C, minimum 11.2°C; annual rainfall 1862 mm.

Map 3.1 Map of the Rajshahi District

Rajshahi (Town) stands on the bank of the river Padma. The area of the Rajshahi Town is 96.69 sq km**.** It consists of four thanas, 39 wards and 169 mahallas. The town has a population of 646716; male 52.42%, female 47.58%. Density of population is 6689 per sq km (Population Census 2001, Preliminary Report). Rajshahi, which is both a district and a divisional town, was flourished, in the seventeenth century. The district head quarters were transferred to Rajshahi Town from Natore in 1825. Its ancient name was Rampur Boalia. The tomb of Hazrat Shah Makhdum (established in 1634) is located at Dargahpara of the town. Many European traders were attracted to this town because of its being a centre of silk production and location by the side of the river Padma; subsequently the Dutch, the French and the English East India Company established business houses in the town in phases. The Silk Factory Building established by the Dutch is now known as Barakuthi. Later the East India Company purchased the Kuthibhaban from the Dutch. The head quarters of the European Voluntary Regiment was established in the Barakuthi during the Sepoy Revolt in 1857. At the end of the nineteenth century the zamindar of Medinipur purchased the building from the British. After 1947 it was being used as the godown of the civil supply department. When the Rajshahi University was established in 1953, the Barakuthibhaban was turned into the residence of the Vice Chancellor with other office establishments. There are 14 graves of European persons in a cemetery in front of the Kuthibhaban. A flood protection embankment was established in 1855 to save the town. Shahib Bazar is the main business centre of the town. The old areas of the town are Shahib Bazar, Rani Bazar, Reshampatti, Boalia, Ghoramara, Hatemkhan, Dargahpara and Kumarpara. Because of flourishing silk industry Rajshahi is also called the City of Silk. Rajshahi municipality was established in 1876 and was turned into a City Corporation in 1991. Administration Rajshahi district was established in 1772. Maldaha, Bogra, Pabna, Natore and Nawabganj districts were

established in phases dividing this district. It has one City Corporation, 4 thanas, 7 municipalities, 93 wards, 297 mahallas, 9 upazilas, 70 union parishads, 1678 mouzas and 1858 villages. The upazilas are Bagha, Bagmara**,** Charghat Durgapur, Godagari, Mahanpur, Paba, Puthia and Tanore thanas are Boalia, Rajpara, Matiher, and Shahmukhdum Population 2262483; male 51.20%, female 48.80%; Muslim 93%; Hindu 5%, Christian 1.5% and others 0.5%; ethnic nationals: Santal 2.34% of the total population. Literacy and educational institutions; Average literacy 30.61%; male 37.6% and female 23.2%. Educational institutions: university 1, medical college 1, engineering college 2, college government and non-government 148, teacher's training college 2, law college 1, agriculture college 1, physical training college 1, survey institute 1, para medical institute 1, silk research institute 1, homeopath college 1, primary teacher's training institute 1, nursing institute 1, police academy (sardah) 1, cadet college 1, madrasa 267, high school 422, S.S.C (vocational) 18, junior high school 130, government primary school 559, non-government primary school 430, community school 4, KG school 8. Noted educational institutions: Rajshahi College (1873), Rajshahi BB Academy (1898), Rajshahi Medical College (1949), Rajshahi Collegiate School (1928), PN Girl's High School (1886), Rajshahi Government Madrasa (1874), Diamond Jubilee Industrial School (1898), Sardaha Police Academy (1912), Putia PN Technical High School (1865), Birkudsha Abinash High School (1917, Bagmara upazila), Sreedhar Government Primary School (1857, Durgapur upazila), Godagari High School (1948), Mohanpur Pilot High School (1948), Shitlai, Kharkhari and Naohata Primary School (1885, Paba upazila), Talonda Ananda Mohan High School (1882, Tanore upazila).

Communication facilities Roads: pucca 896 km, semi pucca 686 km and mud road 4726 km; railways 70 km; rail station 13; waterways 91 nautical mile; airport 1.

Table 3.1 Educational Institution of Rajshahi District

Serial No.	Upazila	Institution				
		High School	Junior School	School & College	Madrasa	College
01	Bagha	39	06	02	10	09
02	Bagmara	66	26	03	52	20
03	Boalia (Sadar)	44	03	06	07	21
04	Charghat	46	13	00	11	12
05	Durgapur	29	13	01	19	09
06	Godagary	56	02	04	29	08
07	Mohonpur	32	12	00	21	15
08	Paba	33	17	03	23	13
09	Puthia	20	25	01	16	12
10	Tanore	43	14	03	28	14
Total	10	408	131	23	216	133

Source: District Education Office, Rajshahi (2012)

Table 3.2 Selected Upazilas and Institutions of this study

Serial No.	Name of the Upazila	Name of the Selected Upazila	Total High School and School & College	Total Selected School	%
01	Bagha				
02	Bagmara	Bagmara	69	14	20
03	Boalia (Sadar)	Boalia (Sadar)	50	10	20
04	Charghat				
05	Durgapur				
06	Godagary				
07	Mohonpur	Mohonpur	32	7	21
08	Paba				
09	Puthia				
10	Tanore	Tanore	46	9	19
Total	**10**	**4**	197	**40**	

3.3.2 List of the Visited Schools

Table 3.3 List of the Visited Schools Urban Area

Name and address of the schools	No. of Respondents			Location of the school
	No. of MTs	No. of students of class ix	No. of students of class x	
BAGMARA				
1. Taherpur High School	02	05	05	At the heart of the market
2.Bhabanigonj Gov. High School	02	05	05	Western side of the Bhabanigonj market
3.Bhabanigonj Gov. Girl's High School	02	05	05	At the heart of the Bhabanigonj market
4. Taherpur Girls High School	02	05	05	Western side of the market
BOALIA				
5.Rajshahi University School	02	05	05	Rajshahi University campus
6.Gov.Labratory High school	02	05	05	Western side of the city
7.Rajshahi Collegiate School	02	05	05	At the heart of the city
8.Gov. P.N Girl's High School	02	05	05	At the middle point of the city
9. Rajshahi Gov. Girl's High School	02	05	05	Western side of the city
10.Housing Estate Girls High School	02	05	05	At the heart of the city
11.Hamidpur Naodapara High School	02	05	05	Northan side of the city
12.Shahid Nazmul Haque Girls High School	02	05	05	Southern side of the city
13.Mirzapur High School	02	05	05	At the middle point of the city
14.Naodapara Girls High School	02	05	05	Northan side of the city
MOHONPUR				
15.Keshorehat High School	02	05	05	Road side
16.Mohonpur Gov. High School	02	05	05	East side of the high road
17.Basantakeder High School	02	05	05	At the heart of the Upazila
TANORE				
18.Tanore Paurashava High School	02	05	05	Middle point of the market
19.Tanore Girls High School	02	05	05	Western side of the market
20.Tanor Pilot High School	02	05	05	Northern side of the Market
Total	40	100	100	

Table 3.4 List of the Visited Schools Rural Area

Name and address of the schools	No. of Respondents			Location of the school
	No. of MTs	No. of students of class ix	No. of students of class x	
BAGMARA				
1.Hat Madh Nagar High School	02	05	05	At the heart of the village market
2.Nardas ML. High School	02	05	05	Union level
3.Mirpur High School	02	05	05	Road side
4.Panisail High School	02	05	05	Road side
5.Boilshing High School	02	05	05	Road side
6.Bagmara ML. High School	02	05	05	At the heart of the Upazila
7. Jhikra High School	02	05	05	Union level
8.Ekdala High School	02	05	05	Road side
9.Konda High School	02	05	05	Union level
10.Jamgram High School	02	05	05	Union level
MOHONPUR				
11.Karisha High School	02	05	05	Road side
12.Jahanabad High School	02	05	05	Union level
13.Dhopaghata A.K High School	02	05	05	Road side
14.Mahish Kundi High School	02	05	05	Road side
TANORE				
15.Dr. Abubakar High School	02	05	05	Road side
16.Chandpur High School	02	05	05	Road side
17.Chapra high School	02	05	05	Road side
18.Hatishal High School	02	05	05	Union level
19.Kamargaon High School	02	05	05	Road side
20.Kaligonjhat High School	02	05	05	Road side
Total	40	100	100	

3.4 Population

All the government and non-government secondary schools students (class nine-ten) and teachers who were engaged in teaching and learning mathematics at class nine-ten of Rajshahi district are the population for this study.

3.5 Sample Size

In order to ensure the cost effectiveness and feasibility of the study, only 40 institutions of rural (20) and urban area (20) from four upazilas (Bagmara, Boalia, Mohonpur and Tanor) of Rajshahi district were selected for the sample purposively.

The table below shows the sample size of the study.

Table 3.5 Sample Size of the Study

Location of school	Category of Respondent Total					
	Institute	**No. of Head teacher**	**No. of mathematics teacher**	**No. of students of class-ix**	**No. of students of class-x**	**Total**
Bagmara	14	14	28	70	70	182
Boalia	10	10	20	50	50	130
Mohonpur	7	7	14	35	35	91
Tanore	9	9	18	45	45	117
Total	40	40	80	200	200	520

In the above table, it has been depicted the clear sample size of 4 categories of respondents. The total number of respondent from the 4 categories is 520.

3.6 Research Tools or Instrument

Four types of instrument approach were adopted for gathering data, the following were the instruments:

i) Questionnaire for teacher and student

ii) Interview Schedule for teacher and student

iii) Semi-structure Interview Schedule for curriculum expert

iv) Classroom Observation Checklist for teacher and student

Questionnaire for Students

The questionnaire for students contains 26 questions. To conduct the questionnaire survey the researcher took prior permission from the Head teacher of the respective school. The mathematics teachers concerned were also contacted earlier. Mathematics teacher just introduced him with the students in the class as well as about the objective of his presence in the class. However, with a prepared check list and other materials for taking notes the researcher seat himself in the back of the class silently so that the students might not sense his presence there. After the class being over and in absence of mathematics

teacher, he distributed questionnaires among the students asking them to answer to the questions of the questionnaires. In case of failure of their understanding any question he made it clear even using Bangla.

Questionnaire for Teacher

Questionnaires for the mathematics teachers was also prepared and supplied to the mathematics teachers. The questionnaire has two parts to it. Part-one includes the name of the institution, name of their educational qualification, date and Part-two contains the questions. The researcher got the questionnaires back from each of the teachers on different times. However after getting back the questionnaires from the teacher's researcher has assessed it and put the results in the form of table and chart in this thesis paper.

Interview

During interview with the Head Teachers (HTs) researcher noted down the comments of the HTs. In most cases HTs were very busy. It is true that the Head teacher of a school is a responsible person. Despite their engagements he convinced them for interview. But they appeared to be lively and interested while he was talking to them. Interview taking was quite a difficult task as he had to pay repeated visits to the concerned institutions. It is true that the Head teacher of a school is a responsible person. To conduct the interview with the Head teachers the researcher prepared a separate question consisting 32 statements related to teaching and learning mathematics at secondary level teachers' performance, their qualification and training, result, syllabus curriculum, administrative factors etc. The questionnaire for interview of the Head teachers has parts. The part-one includes the name and address of the institution, name of the Head teacher, educational qualification and training, date and cell phone no. Part two consist of 15 statements asking for replies from the Head teachers.

Classroom Observation

To find out the realistic that happenings and activities in the classroom the researcher adopted non-controlled non-participant observation method. The researcher selected this method so that he could observe the teachers-students interaction, teachers' method of teaching, students' participation in the class and their interaction with the class teacher, using the important skills in teaching and learning mathematics. Before going to observe classroom activities the researcher prepared a checklist which have two parts-part one is for common information such as name of the institutes, name of the teacher, number of total students, number of present students, topic and class time. During classroom observation the researcher has observed and noted down physical facilities in the classroom such as table, bench, electricity, audio-video facilities, classroom size, cleanliness etc. However, to observe the classrooms of the study schools the researcher took prior permission from the head teachers of the schools. He was also confirmed about the mathematics classes and about the presence of the mathematics teachers earlier. Accordingly, on the appointed day and time the researcher went to the respective school and seated himself in the back bench silently so that the teachers and students might not sense his presence in the classroom and they might not be influenced by him.

3.7 Data Analysis Technique

After collecting data and information from the study area through questionnaire and interview these have been carefully reviewed, classified, tabulated, and analyzed. Collected data have been presented in tables. These tables have been prepared in order to show percentages. The data have been analyzed and presented in an orderly and systematic ways of some statistical techniques. Researcher was used very common but essential program of SPSS: 16.0 software and Microsoft office excel program.

3.8 Potential Ethical Issues/Considerations

The researcher went to collect data in the schools with request letter signed by supervisors. Before starting data collection procedure, the researcher took the oral and written permission of the headmasters. However the researcher assures that the names of the schools and identities of the person from whom data would be collected would not be disclosed. Researcher informed about the permission to the teachers whose class and interview he did observe. In the classroom, while observing researcher tried not to interrupt the classrooms activity anyway. In the beginning of each new class, researcher introduced himself and the purpose of observing. He also did this before interviewing the teachers. The researcher was always respectful while dealing with teachers and students in the schools. In the time of interviewing teachers, they were told the topic and purpose of the study and asked their assistance cordially. The interviews were asked that the data obtained from them would not be disclosed in any way. Those data were used for this specific researcher purpose only. The goal of this qualitative study is to investigate into the status and to find out the challenges of teaching and learning mathematics at secondary level in Bangladesh. To achieve this goal, different factors like teaching-learning practices, teachers and students' behavior, their motivation, classroom interactions, physical facilities, expectations of teachers and students, attitude of mathematics teachers towards have been studied. No doubt, the experiences of teachers and students and their classroom behavior represent the present state of mathematics teaching-learning at the secondary level of education in Bangladesh. Their beliefs and expectations reflect their psychological stand about teaching and learning mathematics. To collect data for ethical considerations the researcher took the following steps:

(i) Permission

Permission to conduct research in Rajshahi district has been sought from the Regional Director. (Letters requesting permission and their replies can be in Appendices (A and B respectively). Permission for learners to take part in the study was obtained from the school Head teachers, mathematics teachers and learners' parents. The aims and objectives of the study were explained verbally to the learners by the researcher prior to their participation.

(ii) Appointments

The researcher posted or distributed letters personally to the principals of each selected school, followed by visits and appointments to conduct interviews or submit questionnaires. Group meetings were held with the teachers and learners to explain the research project and the process. The researcher personally distributed the questionnaires to all schools with the help of the teachers.

(iii) Confidentiality

All respondents were assured of confidentiality by means of a written notice. Participants were given a pseudonym to protect their identities and to ensure confidentiality. At all times the learners were informed that they were free to withdraw from the study or not to answer any question if the so wished. Learners were assured of the confidentiality and anonymity of their answers and in particular, that the information they provided for the research would not be divulged to their school and teachers at any time. Care was taken to ensure total confidentiality.

(iv) Consent

Written informed consent was obtained voluntarily without duress and coercion or bribery from the mathematics teachers and students of class nine and ten of the participating schools. The aims, objectives, method and duration of the research were described to the participants.

(v) Data Anonymity

The researcher assured all participants that data collected would be destroyed after the data have been analyzed and the research report compiled and finalized. No person, except the researcher, supervisors and the data analyst, would be able to access the raw data. Even the transcript of the raw data contained no names, only the numbers of participants.

(vi) Post-research Relationships

The research report has been made available to the special collection section (Central library) of the University of Rajshahi in Bangladesh where researchers could have access to it.

3.9 Validity and Reliability of the Questionnaires

Validity is concerned with whether a test measures what it intends to measure. Both the construct and content validity of an instrument make it sure that the data collected through them are correct. Content validity asks if the test content aches the content of the study and construct validity examines if the test matches a theoretical construct. The following aspects have been considered to design the questionnaires in order to ensure the content validity of the questionnaires.

a. Objectives of the proposed study
b. Opinion of the writers regarding research methods
c. Suggestions of the experienced researcher and mathematics teacher, educators working at TTCs
d. Comments of the teachers and students received in pre testing of the questionnaires

Available books on research methods have been studied to learn different data collection methods, sampling procedure and their strengths and weakness. The study of the books on research methods helps to construct the questionnaires for surveys, interviews and the checklist for observations. Construct validity of the instrument has further been ensured through pre-

testing of the instrument. After the pre-testing of the questionnaires, valuable points have been added and questions that seemed to be un-useful have been excluded. Clear instructions have been provided to avoid ambiguity. Leading questions have consciously been avoided. Learned supervisor's and senior researcher's suggestions have sincerely been considered.

Reliability is concerned with the extent to which one can depend on the test results. It is said that there is always validity-reliability, tension and reliability offers a possible compromise. It is some time essential to sacrifice a degree of reliability to enhance validity. A valid and reliable test is useless if it is not practical in view of economy, administration and interpretation of results.

3.10 Reliability of the Rating Scale

To determine the reliability of the rating scale, the mean of the rating (M) and standard deviation (SD) of the test scores were calculated in respect of the entire sample as shown in the table.

Table 3.6 Summarized Data on Ratings of Teachers of Classroom Observation

Respondent category	Number of respondent	Number of item in the scale	Highest possible score (n)	Mean rating score (M)	Standard deviation of rating (SD)	Reliability coefficient ®
Mathematics Teacher	80	30	150	96.50	18.74	0.91

The reliability of the rating scale for the respondent was calculated by using the approximation formula of the method of rational equivalence as shown below.

$$R = \frac{ns^2 - M(n-M)}{(n-1)s^2}$$

Where n = 150, M = 96.50 and s(SD) = 18.74

= 0.9087

= 0.91

Chapter 4
Distribution and Association among the Variables

4.1 Introduction

The study mainly dealt with the challenges of teaching and learning mathematics subject faced by the teachers and students at secondary level of teaching and learning in Bangladesh. The researcher has collected data from selected schools in respect of exploring information on the challenges of teaching and learning mathematics at secondary level in Bangladesh. Data have been tabulated statistically and those data have proved that the necessity of doing research on this field cannot be denied. The analyzed data have been given below.

4.2 Results of Head Teachers' Interviews

Table 4.1 Results of Head Teacher Interviews

Characteristics	Urban area (n = 20)		Rural area (n = 20)		Urban area vs. Rural area		
	Yes (%)	No (%)	Yes(%)	No (%)	χ^2	DF	P-Value
Annual action plan	12 (60.0)	8(40.0)	7 (35.0)	13 (65.0)	5.502	1	**0.008**
School library	13 (65.0)	7(35.0)	9 (45.0)	11 (55.0)	4.102	1	**0.007**
Visit mathematics class	9 (45.0)	11(55.0)	4 (20.0)	16 (80.0)	4.201	1	**0.006**
Professional training of teacher	12 (60.0)	8(40.0)	6 (30.0)	14 (70.0)	5.201	1	**0.006**
Sufficient teaching aids	15 (75.0)	5(25.0)	7 (35.0)	13 (65.0)	6.201	1	**0.007**
Multimedia classroom	7(35.0)	13(65.0)	1 (5.0)	19 (95.0)	10.201	1	**0.001**
Practical class	12(60.0)	8(40.0)	4(20.0)	16 (80.0)	7.305	1	**0.004**
Present textbook is sufficient	11(55.0)	9(45.0)	5(25.0)	15 (75.0)	6.412	1	**0.007**
Arrange guardian meeting	6(30.0)	14(70.0)	2(10.0)	18 (90.0)	4.311	1	**0.007**
Students hostel	15(75.0)	5(25.0)	8(40.0)	12 (60.0)	4.264	1	**0.008**

The table represent that 60% urban school and 35% rural school have annual action plan. The calculated χ^2 value was found to be 5.502, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do your school have annual action plan is significant at the level of 10%. Here 65% urban school and 45% rural school have library for their

student. The calculated χ^2 value was found to be 4.102, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do your school have library is significant at the level of 10%. At this time 45% urban school and 20% rural school head teacher visit mathematics class in the time of teaching. Here the calculated χ^2 value was found to be 4.201, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do you visit mathematics class in the time of teaching is significant at the level of 10%. There 60% urban school and 30% rural school head teacher said that their mathematics teacher have different professional training. Here the calculated χ^2 value was found to be 5.201, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do your mathematics teachers have any professional training is significant at the level of 10%. Nearby 75% urban school and 35% rural school have sufficient teaching aids. Here the calculated χ^2 value was found to be 6.201, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do your schools' have sufficient teaching aids is significant at the level of 10%. At this point 35% urban school and 95% rural school have multimedia classroom. Here the calculated χ^2 value was found to be 10.201, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Then the difference between the school of urban and rural area of the statement do your school have multimedia classroom is significant at the level of 5%. Near 35% urban school and 95% rural schools' mathematics teachers take practical class. Now the calculated χ^2 value was found to be 7.305, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the

school of urban and rural area of the statement do your mathematics teachers take practical class is significant at the level of 5%. In attendance 55% urban school and 25% rural schools' head teacher think that the present textbook is sufficient for teaching mathematics. At this time the calculated χ^2 value was found to be 6.412, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do you think the present textbook is sufficient for teaching is significant at the level of 10%. At this point 30% urban school and 10% rural schools' head teacher arrange guardian meeting in their school every year. Now the calculated χ^2 value was found to be 4.311, which is greater than the table value with DF 1. Then the null hypothesis is rejected. As a result the difference between the school of urban and rural area of the statement do you arrange guardian meeting in your school every year is significant at the level of 10%. Here 75% urban school and 40% rural schools' have students hostel. At this time the calculated χ^2 value was found to be 4.264, which is greater than the table value with DF 1. Then the null hypothesis is rejected. For that reason the difference between the school of urban and rural area of the statement Do your school have students hostel is significant at the level of 10%.

4.3 Results of Teachers' Interviews

4.3.1 Introduction

The purpose of interviewing teachers of secondary schools of four upazilas of Rajshahi district was to find out the answers to the questions related to the objectives stated in section 1.4. This section has dealt with all the information received through the interviews of teachers. First of all it dealt with the academic qualification and training of teachers and then their views on different questions related to the objectives.

4.3.2 Academic Qualification and Training of Teachers

In the interviews, the aim of the researcher's was to collect all sorts of professional information from teachers. The main purpose was to see whether their academic qualification and training are helping them to teaching mathematics at secondary level. From the following tables one can gate a clear picture of their educational qualification and training of mathematics teachers at secondary level in Bangladesh.

4.3.2.1 Educational Qualification

Educational qualification of the respondents has been shown in the following table

Table 4.2 Educational Qualifications of the Mathematics Teachers

Educational qualification of the mathematics teachers	Urban area (n = 40)		Rural area (n = 40)		Urban area vs. Rural area		
	Yes (%)	No (%)	Yes (%)	No (%)	χ^2	DF	**P-Value**
BSc (with mathematics)	40 (100)	0 (0.0)	30 (75.0)	10 (25.0)	11.429	1	**0.004**
MSc	18 (45.0)	22 (55.0)	8 (20.0)	32 (80.0)	29.463	1	**0.000**

The table shows that the educational status of the mathematics teachers is unusual. It was found that some teachers having no basic knowledge on mathematics are teaching mathematics in some of the schools under the study. It should be noted that the teachers who have M. Sc degrees in mathematics are mostly the teachers of urban area. The table indicates that 100% teacher of urban area, 75.0% teacher of rural area having B. Sc degree with mathematics and 45.0% teacher of urban area, 20.0% teacher of rural area having MSc degree with mathematics The differences of educational qualification between urban and rural areas of mathematics teachers are significant at the level of 5% and highly significant.

4.3.2.2 Professional Training

Teachers must have professional training. But it was found that some schools do not have trained teacher. B. Ed training at Teachers Training Colleges really trains teachers to make them familiar with the pedagogy and also the techniques of teaching; however the

training is exam-oriented and provides an opportunity to receive an increase in their salary. That is why teachers receive the training to have an increase in their salary.

Table 4.3 Professional Training of the Teacher

Professional training of the mathematics teacher	Urban area (n = 40)		Rural area (n = 40)		Urban area vs. Rural area		
	Yes (%)	No (%)	Yes (%)	No (%)	χ^2	DF	**P-Value**
B. Ed	29(72.5)	11(27.5)	19(47.5)	21(52.5)	5.208	1	**0.003**
T.Q.I	35(87.5)	5(12.5)	9(22.5)	31(77.5)	34.141	1	**0.000**
Other	31(77.5)	9(22.5)	29(72.5)	11(27.5)	.267	1	**0.230**

The table shows that 72.5% teachers of urban area and 47.5% teachers of rural area have B. Ed, 87.5% teachers of urban area and 22.5% teachers of rural area having T. Q. I. training under the study. So, there is a shortage of trained teachers under the study. 27.5% teachers of urban area and 52.5% teachers of rural area do not have this B. Ed training. Other trainings reach in very few teachers. Therefore the difference between the school of urban and rural area of the statement Professional training of the mathematics teacher is significant at the level of 5%, highly significant and insignificant.

4.3.3 Teaching Aids

Teaching aids are very essential for the students of class nine and class ten especially in mathematics class. The study found that almost of all government schools are facilitated with teaching aids but teachers are not using it in the class room though using teaching aids is pertinent to teaching. There are some materials without which proper teaching and learning in the classroom cannot happen. These materials include textbooks, teacher guides, boards (black or white), chalk or board markers, campus, scale, calculator, geometry box and so on. All these things together are called teaching materials. Besides, some other things that accelerate teaching and learning are called teaching aids. However, all teaching aids are teaching materials but all teaching materials are not teaching aids. In

order to ensure a proper teaching methods and techniques, teacher guides should be used regularly by teachers in their schools as an aid to lesson preparation. Listening texts are there in the teacher guides. But the researcher has found many teachers not used teachers guide or any other teaching resources to make the teaching and learning successful. Cent percent (100%) of the mathematics teacher have agreed that teaching aids can accelerate learning but they cannot use or prepare teaching aids due to excessive workload. For fruitful mathematics classes, teachers must use relevant teaching aids. The classroom teachers never feel the necessity of preparing or collecting teaching aids them. As they do not use teaching aids, they very often have to fall back into traditional method.

Table 4.4 Results of Teacher Interviews

Characteristic	**Urban area (n = 40)**					**Rural area (n = 40)**					**Urban area vs. Rural area**		
	A %	O %	S %	R %	N %	A %	O %	S %	R %	N %	χ^2	DF	**P-Value**
Follow the lesson plan	7 17.5	11 27.5	17 42.5	2 5.0	3 7.5	0 0.0	15 37.5	8 20.0	6 15.0	11 27.5	45.626	12	0.000
Uses of teaching aids	8 20.0	10 25.0	9 22.5	12 30.0	1 2.5	6 15.o	10 25.o	15 37.5	6 15.0	3 3.5	76.778	16	0.000
Take tutorial examination	5 12.5	16 40.0	12 30.0	4 10.0	3 7.5	3 7.5	5 12.5	10 25.0	17 42.5	5 12.5	87.263	16	0.000

***** A= Always, O = Often, S = Sometimes, R = Rarely, N = Never.

Table shows that 17.5% teacher always, 27.5% teacher often, 42.5% teacher sometime, 5.0% teacher rarely, 7.5% teacher never followed the lesson plan at the time of teaching of the urban area and 0.0% teacher always, 37.5% teacher often, 20.0% teacher sometime, 15.0% teacher rarely, 27.5% teacher never followed the lesson plane at the time of teaching of the rural area. This result is not good enough for teaching mathematics. Here the calculated χ^2 value was found to be 45.626, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do you follow the lesson plane given in the teacher guide is highly significant. 20.0% teacher always, 25.0% teacher often, 22.5% teacher sometime, 30% teacher rarely, 2.5% teacher never uses of teaching aids at the time of

teaching of the urban area and 15.0% teacher always, 25.0% teacher often, 37.5% teacher sometime, 15% teacher rarely, 3.5% teacher never uses of teaching aids at the time of teaching of the rural area. This result is not good enough for teaching mathematics. There have a highly significant different uses of teaching aids between the urban and rural schools. 12.5% teacher always, 40.0% teacher often, 30.0% teacher sometime, 10.0% teacher rarely and 7.5% teacher never of urban area take tutorial examination. On the contrary 7.5% teacher always, 12.5% teacher often, 25.0% teacher sometime, 42.5% teacher rarely and 12.5% teacher never of rural area take tutorial examination. There have a highly significant different of taking tutorial examination between urban and rural schools under the study.

4.3.4 Teaching-Learning Approach in the Mathematics Classroom

4.3.4.1 Good Mathematics Teacher

A teacher is more like a gardener who tends each plant, examines water and sees that the plant may take its own nourishment. The teacher should be a guide, helper and a friend. The teacher must study the child, must know the effect of environment of the child and should know the laws of learning which a study of psychology is necessary.

4.3.4.2 Attributes of Mathematics Teacher

The following attributes must be needed for a mathematics teacher

- Good subjective based knowledge
- Knowledge and skill about modern teaching method of teaching mathematics.
- Good teaching capacity/ technique
- Psychological knowledge
- Awareness about learning outcome
- Good understanding of students and their environment

4.3.4.3 Use of Different Method for Effective Teaching Mathematics

To teach successfully, one must plan successfully. Successful planning means knowing how to facilitate a positive learning experience for all students. The teacher uses his/her best professional judgment to decide which method; strategy and techniques will work best for a particular situation (Dhand, 2005). Different methods of teaching mathematics have been proposed by different educators and the knowledge of these methods may help in working out a better teaching strategy. It is not appropriate for a teacher to commit to one particular method. A teacher should adopt a teaching approach after considering the nature of the children, their interests and maturity and the resources available. Every method has certain merits and few demerits and it is the work of a teacher to decide which method is best for the students. Some of the methods of teaching Mathematics are as follows:

- Lecture Method
- Analytical Method
- Synthetic Method
- Inductive Method
- Deductive Method
- Heuristic Method (Discovery/Inquiry Method)
- Brain Storming Method
- Problem Solving Method

Lecture Method

The lecture method is the most widely used form of presentation. Every teacher has to know how to develop and present a lecture. They also must understand the scopes and limitations of this method.

- Lectures are used to introduce new topics, summarizing ideas, showing relationships between theory and practice, reemphasizing main points, etc.

- This method is adaptable to many different settings (small or large groups).
- It may be used to introduce a unit or a complete course.
- Finally, lectures can be effectively combined with other teaching methods to give added meaning and direction.

The teaching lecture is favored by most teachers because it allows some active participation by the students. The success of the teaching lecture depends upon the teacher's ability to communicate effectively with the class. However in this method the feedback is not very obvious and thus the teacher must develop a keen perception for subtle responses from the class-facial expressions, manner of taking notes, and apparent interest or disinterest in the lesson. The successful teacher will be able to interpret the meaning of these reactions and adjust the lesson accordingly.

Preparing the Teaching Lecture

Planning:

The following four steps are followed in the planning phase of preparation:

- Establishing the objective and desired outcomes;
- Researching the subject;
- Organizing the material; and
- Planning productive classroom activities

In all stages of preparing for the teaching lecture, the teacher should support any point to be covered with meaningful examples, comparisons, statistics, or testimony. While developing the lesson, the teacher also should strongly consider the use of examples and personal experiences related to the subject of the lesson.

Rehearsing:

After completing the preliminary planning and writing of the lesson plan, the teacher should rehearse the lecture to build self-confidence. It helps to smooth out the use notes, visual aids, and other instructional devices.

Delivering a Lecture:

Suitable Language: In the teaching lecture, simple rather than complex words should be used whenever possible. The teacher should not use substandard English. If the subject matter includes technical terms, the teacher should clearly define each one so that no student is in doubt about its meaning. Whenever possible, the teacher should use specific rather than general words.

Tone and Pace: Another way the teacher can add life to the lecture is to vary his or her tone of voice and pace of speaking. In addition, using sentences of different length also helps. To ensure clarity and variety, the teacher should normally use sentences of short and medium length.

Use of Notes: For a teacher notes are a must because they help keep the lecture on track. The teacher should use them modestly and should make no effort to hide them from the students. Notes may be written legibly or typed, and they should be placed where they can be consulted easily.

Analytical Method

The word “Analytic” is derived from the word “analysis” which means “breaking up” or resolving a thing into its constituent elements. The original meaning of the word analysis is to unloose or to separate things that are together. In this method we break up the unknown problem into simpler parts and then see how these can be recombined to find the solution. So we start with what is to be found out and then think of further steps or

possibilities the may connect the unknown built the known and find out the desired result.

It is believed that all the highest intellectual performance of the mind is Analysis.

- It is derived from the word analysis, its means breaking up.
- It leads to conclusion to hypothesis
- It leads to unknown to known
- It leads to abstract to concrete

Example:

If $a^2+b^2=7ab$ prove that 2log (a+b) = 2log3+loga+logb

Proof:

To prove this using analytic method, begin from the unknown.

The unknown is 2log (a+b) = 2log3+loga+logb

Now, 2log (a+b) = 2log 3+ log a+ log b is true

If $\log (a+b)^2 = \log 3^2 + \log a + \log b$ is true

If $\log (a+b)^2 = \log 9 + \log ab$ is true

If $\log (a+b)^2 = \log 9ab$ is true

If $(a+b)^2 = 9ab$ is true

If $a^2+b^2=7ab$ which is known and true

Thus if $a^2+b^2= 7ab$ prove that 2log (a+b) = 2log3+loga+logb

This method is particularly suitable for teaching of Arithmetic, Algebra and Geometry as it analyses the problem into sub-parts and various parts are reorganized and the already learnt facts are used to connect the known with unknown. It puts more stress on reasoning and development of power of reasoning is one of the major aims of teaching of mathematics.

Synthetic Method

In this method we proceed from known to unknown. Synthetic is derived from the word "synthesis". Synthesis is the complement of analysis.

To synthesis is to combine the elements to produce something new. Actually it is reverse of analytic method. In this method we proceed "from know to unknown." So in it we combine together a number of facts, perform certain mathematical operations and arrive at a solution. That is we start with the known data and connect it with the unknown part.

- It leads to hypothesis to conclusion
- It leads to known to unknown
- It leads to concrete to abstract

Example:

If $a^2+b^2=7ab$ prove that $2\log (a+b) = 2\log 3+\log a+\log b$

Proof:

To prove this using synthetic method, begin from the known.

The known is $a^2+b^2= 7ab$

Adding 2ab on both sides

$a^2+b^2+2ab=7ab + 2ab$

$(a+b)^2 = 9ab$

Taking log on both sides

$\log (a+b)^2 = \log 9ab$

$2\log (a+b) = \log 9 + \log ab$

$2 \log (a+b) = \log 3^2 + \log a + \log b$

$2\log (a+b) = 2\log 3+ \log a+ \log b$

Thus if $a^2+b^2=11ab$ prove that $2\log (a-b) = 2\log 3+\log a+\log b$

Inductive Method

Induction is that form of reasoning in which a general law is derived from a study of particular objects or specific processes. Students use measurements, manipulators or constructive activities and patterns etc to discover a relationship. They later formulate a law or rule about that relationship based on their observations, experiences, inferences and conclusions.

Example 1: Ask pupils to draw a number of triangles. Ask them to measure the three angles of each triangle and find their sum. They will find that the sum of the three angles of all triangles is 180^0

Example 2: Ask pupils to find the sum of two odd numbers like 3+5=8, 5+7=12,9+11=20, etc. They will find that the sum of two odd numbers is an even number.

Steps in the Inductive Method:

1) The first step is clear recognition of the problem. It should be clearly understood and defined by the pupils.

2) Once the problem has been defined, the child should start searching for data from all possible sources like books, magazines, journals, making visits to certain places etc.

3) Under the guidance of the teacher, the pupils organize the data which they have collected from various sources. They select relevant data and discard irrelevant material.

4) By studying particular instances, the pupils frame possible solutions.

5) These solutions are discussed, argued and judged. Thus tentative solutions are eliminated and only the probable solutions remain.

6) The solutions are applied to the situation and results are verified.

Deductive Method

Deductive method is based on deduction. In this approach we proceed from general to particular and from abstract and concrete. At first the rules are given and then students are asked to apply these rules to solve more problems. This approach is mainly used in Algebra, Geometry and Trigonometry because different relations, laws and formulae are used in these sub branches of mathematics. In this approach, help is taken from assumptions, postulates and axioms of mathematics. It is used for teaching mathematics in higher classes.

Deductive approach proceeds form

- General rule to specific instances
- Unknown to know
- Abstract rule to concrete instance
- Complex to simple

Steps in Deductive Approach

Deductive approach of teaching follows the steps given below for effective teaching

- Clear recognition of the problem
- Search for a tentative hypothesis
- Formulating of a tentative hypothesis
- Verification

Example 1:

Find a^2 X a^{10} =?

Solution:

General: a^m X a^n = a^{m+n}

Particular: a^2 X a^{10} = a^{2+10} = a^{12}

Example 2:

Find $(102)^2$ =?

Solution:

General: $(a+b)^2 = a^2+b^2+2ab$

Particular: $(100+2)^2 = 100^2 + 2^2 + (2 \times 100 \times 2)$

$= 10000+4+400= 10404$

Deductive approach is suitable for giving practice to the student in applying the formula or principles or generalization which has been already arrived at. This method is very useful for fixation and retention of facts and rules as at provides adequate drill and practice.

Heuristic Method

The word 'Heuristic' has been derived from the Greek word 'Heurisco' which means 'I find' or 'I discover'. This method implies that the attitude of students shall be that of the discoveries and not of passive recipients of knowledge. Armstrong originally introduced this method for learning of science. This method emphasis experimentation as the teacher be comes on looker and the child tries to move a head independently without any help. This method makes the student self-reliant and independent. But the teacher should develop the heuristic attitude by making a lot of preparation. The question should be so planned that it may be possible for the students to find the solution independently by proceeding in the proper direction.

Example 1:

The population of a city is 50,000. The rate of growth in population is 4% p.a. what will be the population after 2 years

Teacher : what we have to find out in the given question

Student : population after two years.

Teacher : how can we find it?

Student : first we find the population after 1 year.

Teacher : what is the growth of every year?

Student : rate of growth is 4% p.a.

Teacher : what will be the population in the end of first year?

Student : population after 1 year = 50000 + 50000x 4/100

= 50000 + 2000 = 52000

Teacher : what will be the base population for second year?

Student : the base population of second year is 52000.

Teacher : how can we find the growth?

Student : the growth of second year = 52000 x 4 /100 = 2080

Teacher : what will population after two years?

Student : population after two years = 52000 + 2080 = 54080

Example 2:

Prove that $a^0 = 1$

Teacher : what is 10/5?

Student : 2

Teacher : what is 5/5?

Student : 1

Teacher : what is 7/7?

Student : 1

Teacher : what is a/a?

Student : 1

Teacher : what is a^m/a^m?

Student : 1. **Equation I**

Teacher : how do you get the result?

Student : if we divide a number by itself, we will get 1.

Teacher : how can you write a^m X $1/a^m$?

Student : $a^{m-m} = a^0$ **Equation II**

Teacher : what do you infer?

Student : $a^0 = 1$

Table 4.5 Use of Different Method under the Study Area

Teaching Method / Location	Lecture Method %	Analytical Method %	Synthetic Method %	Inductive Method %	Deductive Method %	Heuristic Method %	Brain storming Method %	Problem solving method %
Urban Area	15 37.5	17 42.5	21 52.5	18 45.0	20 50.0	14 35.0	15 37.5	13 32.5
Rural Area	14 35.0	16 40.0	20 50.0	17 42.5	19 47.5	13 32.5	14 35.0	12 30.0

The table represents that 37.5% teacher of urban area and 35.0% teacher of rural area use lecture method, 42.5% teacher of urban area and 40.0% teacher of rural area use analytical method, 52.5% teacher of urban area and 50.0% teacher of rural area use synthetic method, 45.0% teacher of urban area and 42.5% teacher of rural area use inductive method, 50.0% teacher of urban area and 47.5% teacher of rural area use deductive method, 35.0% teacher of urban area and 32.5% teacher of rural area use heuristic method, 37.5% teacher of urban area and 35.0% teacher of rural area use brain storming method, 32.5% teacher of urban area and 30.0% teacher of rural area use problem solving method in the mathematics classroom.

Table 4.6 Result from Mathematics Teacher of Some Characteristic

Characteristics	Urban area (n = 20)		Rural area (n = 20)		Urban area vs. Rural area		
	Yes (%)	No (%)	Yes (%)	No (%)	χ^2	DF	P-Value
Necessity of Lesson Plan	34(85.0)	6(15.0)	25(62.5)	15 (37.5)	11.765	1	**0.001**
Make any lesson	22(55.o)	18(45.0)	10(25.0)	30(75.0)	10.909	1	**0.001**
Creative is necessary	31(77.5)	9(22.5)	13(32.5)	27(67.5)	11.709	1	**0.001**
Sufficient teaching aids	35(87.5)	5(12.5)	11(27.5)	29(72.5)	2.167	1	**0.235**
present text book is sufficient	18(45.0)	22(55.0)	11(27.5)	29(72.5)	18.544	1	**0.000**
Feel difficulty using/ teaching this book	16(40.0)	24(60.0)	31(77.5)	9(22.5)	7.742	1	**0.005**
Attend school in schedule time	25(62.5)	15(37.5)	12(30.0)	28(70.0)	9.899	1	**0.000**
Leave school in schedule time	17(42.5)	23(57.5)	8 (20.0)	32 (80.0)	4.713	1	**0.002**
Complete mathematics course in time	18 45.0)	22(55.0)	13(32.5)	27 (67.5)	2.650	1	**0.217**
Take mathematics practical class	21(52.5)	19(47.5)	10(25.0)	30 (75.0)	13.333	1	**0.000**
Take any extra class for weaker students	17(42.5)	23(57.5)	6 (15.0)	34 (85.0)	9.550	1	**0.002**
Feel trouble taking mathematics class	19(47.5)	21(42.5)	30(75.0)	10 (25.0)	12.063	1	**0.000**
Involve in private	29(72.5)	11(27.5)	12(30.0)	28(70.0)	6.502	1	**0.002**
Mathematics syllabus is appropriate	27 (65.5)	13(32.0)	12(30.00)	28 (70.0)	6.502	1	**0.001**

Table shows that 85.0% teacher of urban area and 62.5% teacher of rural area think that lesson plan is necessary for teaching mathematics in classroom but 15.0% teacher of urban area and 37.5% teacher of rural area think that lesson plane is not necessary for teaching mathematics in classroom. Here the calculated χ^2 value was found to be 11.765, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement Do you think lesson plane is necessary for teaching mathematics in is significant at the level 5%. 55.0% teacher of urban area and 25.0% teacher of rural area make lesson plan for their class but 45.0% teacher of urban area and 75.0% teacher of rural area do not make any lesson plane for their class for teaching mathematics in the classroom. Here the calculated χ^2 value was found to be 10.909, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of

urban and rural area of the statement do you make any lesson plane for your class is significant at the level of 5%. 77.5% teacher of urban area and 32.5% teacher of rural area think that creative is necessary for mathematics class but 22.5% teacher of urban area and 67.5% teacher of rural area think that creative is necessary for mathematics class for teaching mathematics in the classroom. Here the calculated χ^2 value was found to be 11.709, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do you think that creative is necessary for mathematics class is significant at the level of 5%. 87.5 % teacher of urban area and 27.5 teacher of rural area have sufficient teaching aids facilities. On the other hand 12.5% teacher of urban area and 72.5% teacher of rural area have not the facilities of sufficient teaching aids of the study area. There have no significant different of sufficient teaching aids between urban and rural area under the study area. 45.0% teacher of urban area and 27.5% teacher of rural area think that the present textbook is sufficient for teaching mathematics but 55.0% teacher of urban area and 72.5% teacher of rural area think that the present textbook is not sufficient for teaching mathematics. There have a highly significant different of the statement present text book is sufficient for teaching mathematics. It is found that 40% teacher of urban area and 77.5% teacher of rural area face various types of difficulties; on the other hand 60% teachers of urban area and 22.5% teachers of rural area do not face any difficulties in using the present textbook under the study area. Here the calculated χ^2 value was found to be 7.742, which is greater than the table value with DF 1. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement do you feel any difficulty using/ teaching this book is significant at the level of 5%. The table confirms that 62.5% teacher of urban area and 30.0% teacher of rural area reach school in time but 15% teacher of urban area and 70.0% teacher of

rural area did not reach school in time. The study found that a significant number of the teachers were irregular. The teacher of both urban and rural schools came to school late and left the school early. It was found more in the rural schools in the study area. Teacher both of urban and rural schools were not following the time schedule properly. There have a highly significant different of arrival times of the teachers of urban and rural area. 42.5% teachers of urban area and 20.0% teachers of rural area left school in schedule time of the school under the study. Conversely 57.0% teacher of urban area and 80.0% teacher of rural area left school before schedule time of the school under the study. So, it may imagine that teachers are not sincere about the class schedule time or do not eager to follow the daily routine of the school. This tendency affects the total academic achievement of the school. For ensuring better performance, timely arrival and departure of the teacher needed to be enforced in all secondary school in Bangladesh. There have a significant different of departure times of the teachers among urban and rural schools under the study at the level of 5%. 45.0% teachers of urban area and 32.5% teachers of rural area can complete their mathematics courses in time alternatively 55.0% teachers of urban area and 67.5% teachers of rural area are not able to complete their mathematics courses in time. So, a significant number of students remain unskilled in mathematics subjects under the study. There have no significant different of course completing strategy of the teacher between urban and rural school. 52.50% teachers of urban area and 25.0% teachers of rural area take practical class on mathematics subjects under the study in contrast 47.5% teachers of urban area and 75.0% teachers of rural area do not take practical class on mathematics subjects under the study. There have a highly significant different of taking mathematics practical class between urban and rural area under the study. 42.5% teacher of urban area and 15.0% teacher of rural area have taking extra class for the weaker student but rest of the 57.5% urban teacher and 85.0% rural teacher did

have taking extra class for the weaker students under the study. There have a significant different of taking extra classes for the weaker students of urban and rural area at the level 5%. 47.5% teacher of urban area and 75.0% teacher of rural area felt trouble in taking mathematics classes conversely 42.5% teacher of urban area and 25.0% teacher of rural area did not felt any trouble in the time of taking mathematics classes. There have a highly significant different of felt trouble in taking mathematics classes between urban and rural area. 72.5% teacher of urban area and 30.0% teacher of rural area are involved in private teaching in opposition 27.5% teacher of urban area and 70.0% teacher of rural area are not involved in private teaching. There have a significant different of involve in private teaching of urban and rural area at the level of 5%. 65.5% teacher of urban area and 30.0% teacher of rural area think that mathematics syllabus is appropriate for class nine-ten on the contrary 32.5% teacher of urban area and 70.0% teacher of rural area think that mathematics syllabus is not appropriate for class nine-ten under the study area. They told that some hard chapters of intermediate level have been included unwisely in class nine-ten. There have a significant different of the statement ‘Do you think that mathematics syllabus is appropriate for class nine-ten’ between urban and rural schools under the study at the level of 5%.

4.3.5 Job Satisfaction

Measuring satisfaction is bit difficult yet the researcher has tried to understand the satisfaction level of the teachers in respect of teaching environment and life style by the salary they get. Teachers were asked the question on the base of answers, ‘Strongly satisfied, Satisfied, Undecided, Dissatisfied, Strongly dissatisfied’. The table below shows the job satisfaction of the teachers under the study.

Table 4.7 Job Satisfaction of the Teacher

Do you satisfy of your job	Urban area (n = 40)					Rural area (n= 40)					Urban area vs. Rural area		
	SS %	S %	U %	D %	SD %	SS %	S %	U %	D %	SD %	χ^2	DF	**P-Value**
	5 12.5	24 60.0	6 15.0	5 12.5	0 0.0	2 5.0	11 27.5	5 12.5	16 40.0	6 15.0	65.680	12	0.000

***** SS= Strongly Satisfied, S= Satisfied, U= Undecided D= Dissatisfied, SD= Strongly Dissatisfied

The table shows that 12.5% teacher Strongly Satisfied, 60.0% teacher Satisfied, 15.0% teacher Undecided, 12.5% teacher Dissatisfied and 0.0% teacher Strongly Dissatisfied of their job in the schools of urban area in contrast 5.0% teacher Strongly Satisfied, 27.5% teacher Satisfied, 12.5% teacher Undecided, 40.0% teacher Dissatisfied and 15.0% teacher Strongly Dissatisfied of their job in the rural area under the study. All parameters of the satisfaction level were found more satisfactory of urban area compared to the rate of rural area under the study. So, it may stipulated to develop the terms and condition of rural secondary educational institutions. There have a highly significant different of job satisfaction in urban and rural schools.

4.4 Results on Students' Interviews

4.4.1 Introduction

The purpose of interviewing students of secondary schools of four upazilas of Rajshahi district was to find out the answers to the questions related to the objectives stated in section 1.4. This section has dealt with all the information received through the interviews of students. It dealt with their views on different questions related to the objectives.

4.4.2 Students' Feeling about the Textbooks

Table 4.8 Feeling of Reading Mathematics

What do you feel reading	Urban area (n = 40)					Rural area (n= 40)					Urban area vs. Rural area		
	Excellent %	Very good %	Good %	Bad %	Very bad %	Excellent %	Very good %	Good %	Bad %	Very bad %	χ^2	DF	**P-Value**
	19 9.5	53 26.5	66 33.0	40 20.0	22 11.0	5 2.5	66 33.0	45 22.5	76 38.0	8 4.0	364.164	16	**0.000**

Table correspond to that 9.5% students excellent, 26.5% students very good, 33.0% student's bad and 22.0% students very bad feel in reading present mathematics book of urban area in class nine and ten under the study area. In opposition 2.5% students excellent, 33% students very good, 22.5% student's good 38.0% students bad and 4.0% students very bad feel in reading present mathematics book of rural area in class nine and ten under the study area. There have a highly significant different of the statement 'What do you feel reading mathematics' between urban and rural area under the study.

Table 4.9 Students Interviews Results for Some Characteristic

Characteristics	Urban area (n = 40)					Rural area (n= 40)					Urban area vs. Rural area		
	A %	O %	S %	R %	N %	A %	O %	S %	R %	N %	χ^2	DF	**P-Value**
Teacher take practical class	20 10.0	63 31.5	59 29.0	34 17.0	24 12.0	11 5.5	41 20.5	72 36.0	46 23.0	30 15.0	425.627	16	0.000
Teacher give Proper understanding	37 18.5	70 35.0	43 21.5	30 15.0	20 10.0	18 9.0	63 31.5	71 35.5	25 12.5	23 11.5	507.966	16	0.000
Teacher give extra class	25 12.5	70 35.0	46 23.0	30 15.0	29 14.5	11 5.5	54 27.0	50 25.0	46 23.0	39 19.5	360.880	16	0.000
Teacher threat students	17 8.7	44 22.0	25 12.5	66 33.0	48 24.0	29 14.5	81 40.5	42 21.0	24 12.0	24 12.5	407.825	16	0.000
teacher abhor students	33 16.5	70 35.0	45 22.5	41 20.5	11 5.5	45 22.5	68 34.0	37 18.5	45 22.5	5 2.5	497.067	16	0.000
Negligence of mathematics teacher in taking class	44 22.0	38 19.0	75 37.5	19 9.5	24 12.0	94 47.0	50 25.0	30 15.0	11 5.5	15 7.5	429.029	16	0.000
Teacher give punishment of students	18 9.0	64 32.0	53 26.5	37 18.5	28 14.0	28 14.0	75 37.5	69 34.5	18 9.0	10 5.0	446.669	16	0.000
Uses chalk board	106 53.0	50 25.0	35 17.5	9 4.5	0 0.0	12 6.0	145 72.5	31 15.5	12 6.0	0 0.0	338.052	9	0.000
Teacher teach after classifying groups	42 21.0	43 21.5	93 46.5	17 8.5	5 2.5	41 20.5	54 27.0	28 14.0	48 24.0	29 14.5	477.367	16	0.000

*****A = Always, O = Often, S = Sometimes, R = Rarely, N = Never

Table shows that 10.0% students always 31.5% students' often 29.0% students sometimes 17.0% students rarely and 12.0% students never gave mathematics practical class from their teacher of the schools of urban area. On the other hand 5.5% students always 20.5% students often 36.0% students sometimes 23.o% students rarely and 15.0% students never gave mathematics practical class from their teacher of the schools of rural area. There

have a highly significant different of taking mathematics practical class between urban and rural schools. 18.5% students always 35.5% students' often 21.5% students sometimes 15.0% students rarely and 10.0% students never give proper understanding the selected topics on mathematics teacher of the schools of urban area. On the other hand 9.0% students always 31.5% students often 35.5% students sometimes 12.5% students rarely and 11.5% students never give proper understanding the selected topics of mathematics teacher of the schools of rural area under the study area. There have a highly significant different of giving proper understanding the selected topics of mathematics teacher between urban and rural schools. 12.5% students always 35.0% students' often 23.0% students sometimes 15.0% students rarely and 14.5% students never gave extra mathematics class from their teacher of the schools of urban area. On the other hand 5.5% students always 27.0% students often 25.0% students sometimes 23.o% students rarely and 19.5% students never gave extra mathematics class from their teacher of the schools of rural area. There have a highly significant different of taking extra mathematics class between urban and rural schools under the study. 8.7% students always, 22.0% students often, 12.5% students sometimes, 33.0% students rarely and 24.0% students never threat in their mathematics teacher in any problem solving situation of urban area. On the contrary 14.5% students always, 40.5% students often, 21.0% students sometimes, 12.0% students rarely and 12.0% students never threat in their mathematics teacher in any problem solving situation of rural area. There have a highly significant different of threat of students in urban and rural areas schools under the study. 16.5% students always, 35.0% students often, 22.5% students sometimes, 20.0% students rarely and 5.5% students never abhorred by their class teacher of urban area. On the other hand 22.5% students always, 34.0% students often, 18.5% students sometimes, 42.5% students rarely and 2.5% students never abhorred by their class teacher of rural area under the study.

There have a highly significant different of teacher abhorred of urban and rural area. 22.0% students always, 19.0% students often, 37.5% students sometimes, 9.5% students rarely and 12.0% students never neglected by their teacher of the schools of urban area. On the other hand 47.0% students always, 25.0% students often, 15.0% students sometimes, 5.5% students rarely and 7.5% students never neglected by their teacher of the schools of rural area. There have a highly significant different of negligence of teacher both urban and rural area under the study. 9.0% students always, 32.0% students often, 26.5% students sometimes, 18.5% students rarely and 14.0% students never punished by their teacher of the schools of urban area. On the other hand 14.0% students always, 37.5% students often, 34.5% students sometimes, 9.0% students rarely and 5.0% students never punished by their teacher of the schools of rural area. There have a highly significant different of given punished of students by their teacher both urban and rural area under the study. 53.0% students always, 25.0% students often, 17.5% students sometimes, 4.5% students rarely and 0.0% students never point out that their mathematics teacher uses chalk board of the schools of urban area. On the other hand 6.0% students always, 72.5% students often, 15.5% students sometimes, 6.0% students rarely and 0.0% students never point out that their mathematics teacher uses blackboard of the schools of rural area. There have a highly significant different of uses chalk board both urban and rural area under the study. 21.0% students always, 21.5% students often, 46.5% students sometimes, 8.5% students rarely and 2.5% students never classified by their teacher in urban schools but 20.5% students always, 27.0% students often, 14.0% students sometimes, 24.0% students rarely and 14.5% students never classified by their mathematics teacher in rural area. There have a highly significant different of making classifying group before starting class of the students of urban area under the study.

Table 4.10 Results of Students Interviews

Characteristics	Urban area (n = 40)		Rural area (n= 40)		Urban area vs. Rural area		
	Yes (%)	No (%)	Yes (%)	No (%)	χ^2	DF	**P-Value**
Teacher use any teaching aid in class	101(5o.5)	99(49.5)	58(29.0)	142(71.0)	80.073	1	0.000
Teacher complete course in time	110(55.0)	90(45.0)	50(25.0)	150(75.0)	54.545	1	0.000
Students have private tutor	120(60.0)	80(40.0)	46(23.0)	154(77.0)	39.827	1	0.000

Table represent that 50.5% students of class nine-ten in urban area and 29.0% students of class nine-ten in rural area mention that their teacher's uses teaching aids in their classroom. Then again, 49.5% students of urban schools and 71.0% students of rural schools of class nine and ten indicate that their teacher not use teaching aids in the class. There have a highly significant different of using teaching aids in urban and rural schools in the study area. 55.0% students of urban area and 25.0% students of rural area point out that their mathematics teacher completes their course in time. On the contrary 45.0% students of urban area and 75.0% students of rural area point out that their mathematics teacher cannot complete their course in time. There have a highly significant different of curse completing strategy between urban and rural area under the study area. 60.0% students of urban area and 23.0% students of rural area have privet tutor but 40.0% students of urban area and 77.0% students of rural area have not privet tutor. There have a highly significant different between urban and rural areas schools in the study area.

Table 4.11 Results in the Last Mathematics Examination and Satisfied Getting Mathematics Teacher

Characteristics	Urban area (n = 40)					Rural area (n= 40)					Urban area vs. Rural area		
	SS %	S %	U %	D %	SD %	SS %	S %	U %	D %	SD %	χ^2	DF	**P-Value**
Results in the last mathematics examination	33 16.5	69 34.5	61 30.5	26 13.0	11 5.5	19 9.5	34 17.0	53 26.5	66 33.0	28 14.0	410.744	16	0.000
Satisfied getting mathematics teacher	30 15.0	97 48.5	54 27.5	19 9.5	0 0.0	18 9.0	44 22.0	48 24.0	60 30.0	30 15.0	354.444	12	0.000

* SS= Strongly Satisfactory, S= Satisfactory, U= Undecided, D= Dissatisfactory, SD= Strongly Dissatisfactory

The table symbolize that 16.5% students Strongly Satisfactory, 34.5% students Satisfactory, 30.5% students Undecided, 13.0% students Dissatisfactory and 5.5% students of urban area in class nine and ten Strongly Dissatisfactory of their result in mathematics subject of the last examination. Conversely 9.5% students Strongly Satisfactory, 17.0% students Satisfactory, 26.5% students Undecided, 33.0% students Dissatisfactory and 14.0% students of rural area in class nine and ten Strongly Dissatisfactory of their result in mathematics subject of the last examination. There have a highly significant different of the statement 'What is your result in the last mathematics examination' between urban and rural schools students of the study area.

15.0% students strongly satisfactory, 48.5% students satisfactory, 27.5% students undecided, 19.5% students dissatisfactory and 0.0% students strongly dissatisfactory of getting their mathematics teacher of the schools of urban area. On the other hand 9.0% students strongly satisfactory, 22.0% students satisfactory, 24.0% students undecided, 30.0% students dissatisfactory and 15.0% students strongly dissatisfactory of getting their mathematics teacher of the schools of rural area under the study. There have a highly significant different of getting their mathematics teacher of urban and rural schools.

4.4.3 Guardians' Information

4.4.3.1 Students' Fathers' / Guardians' Occupation

The researcher, in the questionnaire about guardians information filled in by student provided various types of occupations like service, agriculture, business, agriculture & business, service & business, service & agriculture and service, agriculture & business. The guardians are asked to respond their Fathers'/Guardians' Occupations. The table below shows the percentage of both the urban and rural students' guardians' occupations.

Table 4.12 Percentage of Students' Guardians' Occupation

Types of occupation	Urban Students' Fathers' / Guardians' Occupation in percentage	Rural Students' Fathers' / Guardians' Occupation in percentage
Service	48	17
Agriculture	8	52
Business	27	15
Agriculture & Business	6	7
Service & business	5	4
Service & agriculture	4	3
Service, agriculture & business	2	2

The above table shows that 48% respondent of students' guardians' occupation are employees; 8% depend on agriculture and 27% also on business; 6% on both agriculture & business and 5% also on service & business; 4% on both service & agriculture and the rest 2% depends on service, agriculture & business of the urban area. On the other hand 17% respondent of students' guardians' occupation are employees; 52% depend on agriculture and 15% also on business; 7% on both agriculture & business and 4% also on service & business; 3% on both service & agriculture and the rest 2% depends on service, agriculture & business of the rural area. The findings showed that majority of the urban students' guardians depend on service and majority of the rural students' guardians depend on agriculture. The next majority are the urban students' guardians who depend on business and the rural students' guardians who depend on service.

4.4.3.2 Students' Mothers' Occupation

The respondents of student are asked to write their mothers' occupation. 86% of urban students' mothers and 93% of rural students' mothers are house wives and the rest of 14% students' mothers of urban area and 7% students' mothers of rural area are employees.

4.4.3.3 Students Fathers' and Mothers' Organization/Institution

The respondent guardians who are employees are asked to write their organizations/institutions where they work. 41% urban students' fathers service in the

educational institutions like primary schools, secondary schools, madrashas and colleges. 35% serve in different NGOs, bank and company and the rest 24% serve in different govt. offices. In context of mothers' organizations/ institutions, 71% urban students' mothers serve in the primary schools; 17% serve in the family planning and the rest 12% in different NGOs. 52% rural students' fathers service in the educational institutions like primary schools, secondary schools, madrashas and colleges. 40% serve in different NGOs, bank and company and the rest 8% serve in different govt. offices. In context of mothers' organizations/ institutions, 85% rural students' mothers serve in the primary schools; 10% serve in the family planning and the rest 5% in different NGOs.

4.4.3.4 Students' Fathers' Academic Qualifications

The researcher wished to know the academic qualifications of the respondents' students' fathers who are letting their children to study in school. In this regard, the researcher provided different levels of education- primary to tertiary levels with the options literate and illiterate as in the item. The students are asked to their guardian's educational qualifications which of the provided options are valid for them. The following table shows the percentage of the students' fathers' educational qualification both urban and rural area.

Table 4.13 Percentages of Students' Fathers' Academic Qualifications

Education levels	Students' Fathers' educational qualification of urban area in %	Students' Fathers' educational qualification of rural area in %
MA/MSc/MCom	23	3
BA/BSc/BCom	37	10
HSC/Equivalent	17	34
SSC/Equivalent	11	17
Primary level	6	16
Literate	4	11
Illiterate	2	9

From the table it is found that 23% students' fathers of urban area and 3% students' fathers of rural area have post graduation degree; 37% students' fathers of urban area and 10% students' fathers of rural area have graduation degree; 17% students' fathers of urban area and 34% students' fathers of rural area have HSC/Equivalent degree; 11% students' fathers of urban area and 17% students' fathers of rural area have SSC/Equivalent degree; 6% students' fathers of urban area and 16% students' fathers of rural area have primary education. 4% students' fathers of urban area and 11% students' fathers of rural area have the knowledge of literacy and 4% students' fathers of urban area and 11% students' fathers of rural area are illiterate. So the urban students have come from comparatively educated families of the study area.

4.4.3.5 Students' Mothers' Formal Education

The students are asked to write their mothers' academic qualifications valid for them. Most of the rural students' mothers have either knowledge of literacy or illiterate, i.e. they have no formal education. The following table shows the students' mothers' academic qualifications.

Table 4.14 Percentages of Students, Mothers' Academic Qualifications

Education Levels	Students' Mothers' Educational Qualification of Urban Area in %	Students' Mothers' Educational Qualification of Rural Area in %
MA/MSc/MCom	6	0
BA/BSc/BCom	19	3
HSC/Equivalent	33	22
SSC/Equivalent	41	23
Primary Level	24	28
Knowledge of Literacy or Illiterate	17	24

From the table it is found that 6% students' mothers of urban area have post graduation degree; 19% students' mothers of urban area and 3% students' mothers of rural area have graduation degree; 33% students' mothers of urban area and 22% students' mothers of rural area have HSC/Equivalent; 41% students' mothers of urban area and 23% students'

mothers of rural area have SSC/Equivalent; 24% students' mothers of urban area and 28% students' mothers of rural area have Primary education. So it is inferred that urban students have come from comparatively educated families of the study area.

4.4.3.6 Monthly Income of the Respondent of Students' Guardians

The respondent of students' are asked to write their guardians monthly income both the students' fathers and mothers together. The following table shows both the urban and rural students' guardians' monthly income.

Table 4.15 Percentages of Students' Guardians' Monthly Income Level

(in Bangladesh Tk. in Thousands)

Students' Guardians' Monthly Income Range	% of Students' Guardians' Monthly Income of Urban Area	% of Students' Guardians' Monthly Income of Rural Area
Below 2	6	15
2-5	8	25
5-10	11	36
10-15	20	14
15-20	23	8
20-30	18	2
30-40	10	0
Above 40	4	0

According to the above table 6% urban students' guardians and 15% rural students' guardians' monthly income is below Tk. 2000.00; 8% urban students' guardians and 25% rural students' guardians' monthly income Tk. 2000.00 to Tk.5000.00; 11% urban students' guardians and 36% rural students' guardians' monthly income Tk.5000.00 to Tk.10000.00; 20% urban students' guardians and 14% rural students' guardians' monthly income Tk.10000.00 to Tk.15000.00; 23% urban students' guardians and 8% rural students' guardians' monthly income Tk.15000.00 to Tk.20000.00; 18% urban students' guardians and 2% rural students' guardians' monthly income Tk.20000.00 to Tk.30000.00; 10% urban students' guardians' income Tk.30000.00 to Tk.40000.00 and 4% urban students' guardians' income Tk.40000.00 to above.

The findings showed that the urban students' guardians are economically substantial in comparison with the rural students' guardians

4.5 Research Findings on the Interviews with Curriculum Expert, Administrator, Teacher Trainers, Head Teacher and Senior Teacher.

Elicitation was used as a technique of draw out information from different persons who are contributing much in the field of mathematics teaching and learning at different levels in order to have their opinions from different respective in relation to the mathematics textbook. For this purpose a semi structured interview schedule was used to structure in collection of information. The questions in the interview schedule guided the researcher not to be lost from the mainstream and other follow-up questions were made and answered. All the important people co-operated with the researcher and provided the answers from their experience and point of view and these are represented bellow:

4.5.1 Findings of the Interviews with Curriculum Experts:

Two curriculum experts who were responsible for the introduction and implementation of the mathematics Text Books were interviewed in order to know what the purpose of introducing the Text Books was and how the Books are being implemented in the classroom. Two of them were professor of Dhaka University (Department of Mathematics) who were introducing the Text Books for classes nine and ten. They were in fact the key persons in introducing and implementing the mathematics Text Book, so their experience and opinions are regarded important in the research.

4.5.2 Mathematics Text Book and Their Implementation in the Classroom

The curriculum experts said that he has explained in the preface of the Text Book for classes 9 and 10 why the mathematics Text Book at the secondary level has been introduced to develop students' skills of Algebra, Trigonometry, Geometry and Parameter through doing the activities in the lesson. They said that they have no experience of

teaching and learning in the classroom situation at secondary schools; however they talked to the teachers of secondary schools and discovered that most of them are lacking the skills of mathematics teaching. That is why they are in fact not able to implement the mathematics Text Books in the classroom in the required way. Nevertheless, they strongly believe that the books are written in such a way that students can acquire mathematical skills if teachers can teach them in the expected way. Moreover, they mentioned that after getting training from teacher training college teachers are gradually developing their expertise and it will take time as most of the teachers in privet schools have come from a very weak background. They remarked that the mathematics Text Books are being used both by teachers and students effectively to some extents, because the result of mathematics in the public examination is better than before, however they pointed out that the mathematics Text Books could be used more successfully if teachers were trained well. They added that the teachers particularly in rural schools do not have the expertise to involve students in activities of the lessons, so the expected results has not been achieved, Teachers of urban area are comparatively better and they can use the activities of the lessons if they are properly trained.

4.5.3 Suggestions for Successful Use of the Mathematics Text Book.

Training: The curriculum experts laid emphasis on intensive training and also follow-up programs to enhance teachers' knowledge on mathematics and teaching skills. They thought that the curriculum of training for mathematics teachers should be based on the basis of study. There is a great need to identify what mathematics teachers are lacking and what they really need to improve. They referred to B. Ed training is sufficient for mathematics teachers, however they was not sure how far their training is achieving the goals, because there is no follow-up in B. Ed training. They informed that there is a provision for follow-up in B. Ed training, but there is not enough money for follow-up activities.

Recruiting, Teachers: The curriculum experts of mathematics subject suggested selecting mathematics teachers who have strong background of mathematics and at least with honors in mathematics subject for more effective use of the mathematics Text Books of the classroom in Bangladesh.

Parental Support:

One of them gave suggestion for parental support at home; educated parents should create an environment for their children to learn mathematics at home.

Proper Environment:

One of them gave emphasis on creating a suitable environment for doing activities in the classroom and teachers can create such kind of environment when they will be trained well.

4.5.4 Findings of the Interviews with Administrator:

One district education officer, one assistant district education officer, one stipend liazu officer, four visitors from regional education office Rajshahi and two upazila education officer, two academic supervisors who were directly involved as administrator of secondary schools of the study area were interviewed to get information on the challenges of teaching and learning mathematics at secondary level of mathematics subject. Rajshahi, district education officer who was a former teacher of kumilla zila school for five years. He has had rich experience of teaching and learning mathematics at secondary level. He emphasizes that teacher of secondary level do not use lesson plan, most of the teacher have not professional training and schools atmosphere is not appropriate of teaching and learning. He explained that present textbook of mathematics is more effective in mathematics teaching and learning if the teachers are uses correct teaching method. Curriculum of mathematics is modern but there is no stable syllabus from class

six to class nine. Assistant district education officer who did not teach at the secondary level but has a lot of experience of teaching and learning mathematics at secondary schools teachers, she has given emphasis on the proper training of teachers and she remarked that mathematics syllabus is good but it has jumped lagging behind the traditionalistic way from class eight. One stipend liazu officer and four visitor of regional district education office Rajshahi have rich experience of teaching and learning mathematics at secondary schools because they visited schools. They pointed out that quality teacher is essential for teaching and learning, syllabus of mathematics of class nine-ten is vast, Teachers not used perfect teaching methods.

4.5.5 Findings of the Interviews with Teacher Trainer

One principal, one assistant principal and four lecturers of mathematics of Rajshahi teacher training college were interviewed in order to know what the purpose of teacher training was and how the train developed of teaching and learning mathematics at secondary level. The principal of teacher training college said that professional training is necessary for all teachers. Most of the teacher of secondary schools has not degree/diploma on pedagogy. Teachers are not accustomed with the modern methods and techniques of teaching mathematics. Teachers having training on teaching methods and techniques, they do not use them in the class teaching. Curriculum of mathematics is not appropriate, syllabus of nine-ten of mathematic are comparatively hard. Assistant principal of teacher teaching college said that curriculum of mathematics is not perfect at all. He argued that from class six to eight there have arithmetic but it is omitted from class nine. If arithmetic is unnecessary then it would be omitted from class six. He added that arithmetic is included class nine-ten or excluded from class six to eight. Trigonometry

which is so hard is needed for only science students and it is not needed for the students of arts and business group. There have a vast of geometry syllabus which is difficult for weak students to solve it easily and timely. Four lecturers of teacher training college said that training is essential for all teachers to develop their skills in teaching. Most of the practicing teachers have not studied mathematics at degree level. They cannot use perfect teaching methods and techniques without professional training. Syllabus of mathematics of class nine-ten is so hard for the students of arts and business group. Parameter, progression and function are very hard and these are not necessary for the students of arts group.

4.5.6 Findings of the Interviews with Head Teacher and Senior Mathematics Teacher:

Five former head teachers, five present head teachers, five former mathematics teachers and five senior mathematics teachers who were directly faced different challenges of teaching and learning mathematics were interviewed to get different real information of the study area. Five former head teacher who were teaching and administering for long time pointed out some challenges of teaching mathematics, the challenges are lack of train and experience mathematics teacher, mathematics teachers are to carry a heavy workload on their shoulders, in the secondary schools, a teacher is to take 5/6 classes on average every day, there have no sequence of mathematics curriculum from class six to class nine and most of the teacher are not satisfy of their salary.

Other five head teacher who are present administering of schools added that no system of professional development has developed in the schools, teachers teaching in the same subject do not sit together to discuss their problems in teaching that subject, most of the teachers do not use lesson plan of their class, many students do not present their class for

math anxiety, they do not get any parental support because their father are uneducated, syllabus of geometry is a vast which is very difficult for the students to solve timely. Five former teacher and five senior teacher explained their views are as same, they emphasis that there is no system of academic supervision, trained teachers are not supervised by anybody who has got expertise in the subject, even the trained teachers are not accountable to anybody or to any authority regarding their use of the teaching methods and techniques, in rural area most of the students are poor, so they cannot go any coaching center or private tutor for solved any problems, most of the teacher cannot use appropriate teaching methods, there have no system of taken extra classes for weaker students, curriculum of mathematics is faulty in many ways, there is no stable syllabus from class six to class nine, it has jumped lagging behind the traditionalistic way from class eight, omission of arithmetic from class nine is another lack of the exiting syllabus.

4.6 Classroom Observation

4.6.1 Classroom Situation

A survey report shows that in spite of available electricity; only one third secondary schools had adequate lighting facilities and the rest two-third schools have no adequate light in the classroom. (Rashel and Jakir, 2004). This scenario is must worst for other educational institutions, because there is no allocation to meet up the expenditure of electric bill in the budget system. In many rural areas there is no brick built classroom. Village people usually use wood and mud to build classrooms. These classrooms are not healthy and attractive for learning. That is why the students fail to be attentive in the classroom (Styrbjorn, 2006). To understand the classroom situation under the study the researcher observed 40 schools from both of the urban (20) and rural (20) areas under the study. The classrooms condition of are given below.

4.6.1.1 Classroom Situation (Rural area)

Insufficient and oldest high school mud made building of Kamargaon High school

Picture 4.1 Infrastructure of Kamargaon High School

Picture 4.2 Infrastructure of Kamargaon High School (Class room)

When the wall of the classroom will fall down on the head of the teacher and students nobody knows.

Picture 4.3 Infrastructure of Kamargaon High School (Class room)

The room shows that the mathematics class is going in the dream world. When the dream of the students will be broken is uncertain.

Table 4.16 Statistics of Kamargaon School on the SSC Examination 2009 and 2010

Year	Total Student Attended in the S. S. C Examination	Total Student Passed	Total Student Failed	Failed in Mathematics	Rate of fail in Mathematics
2009	50	31	19	12	63.16%
2010	56	35	21	15	71.43%
Total	116	76	40	27	67.50%

The statistics shows that in 2009 total student attended in the SSC Examination was 50, passed 31 and the rate of failed in mathematics was 63.16%. In the next year 2010 it was found that total student attended in the SSC examination was 56, passed 21 and the rate of failed in mathematics was 71.43%. on an average two years total student attended in the SSC examination was 116 and rate of fail in mathematics was 67.50.

Picture 4.4 Tanore, Girls' High School Building Tanore, Rajshahi

The building shows the pathetic scene of the Tanore Girls' High School

Picture 4.5 Classroom situation of Tanore Girls' High School under Tanore Upazila, Rajshahi (Class Ten)

The class of Tanore Girls' school is running only by 06 students. There was a bench crisis in the classroom. A significant number of the girls' student were absent from the class.

Table 4.17 Statistics of Tanore Girl's High School on the SSC Examination 2009 and 2010

Year	Total Student Attended in the S. S. C Examination	Total Student Passed	Total Student Failed	Failed in Mathematics	Rate of fail in Mathematics
2009	30	22	08	06	75.00%
2010	35	30	05	03	60.00%
Total	65	52	13	09	69.23%

The statistics shows that in 2009 total student attended in the SSC examination was 30, passed 22 and the rate of failed in mathematics was 75.00%. In the next year 2010 it was found that total student attended in the SSC Examination was 35, passed 30 and the rate of failed in mathematics was 60.00%. On an average two years total student in the SSC examination 65 and rate of fail in mathematics was 69.23.

4.6.1.2 Classroom Situation (Urban area)

Picture 4.6 School Building of Baya High School, Rajshahi

The infrastructure of the Baya High School was found well condition. It provides the students sufficient classroom needs.

Picture 4.7 Classroom observation by the researcher of Baya High School (Class Ten)

The students were attentive to their class and the teacher was teaching attentively in the class room.

Table 4.18 Statistics of Baya High School on the SSC Examination 2009 and 2010

Year	Total Student Attended in the SSC Examination	Total Student Passed	Total Student Failed	Failed in Mathematics	Rate of fail in Mathematics
2009	60	55	05	00	0.0%
2010	66	60	06	01	16.67%
Total	126	115	11	01	9.10%

The statistics shows that in 2009 total student attended in the SSC examination was 60, passed 55 and the rate of failed in mathematics was 0.0%. In the next year 2010 it was found that total student attended in the SSC examination was 66, passed 60 and the rate of

failed in mathematics was 16.67%. On an average two years total student attended in 126, total pass 115 total fail 11 and rate of fail in mathematics was 9.10%.

Picture 4.8 Rajshahi University School and College (side one)

Picture 4.9 Rajshahi University School and College (side two)

Sufficient Infrastructures of Rajshahi University School and College

Information collection from the principal in the office room of Rajshahi University School

Picture 4.10 Collection of Information from the girls' student by the researcher (Class Ten)

Interviewing girls' student by the researcher on various mathematical aspects

Picture 4.11 Mathematics Class Observation of Rajshahi University School (Class Nine)

The picture shows that the classroom situation of the Rajshahi University School was satisfactory. All the students were attentive to their class teacher and calculating mathematics with the class teacher.

Table 4.19 Statistics of the Rajshahi University School on the S. S.C Examination 2009 and 2010

Year	Total Student Attended in the S. S. C Examination	Total Student Passed	Total Student Failed	Failed in Mathematics	Rate of fail in Mathematics
2009	113	108	05	00	00%
2010	124	122	02	00	00%
Total	237	230	07	00	00%

The statistics shows that in 2009 total student attended in the SSC examination was 113, passed 108 and the rate of failed in mathematics was 00%. In the next year 2010 it was found that total student attended in the SSC examination was 124, passed 122 and the rate of failed in mathematics was 00%.

Reviewing the classroom observation, interviewing of the teachers and students infrastructural dimensions and the S. S. C result, the following significant information may be mentioned.

- Insufficiency of infrastructure
- Shortage of mathematics teacher
- Lack of trained mathematics teacher
- Lack of management procedure
- Lack of teaching aids
- Lack of knowledge of utility of teaching aids
- Lack of proper lesson plans and time table of mathematics subject
- Irregular class taking tendency of teacher
- Large classes in schools

- Teachers' inability to follow the methods of teaching mathematics prescribed in the teacher's guide
- Learners lack of interest in learning mathematics
- Lack of proper environment for practice mathematics in the classroom
- Inappropriate teaching methodology
- Problem with the time frame for a huge task in the class
- Lack of educational tools, books and other teaching resources

The researcher has considered the above factors affecting quality teaching and learning problems of mathematics in the selected school.

4.6.2 Results of Classroom Observation

The researcher investigates 20 Urban and 20 Rural schools and evaluated the statement on the basis of using a five points Likert method rating scale ranging from 1(Strongly Disagree), 2(Disagree), 3(Undecided), 4(Agree) to 5(Strongly Agree). The Mean (M) and Standard Deviation (SD) are calculated for each of the statement of the observation as the rank. The nearer Mean would determine the score of observation like, Strongly Disagree, Disagree, Undecided, Agree and Strongly agree for 1,2,3,4 and 5 respectively. The Mean and SD of the observation are presented in the tabular form in table.

Table 4.20 Mean and SD of the Classroom Observation of Urban Area

Sl. No.	Statement	Mean	SD
1	Classroom temperature has been found normal (U_1)	2.7500	1.46322
2	Classroom has been found neat and clean (U_2)	2.9250	1.57525
3	Classroom has been found sufficient light (U_3)	2.5750	1.43021
4	Classroom has been found having adequate benches (U_4)	2.8000	1.41784
5	Classroom has been found electricity facilities (U_5)	4.1324	0.89532
6	Classroom has been found free from noise pollution (U_6)	2.7000	1.34355
7	Classroom has been found organized (U_7)	2.3500	1.25167
8	Class size has been found large (U_8)	2.4500	1.35167
9	Teacher has entered the classroom with smiling face (U_9)	2.3700	1.29167
10	Teacher has started the class with a nice warmer (U_{10})	2.6500	1.15168
11	Teachers' voice has been found audible (U_{11})	2.4700	1.55169
12	Teacher was found friendly (U_{12})	2.2300	1.29168
13	Teacher had a lesson plan (U_{13})	2.4100	1.35163
14	Teacher has followed the stages of the lesson (U_{14})	2.1500	1.50555
15	Teacher has used perfect teaching method in the class (U_{15})	2.4750	1.30064
16	Teacher has made students busy in during activities from the lesson (U_{16})	2.4750	1.43201
17	Teacher has corrected students' mistakes gently (U_{17})	2.7900	1.46322
18	Teacher has praised students (U_{18})	2.6200	1.41784
19	Teacher has used chalk board nicely (U_{19})	3.1500	1.00215
20	Teacher has monitored the class (U_{2o})	3.8750	1.00127
21	Technique of teacher switching from one section to another has been suitable (U_{21})	3.3500	0.98247
22	Teacher has maintained time properly (U_{22})	3.2500	0.87923
23	Teachers has given homework for his/her students (U_{23})	3.0750	1.49164
24	Students have looked jolly (U_{24})	3.4750	0.99521
25	Students have understood instructions (U_{25})	2.6500	1.25167
26	Students have told their difficulties to teacher (U_{26})	2.9250	1.47435
27	Students were found interested in listening to the exercise (U_{27})	2.8750	1.41761
28	Students have listened and answered questions (U_{28})	2.5250	1.37724
29	Students have maintained classroom discipline (U_{29})	2.4500	1.39505
30	Students' motivation towards learning was found satisfactory (U_{30})	2.5500	1.41331

*U = Classroom Observation of Urban Area

The mean of 30 observations of the Teachers of Urban areas schools separately are between 2.1500 to 4.1324 and SD is 0.87923 to 1.57525. Maximum numbers of SD is > 1.00. So, most of the teachers are heterogeneous in the selected schools.

4.6.2.1 Classroom temperature has been found normal (U_1)

The mean value of the observation (U_1) is quite closer to the score 'Undecided' in the rating scale and valued 2.7500 which is near to 3. Thus the score indicates that the classroom temperature of urban schools have been found normal (U_1) is 'Undecided'. The SD value 1.46322 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_1).

4.6.2.2 Classroom has been found neat and clean (U_2)

The mean value of the observation (U_2) is quite closer to the score 'Undecided' in the rating scale and valued 2.9250 which is near to 3. Thus the score indicates that the classrooms of urban schools have been found neat and clean (U_2) is 'Undecided'. The SD value 1.57525 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_2).

4.6.2.3 Classroom has been found sufficient light (U_3)

The mean value of the observation (U_3) is quite closer to the score 'Undecided' in the rating scale and valued 2.5750 which is near to 3. Thus the score indicates that the classrooms of urban schools have been found sufficient light (U_3) is 'Undecided'. The SD value 1.43021 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_3).

4.6.2.4 Classroom has been found having adequate benches (U_4)

The mean value of the observation (U_4) is quite closer to the score 'Undecided' in the rating scale and valued 2.8000 which is near to 3. Thus the score indicates that the classroom has been found having adequate benches (U_4) is Undecided. The SD value 1.41784 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_4).

4.6.2.5 Classroom has been found electricity facilities (light and fan) (U_5)

The mean value of the observation (U_5) is quite closer to the score 'Agree' in the rating scale and valued 4.1324 which is near to 4. Thus the score indicates that the classrooms of urban schools have been found electricity facilities (light and fan) (U_5) is 'Agree'. The SD value 0.89532 which is < 1 indicates that the classrooms are homogenous in respect of observation (U_5).

4.6.2.6 Classroom has been found free from noise pollution (U_6)

The mean value of the observation (U_6) is quite closer to the score 'Undecided' in the rating scale and valued 2.7000 which is near to 3. Thus the score indicates that the classroom has been found organized (U_6) is Undecided. The SD value 1.34355 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_6).

4.6.2.7 Classroom has been found organized (U7)

The mean value of the observation (U_7) is quite closer to the score 'Disagree' in the rating scale and valued 2.3500 which is near to 2. Thus the score indicates that the classroom has been found organized (U_7) is Disagree. The SD value 1.25167 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_7).

4.6.2.8 Class size has been found large (U8)

The mean value of the observation (U_8) is quite closer to the score 'Disagree' in the rating scale and valued 2.4500 which is near to 2. Thus the score indicates that the class size has been found large (U_8) is Disagree. The SD value 1.35167 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (U_8).

4.6.2.9 Teacher has entered the classroom with smiling face (U9)

From the table, it is found that the mean value (U_9) is quite closer to the score 'Disagree' in the rating scale and valued 2.3700 which is near to 2. Thus it is inferred that the teacher has entered the classroom with smiling face (U_9) is Disagree. The SD value 1.46322 which is > 1 indicates that the urban school teachers are heterogeneous in respect of the observation (U_9).

4.6.2.10 Teacher has started the class with a nice warmer (U10)

The mean value of the observation (U_{10}) is quite closer to the category **'**Undecided' in the rating scale and valued 2.6500 which is near to 3. Thus the score indicates that the observation, teacher has started the class with a nice warmer (U_{10}) is Undecided. The SD value 1.15168 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{10}).

4.6.2.11 Teachers' voice has been found audible (U11)

The mean value of the observation (U_{11}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4700 which is near to 2. Thus the score indicates that the observation, teachers' voice has been found audible (U_{11}) is Disagree. The SD value 1.55169 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{11}).

4.6.2.12 Teacher was found friendly (U12)

The mean value of the observation (U_{12}) is quite closer to the score 'Disagree' in the rating scale and valued 2.2300 which is near to 2. Thus the score indicates that the observation, teacher was found friendly (U_{12}) is Disagree. The SD value 1.29168 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{12}).

4.6.2.13 Teacher had a lesson plan (U13)

The mean value of observation (U_{13}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4100 which is near to 2. Thus the score indicates that the observation, teacher had a lesson plan (U_{13}) is Disagree. The SD value 1.35163 which is > 1 that indicates the teachers are heterogeneous in respect of the observation (U_{13}).

4.6.2.14 Teacher has followed the stages of the lesson (U14)

The mean value of the observation (U_{14}) is quite closer to the score 'Disagree' in the rating scale and valued 2.1500 which is very near to 2. Thus the score indicates that the observation, teacher has followed the stages of the lesson (U_{14}) is Disagree. The SD value 1.50555 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{14}).

4.6.2.15 Teacher has used perfect teaching method in the class (U15)

The mean value of the observation (U_{15}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4750 which is near to 2. Thus the score indicates that the observation, teacher has used perfect teaching method in the class (U_{15}) is Disagree. The SD value 1.30064 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{15}).

4.6.2.16 Teacher has made students busy in during activities from the lesson (U16)

The mean value of the observation (U_{16}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4750 which is near to 2. Thus the score indicates that the observation, teacher has made students busy in during activities from the lesson (U_{16}) is Disagree. The SD value 1.43201 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{16}).

4.6.2.17 Teacher has corrected students' mistakes gently (U17)

The mean value of the observation (U_{17}) is quite closer to the score 'Undecided' in the rating scale and valued 2.7900 which is near to 3. Thus the score indicates that the observation, teacher has corrected students' mistakes gently (U_{17}) is Undecided. The SD value 1.46322 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{17}).

4.6.2.18 Teacher has praised students (U18)

The mean value of the observation (U_{18}) is quite closer to the score 'Undecided' in the rating scale and valued 2.6200 which is near to 3. Thus the score indicates that the observation, teacher has praised students (U_{18}) is Undecided. The SD value 1.41784 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{18}).

4.6.2.19 Teacher has used chalk board nicely (U19)

The mean value of the observation (U_{19}) is quite closer to the score 'Undecided' in the rating scale and valued 3.1500 which is very near to 3. Thus the score indicates that the observation, teacher has used black board nicely (U_{19}) is Undecided. The SD value 1.00215 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{19})

4.6.2.20 Teacher has monitored the class (U20)

The mean value of the observation (U_{20}) is quite closer to the score 'Agree' in the rating scale and valued 3.8750 which is very near to 4. Thus the score indicates that the observation, teacher has monitored the class (U_{20}) is Agree. The SD value 1.00127 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{20}).

4.6.2.21 Technique of teacher switching from one section to another has been suitable (U21)

The mean value of the observation (U_{21}) is quite closer to the score 'Undecided' in the rating scale and valued 3.3500 which is near to 3. Thus the score indicates that the urban schools technique of teacher switching from one section to another has been suitable (U_{21}) is 'Undecided'. The SD value 0.98247 which is < 1 indicates that the statement is homogeneous in respect of observation (U_{21}).

4.6.2.22 Teacher has maintained time properly (U22)

The mean value of the observation (U_{22}) is quite closer to the score 'Undecided' in the rating scale and valued 3.2500 which is very near to 3. Thus the score indicates that the observation, teacher has maintained time properly (U_{22}) is Undecided. The SD value 0.87923 which is < 1 indicates that the teachers are homogeneous in respect of observation (U_{22}).

4.6.2.23 Teacher has given home work for his/her students (U23)

The mean value of the observation (U_{23}) is quite closer to the score 'Undecided' in the rating scale and valued 3.0750 which is near to 3. Thus the score indicates that the observation, teacher has given students home work **(**U_{23}**)** is Undecided. The SD value 1.49164 which is > 1 indicates that the teachers are heterogeneous in respect of observation (U_{23}).

4.6.2.24 Students have looked jolly (U24)

The mean value of the observation (U_{24}) is quite closer to the score 'Undecided' in the rating scale and valued 3.4750 which is near to 3. Thus the score indicates that the urban students have looked jolly (U_{24}) is Undecided. The SD value 0.99521 which is < 1 indicates that the students are homogeneous in respect of observation (U_{24}).

4.6.2.25 Students have understood instructions (U25)

The mean value of the observation (U_{25}) is quite closer to the score 'Undecided' in the rating scale and valued 2.6500 which is near to 3. Thus the score indicates that the urban students have understood instructions (U_{25}) are Undecided. The SD value 1.25167 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{25}).

4.6.2.26 Students have told their difficulties to teacher (U26)

The mean value of the observation (U_{26}) is quite closer to the score 'Undecided' in the rating scale and valued 2.9250 which is very near to 3. Thus the score indicates that the urban students have told their difficulties to teacher (U_{26}) is 'Undecided'. The SD value 1.47435 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{26}).

4.6.2.27 Students were found interested in listening to the exercise (U27)

The mean value of the observation (U_{27}) is quite closer to the score 'Undecided' in the rating scale and valued 2.8750 which is near to 3. Thus the score indicates that the urban students were found interested in listening to the exercise (U_{27}) is Undecided. The SD value 1.41761 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{27}).

4.6.2.28 Students have listened and answered questions (U28)

The mean value of the observation (U_{28}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5250 which is near to 3. Thus the score indicates that the urban students have listened and answered questions (U_{28}) are Undecided. The SD value 1.37724 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{28}).

4.6.2.29 Students have maintained classroom discipline (U29)

The mean value of the observation (U_{29}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4500 which is near to 2. Thus the score indicates that the urban students have maintained classroom discipline (U_{29}) is Disagree. The SD value 1.39505 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{29}).

4.6.2.30 Students' motivation towards learning was found satisfactory (U30)

The mean value of the observation (U_{30}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5500 which is near to 3. Thus the score indicates that the urban students have looked motivated to learn (U_{30}) is Undecided. The SD value 1.41331 which is > 1 indicates that the students are heterogeneous in respect of observation (U_{30}).

4.6.3 Mean and SD of the Classroom Observation of Rural Area

Table 4.21 Mean and SD of the Classroom Observation of Rural Area

Sl. No.	Statement	Mean	SD
1	Classroom temperature has been found normal (R_1)	2.6750	1.36603
2	Classroom has been found neat and clean (R_2)	2.8750	1.47087
3	Classroom has been found sufficient light (R_3)	2.5250	1.37724
4	Classroom has been found having adequate benches (R_4)	2.6250	1.35282
5	Classroom has been found electricity facilities (light, fan) (R_5)	2.3750	0.83451
6	Classroom has been found free from noise pollution (R_6)	2.7100	1.34355
7	Classroom has been found organized (R_7)	2.6000	1.41784
8	Class size has been found large (R_8)	2.3023	1.36543
9	Teacher has entered the classroom with smiling face (R_9)	2.5900	1.52437
10	Teacher has started the class with a nice warmer (R_{10})	2.2090	1.62439
11	Teachers' voice has been found audible (R_{11})	2.7009	1.42437
12	Teacher was found friendly (R_{12})	2.4025	1.72431
13	Teacher had a lesson plan (R_{13})	2.2080	0.95623
14	Teacher has followed the stages of the lesson (R_{14})	2.6250	1.44449
15	Teacher has used perfect teaching method in the class (R_{15})	2.2000	1.32433
16	Teacher has made students busy in during activities from the lesson (R_{16})	2.4250	1.44803
17	Teacher has corrected students' mistakes gently (R_{17})	2.3500	1.36907
18	Teacher has praised students (R_{18})	2.8250	1.61543
19	Teacher has used chalkk board nicely (R_{19})	2.6250	1.53067
20	Teacher has monitored the class (R_{2o})	2.2750	1.33949
21	Technique of teacher switching from one section to another has been suitable (R_{21})	2.8750	1.53902
22	Teacher has maintained time properly (R_{22})	2.5500	1.39505
23	Teachers has given homework for his/her students (R_{23})	2.4500	1.35779
24	Students have looked jolly (R_{24})	2.5200	1.46760
25	Students have understood instructions (R_{25})	2.7000	1.52248
26	Students have told their difficulties to teacher (R_{26})	2.5250	1.48475
27	Students were found interested in listening to the exercise (R_{27})	2.8750	1.41761
28	Students have listened and answered questions (R_{28})	2.5250	1.37724
29	Students have maintained classroom discipline (R_{29})	2.3542	1.21357
30	Students' motivation towards learning was found satisfactory (R_{30})	3.0500	0.97453

*R = Classroom Observation of Rural Area

The mean of 30 observations of the Teachers of Rural areas schools separately are between 2.2090 to 3.0500 and SD is 0.83451 to 1.72431. Maximum numbers of SD is > 1.00. So, most of the teachers are heterogeneous in the selected schools.

4.6.3.1 Classroom temperature has been found normal (R1)

The mean value of the observation (R_1) is quite closer to the score 'Undecided' in the rating scale and valued 2.6750 which is near to 3. Thus the score indicates that the classroom temperature of rural schools have been found normal (R_1) is 'Undecided'. The SD value 1.36603 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_1).

4.6.3.2 Classroom has been found neat and clean (R2)

The mean value of the observation (R_2) is quite closer to the score 'Undecided' in the rating scale and valued 2.8750 which is near to 3. Thus the score indicates that the classrooms of rural schools have been found neat and clean (R_2) is 'Undecided'. The SD value 1.47087 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_2).

4.6.3.3 Classroom has been found sufficient light (R3)

The mean value of the observation (R_3) is quite closer to the score 'Undecided' in the rating scale and valued 2.5750 which is near to 3. Thus the score indicates that the classrooms of rural schools have been found sufficient light (R_3) is 'Undecided'. The SD value 1.37724 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_3).

4.6.3.4 Classroom has been found having adequate benches (R4)

The mean value of the observation (R_4) is quite closer to the score 'Undecided' in the rating scale and valued 2.6250 which is near to 3. Thus the score indicates that the classroom has been found having adequate benches (R_4) is Undecided. The SD value 1.35282 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_4).

4.6.3.5 Classroom has been found electricity facilities (light and fan) (R5)

The mean value of the observation (R_5) is quite closer to the score 'Disagree' in the rating scale and valued 2.3750 which is near to 2. Thus the score indicates that the classrooms of rural schools have been found electricity facilities (light and fan) (R_5) is Disagree. The SD value 0.83451 which is < 1 indicates that the classrooms are homogenous in respect of observation (R_5).

4.6.3.6 Classroom has been found free from noise pollution (R6)

The mean value of the observation (R_6) is quite closer to the score 'Undecided' in the rating scale and valued 2.7100 which is near to 3. Thus the score indicates that the classroom has been found organized (R_6) is Undecided. The SD value 1.34355 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_6).

4.6.3.7 Classroom has been found organized (R7)

The mean value of the observation (R_7) is quite closer to the score 'Undecided' in the rating scale and valued 2.6000 which is near to 3. Thus the score indicates that the classroom has been found organized (R_7) is Undecided. The SD value 1.41784 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_7).

4.6.3.8 Class size has been found large (R8)

The mean value of the observation (R_8) is quite closer to the score 'Disagree' in the rating scale and valued 2.3023 which is near to 2. Thus the score indicates that the class size has been found large (R_8) is Disagree. The SD value 1.36543 which is > 1 indicates that the classrooms are heterogeneous in respect of observation (R_8).

4.6.3.9 Teacher has entered the classroom with smiling face (R9)

From the table, it is found that the mean value (R_9) is quite closer to the score 'Undecided' in the rating scale and valued 2.5900 which is near to 3. Thus it is inferred

that the teacher has entered the classroom with smiling face (R_9) is Undecided. The SD value 1.52437 which is > 1 indicates that the rural school's teachers are heterogeneous in respect of the observation (R_9).

4.6.3.10 Teacher has started the class with a nice warmer (R10)

The mean value of the observation (R_{10}) is quite closer to the category **'**Disagree' in the rating scale and valued 2.2090 which is near to 2. Thus the score indicates that the observation, teacher has started the class with a nice warmer (R_{10}) is Disagree. The SD value 1.62439 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{10}).

4.6.3.11 Teachers' voice has been found audible (R11)

The mean value of the observation (R_{11}) is quite closer to the score 'Undecided' in the rating scale and valued 2.7009 which is near to 3. Thus the score indicates that the observation, teachers' voice has been found audible (R_{11}) is Undecided. The SD value 1.42437 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{11}).

4.6.3.12 Teacher was found friendly (R12)

The mean value of the observation (R_{12}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4025 which is near to 2. Thus the score indicates that the observation, teacher was found friendly (R_{12}) is Disagree. The SD value 1.72431 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{12}).

4.6.3.13 Teacher had a lesson plan (R13)

The mean value of observation (R_{13}) is quite closer to the score 'Disagree' in the rating scale and valued 2.2080 which is near to 2. Thus the score indicates that the observation, teacher had a lesson plan (R_{13}) is Disagree. The SD value 0.95623 which is <1 that indicates the teachers are homogeneous in respect of the observation (R_{13}).

4.6.3.14 Teacher has followed the stages of the lesson (R14)

The mean value of the observation (R_{14}) is quite closer to the score 'Undecided' in the rating scale and valued 2.6250 which is very near to 3. Thus the score indicates that the observation, teacher has followed the stages of the lesson (R_{14}) is Undecided. The SD value 1.44449 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{14}).

4.6.3.15 Teacher has used perfect teaching method in the class (R15)

The mean value of the observation (R_{15}) is quite closer to the score 'Disagree' in the rating scale and valued 2.2000 which is near to 2. Thus the score indicates that the observation, teacher has used perfect teaching method in the class (R_{15}) is Disagree. The SD value 1.32433 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{15}).

4.6.3.16 Teacher has made students busy in during activities from the lesson (R16)

The mean value of the observation (R_{16}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4250 which is near to 2. Thus the score indicates that the observation, teacher has made students busy in during activities from the lesson (R_{16}) is Disagree. The SD value 1.44803 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{16}).

4.6.3.17 Teacher has corrected students' mistakes gently (R17)

The mean value of the observation (R_{17}) is quite closer to the score 'Disagree' in the rating scale and valued 2.3500 which is near to 2. Thus the score indicates that the observation, teacher has corrected students' mistakes gently (R_{17}) is Disagree. The SD value 1.36907 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{17}).

4.6.3.18 Teacher has praised students (R18)

The mean value of the observation (R_{18}) is quite closer to the score 'Undecided' in the rating scale and valued 2.8250 which is near to 3. Thus the score indicates that the observation, teacher has praised students (R_{18}) is Undecided. The SD value 1.61543 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{18}).

4.6.3.19 Teacher has used chalk board nicely (R19)

The mean value of the observation (R_{19}) is quite closer to the score 'Undecided' in the rating scale and valued 2.6250 which is very near to 3. Thus the score indicates that the observation, teacher has used chalk board nicely (R_{19}) is Undecided. The SD value 1.53067 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{19}).

4.6.3.20 Teacher has monitored the class (R20)

The mean value of the observation (R_{20}) is quite closer to the score 'Disagree' in the rating scale and valued 2.2750 which is very near to 2. Thus the score indicates that the observation, teacher has monitored the class (R_{20}) is Disagree. The SD value 1.33949 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{20}).

4.6.3.21 Technique of teacher switching from one section to another has been suitable (R21)

The mean value of the observation (R_{21}) is quite closer to the score 'Undecided' in the rating scale and valued 2.8750 which is near to 3. Thus the score indicates that the urban schools technique of teacher switching from one section to another has been suitable (R_{21}) is 'Undecided'. The SD value 1.53902 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{21}).

4.6.3.22 Teacher has maintained time properly (R22)

The mean value of the observation (R_{22}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5500 which is near to 3. Thus the score indicates that the observation, teacher has maintained time properly (R_{22}) is Undecided. The SD value 1.39505 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{22}).

4.6.3.23 Teacher has given home work for his/her students (R23)

The mean value of the observation (R_{23}) is quite closer to the score 'Disagree' in the rating scale and valued 2.4500 which is near to 2. Thus the score indicates that the observation, teacher has given students home work **(**R_{23}**)** is Disagree. The SD value 1.35779 which is > 1 indicates that the teachers are heterogeneous in respect of observation (R_{23}).

4.6.3.24 Students have looked jolly (R24)

The mean value of the observation (R_{24}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5200 which is near to 3. Thus the score indicates that the rural students have looked jolly (R_{24}) is Undecided. The SD value 1.46760 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{24}).

4.6.3.25 Students have understood instructions (R25)

The mean value of the observation (R_{25}) is quite closer to the score 'Undecided' in the rating scale and valued 2.7000 which is near to 3. Thus the score indicates that the rural students have understood instructions (R_{25}) are Undecided. The SD value 1.52248 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{25}).

4.6.3.26 Students have told their difficulties to teacher (R26)

The mean value of the observation (R_{26}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5250 which is very near to 3. Thus the score indicates that the rural students have told their difficulties to teacher (R_{26}) is 'Undecided'. The SD value 1.48475 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{26}).

4.6.3.27 Students were found interested in listening to the exercise (R27)

The mean value of the observation (R_{27}) is quite closer to the score 'Undecided' in the rating scale and valued 2.8750 which is near to 3. Thus the score indicates that the rural students were found interested in listening to the exercise (R_{27}) is Undecided. The SD value 1.41761 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{27}).

4.6.3.28 Students have listened and answered questions (R28)

The mean value of the observation (R_{28}) is quite closer to the score 'Undecided' in the rating scale and valued 2.5250 which is near to 3. Thus the score indicates that the rural students have listened and answered questions (R_{28}) are Undecided. The SD value 1.37724 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{28}).

4.6.3.29 Students have maintained classroom discipline (R29)

The mean value of the observation (R_{29}) is quite closer to the score 'Disagree' in the rating scale and valued 2.3542 which is near to 2. Thus the score indicates that the rural students have maintained classroom discipline (R_{29}) is Disagree. The SD value 1.21357 which is > 1 indicates that the students are heterogeneous in respect of observation (R_{29}).

4.6.3.30 Students' motivation towards learning was found satisfactory (R30)

The mean value of the observation (R_{30}) is quite closer to the score 'Undecided' in the rating scale and valued 3.0500 which is near to 3. Thus the score indicates that the urban students have looked motivated to learn (R_{30}) is Undecided. The SD value 0.97453 which is < 1 indicates that the classrooms are homogenous in respect of observation (R_{30}).

4.6.4 Chi-Square Test of Classroom Observation

(Version 16.0 Pearson Chi-square)

Table 4.22 Classroom temperatures has been found normal

Statement	**Scale**	**Location**				**Total**	
		Urban		**Rural**			
		Frequency	%	Frequency	%	Frequency	%
Classroom temperature has been found normal	Strongly Disagree	11	27.50	13	16.25	24	30.00
	Disagree	11	27.50	8	10.00	19	23.75
	Undecided	4	10.00	2	2.50	6	7.50
	Agree	6	15.00	6	7.50	12	15.00
	Strongly Agree	8	20.00	11	13.75	19	23.75
Total		40	100	40	100	80	100
Chi-Square	Value = 16.092		DF = 16		**P-Value** =3.672		

The table shows that the calculated χ^2 value was found to be 16.092, which is less than the table value with DF 16(26.296). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement classroom temperature has been found normal is insignificant.

Table 4.23 Classroom has been found neat and clean

Statement	**Scale**	**Location**				**Total**	
		Urban		**Rural**			
		Frequency	%	Frequency	%	Frequency	%
Classroom has been found neat and clean	Strongly Disagree	7	17.50	13	32.50	20	25.00
	Disagree	15	37.50	8	20.00	23	28.75
	Undecided	7	17.50	3	7.50	10	12.50
	Agree	7	17.50	10	25.00	17	21.25
	Strongly Agree	4	10.00	6	15.00	10	12.50
Total		40	100	40	100	80	100
Chi-Square	Value = 38.552		DF = 16		**P-Value** = 0.001		

The table shows that the calculated χ^2 value was found to be 38.552, which is greater than the table value with DF 16(26.296) at 5%. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement classroom has been found neat and clean is significant at the level of 5%.

Table 4.24 Classroom has been found sufficient light

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Classroom has been found sufficient light	Strongly Disagree	11	27.50	10	25.00	21	26.25
	Disagree	13	32.50	8	20.00	21	26.25
	Undecided	3	7.50	3	7.500	6	7.50
	Agree	6	15.00	15	37.50	21	26.25
	Strongly Agree	7	17.50	4	10.00	11	13.75
Total		40	100	40	100	80	100
Chi-Square	Value = 32.000		DF = 16		**P-Value** = 0.001		

The table shows that the calculated χ^2 value was found to be 32.000, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement classroom has been found sufficient light is significant at the level of 5%.

Table 4.25 Classroom has been found having adequate benches

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Classroom has been found having adequate benches	Strongly Disagree	11	27.50	13	32.50	24	30.00
	Disagree	10	25.00	10	25.00	20	25.00
	Undecided	4	10.00	5	12.50	9	11.25
	Agree	6	15.00	6	15.00	12	15.00
	Strongly Agree	9	22.50	6	15.00	15	18.75
Total		40	100	40	100	80	100
Chi-Square	Value = 37.143		DF = 16		**P-Value** = 0.002		

The table shows that the calculated χ^2 value was found to be 37.143, which is greater than the table value with DF 16(26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement classroom has been found having adequate benches is significant at the level of 5%.

Table 4.26 Classroom has been found electricity facilities (light and fan)

Statement	Scale	Location				Total	
		Urban		Rural			
		Frequency	%	Frequency	%	Frequency	%
Classroom has been found electricity facilities (light and fan)	Strongly Disagree	15	37.50	13	32.50	28	35.00
	Disagree	13	32.50	4	10.00	17	21.25
	Undecided	3	7.50	14	35.00	17	21.25
	Agree	4	10.00	9	22.50	13	16.25
	Strongly Agree	5	12.50	0	0.00	5	6.25
Total		40	100	40	100	80	100
Chi-Square	Value = 28.333		DF = 16		**P-Value** = 0.002		

The table shows that the calculated χ^2 value was found to be 28.333, which is greater than the table value with DF 12 (21.026). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement classroom has been found electricity facilities (light and fan) is significant at the level of 5%.

Table 4.27 Classroom has been found free from noise pollution

Statement	Scale	Location				Total	
		Urban		Rural			
		Frequency	%	Frequency	%	Frequency	%
Classroom has been found free from noise pollution	Strongly Disagree	9	22.50	13	32.50	22	27.50
	Disagree	11	27.50	12	30.00	23	28.75
	Undecided	0	0.00	2	5.00	2	2.50
	Agree	14	35.00	7	17.50	21	26.25
	Strongly Agree	6	15.00	6	15.00	12	15.00
Total		40	100	40	100	80	100
Chi-Square	Value = 19.167		DF =12		**P-Value** =2.342		

The table shows that the calculated χ^2 value was found to be 19.167, which is less than the table value with DF 12 (21.026). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement classroom has been found free from noise pollution is insignificant.

Table 4.28 Classroom has been found organized

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Classroom has been found organized	Strongly Disagree	14	35.00	12	30.00	26	32.50
	Disagree	12	30.00	11	27.50	23	28.75
	Undecided	5	12.50	5	12.50	10	12.50
	Agree	5	12.50	8	20.00	13	16.25
	Strongly Agree	4	10.00	4	10.00	8	10.00
Total		40	100	40	100	80	100
Chi-Square	Value = 20.001		DF =16		**P-Value** = 2.054		

The table shows that the calculated χ^2 value was found to be 20.001, which is less than the table value with DF 16 (26.296). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement classroom has been found organized is insignificant.

Table 4.29 Class size has been found large

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Class size has been found large	Strongly Disagree	13	32.50	10	25.00	23	28.75
	Disagree	11	27.50	6	15.00	17	21.25
	Undecided	6	15.00	4	10.00	10	12.50
	Agree	5	12.50	12	30.00	17	21.25
	Strongly Agree	5	12.50	8	20.00	13	16.25
Total		40	100	40	100	80	100
Chi-Square	Value = 36.328		DF = 16		**P-Value**= 0.003		

The table shows that the calculated χ^2 value was found to be 36.328, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement class size has been found large is significant at the level 5%.

Table 4.30 Teacher has entered the classroom with smiling face between urban area and rural area

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has entered the classroom with smiling face	Strongly Disagree	10	25	10	25	20	25.0
	Disagree	11	27.5	10	25	21	26.25
	Undecided	5	12.5	8	20	13	16.25
	Agree	7	17.5	7	17.5	14	17.5
	Strongly Agree	7	17.5	5	12.5	12	15.0
Total		40	100	40	100	80	100
Chi-Square	Value = 27.212		DF = 16		**P-Value** = 0.004		

The table shows that the calculated χ^2 value was found to be 27.212, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has entered the classroom with smiling face is significant at the level of 5%.

Table 4.31 Teacher has started the class with a nice warmer between urban area and rural area

Statement	**Scale**	**Location**				**Total**	
		Urban		**Rural**		Frequency	%
		Frequency	%	Frequency	%		
Teacher has started the class with a nice warmer	Strongly Disagree	13	32.50	12	30.0	25	31.25
	Disagree	8	20.0	10	25.0	18	22.50
	Undecided	7	17.50	8	20.0	15	18.75
	Agree	7	17.50	5	12.5	12	15.00
	Strongly Agree	5	12.5	5	12.5	10	12.50
Total		40	100	40	100	80	100
Chi-Square	Value = 38.164		DF = 16		**P-Value** = 0.001		

The table shows that the calculated χ^2 value was found to be 38.164, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has started the class with a nice warmer is significant at the level of 5%.

Table 4.32 Teachers' voice has been found audible

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teachers' voice has been found audible	Strongly Disagree	9	22.50	10	25.00	19	23.75
	Disagree	11	27.50	11	27.50	22	27.50
	Undecided	5	12.50	8	20.00	13	16.25
	Agree	9	22.50	6	15.00	15	18.75
	Strongly Agree	6	15.00	5	12.50	15	18.75
Total		40	100	40	100	80	100
Chi-Square	Value = 39.355		DF = 16		**P-Value** = 0.009		

The table shows that the calculated χ^2 value was found to be 39.355, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teachers' voice has been found audible is significant at the level of 10%.

Table 4.33 Teacher was found friendly

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher was found friendly	Strongly Disagree	11	27.50	12	30.00	23	28.75
	Disagree	9	22.50	17	42.50	26	32.50
	Undecided	5	12.50	1	2.50	6	7.50
	Agree	9	22.50	5	12.50	14	17.50
	Strongly Agree	6	15.00	5	12.50	11	13.75
Total		40	100	40	100	80	100
Chi-Square	Value = 34.259		DF = 16		**P-Value** = 0.003		

The table shows that the calculated χ^2 value was found to be 34.259, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher was found friendly is significant at the level of 5%.

Table 4.34 Teacher had a lesson plan

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher had a lesson plan	Strongly Disagree	11	27.5	10	25	21	26.50
	Disagree	7	17.5	8	20	15	18.75
	Undecided	6	15.0	6	15.0	12	15.0
	Agree	6	15.0	9	22.5	15	18.75
	Strongly Agree	10	25	7	17.5	17	21.25
Total		40	100	40	100	80	100
Chi-Square	Value = 51.170		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 51.170, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher had a lesson plan is highly significant.

Table 4.35 Teacher has followed the stages of the lesson

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has followed the stages of the lesson	Strongly Disagree	15	37.50	8	20.00	23	28.75
	Disagree	9	22.50	14	35.00	23	28.75
	Undecided	11	27.50	5	12.50	16	20.00
	Agree	2	5.00	8	20.00	10	12.50
	Strongly Agree	3	7.50	5	12.50	8	10.00
Total		40	100	40	100	80	100
Chi-Square	Value = 40.377		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 40.377, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has followed the stages of the lesson is highly significant.

Table 4.36 Teacher has used perfect teaching method in the class

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has used perfect teaching method in the class	Strongly Disagree	14	35.00	6	15.00	20	25.00
	Disagree	10	25.00	11	27.50	21	26.25
	Undecided	4	10.00	9	22.50	13	16.25
	Agree	7	17.50	8	20.00	15	18.75
	Strongly Agree	5	12.5	6	15.00	11	13.75
Total		40	100	40	100	80	100
Chi-Square	Value = 43.894		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 43.894, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has used perfect teaching method in the class is highly significant.

Table 4.37 Teacher has made students busy in during activities from the lesson between

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has made students busy in during Activities from the lesson	Strongly Disagree	13	32.50	10	25.00	23	28.75
	Disagree	11	27.50	11	27.50	22	27.50
	Undecided	7	17.50	6	15.00	13	16.25
	Agree	7	17.50	7	17.50	14	17.50
	Strongly Agree	2	5.00	6	15.00	8	10.00
Total		40	100	40	100	80	100
Chi-Square	Value = 16.123		DF = 16		**P-Value** = 3.444		

The table shows that the calculated χ^2 value was found to be 16.123, which is less than the table value with DF 16 (26.296). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement teacher has made students busy in during activities from the lesson is insignificant.

Table 4.38 Teacher has corrected students' mistakes gently

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has corrected students' mistakes gently	Strongly Disagree	12	30.00	12	30.00	24	30.00
	Disagree	6	15.00	10	25.00	16	20.00
	Undecided	7	17.50	4	10.00	11	13.75
	Agree	8	20.00	9	22.50	17	21.25
	Strongly Agree	7	17.50	5	12.50	12	15.00
Total		40	100	40	100	80	100
Chi-Square	Value =41.056		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 41.056, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has corrected students' mistakes gently is highly significant.

Table 4.39 Teacher has praised students

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has praised students	Strongly Disagree	11	27.50	17	42.50	28	34.00
	Disagree	12	30.00	9	22.50	21	26.25
	Undecided	8	20.00	6	15.00	14	17.50
	Agree	5	12.50	5	12.50	10	12.50
	Strongly Agree	4	10	3	7.50	7	8.75
Total		40	100	40	100	80	100
Chi-Square	Value = 34.691		DF = 16		**P-Value** = 0.004		

The table shows that the calculated χ^2 value was found to be 34.691, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has praised students is significant at the level of 5%.

Table 4.40 Teacher has used chalk board nicely

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has used chalk board nicely	Strongly Disagree	14	35.00	16	40.00	30	37.50
	Disagree	9	22.50	8	20.00	17	21.25
	Undecided	6	15.00	2	5.00	8	10.00
	Agree	6	15.00	11	27.50	17	21.25
	Strongly Agree	5	12.50	3	7.50	8	10.00
Total		40	100	40	100	80	100
Chi-Square	Value = 20.136		DF = 16		**P-Value** = 1.214		

The table shows that the calculated χ^2 value was found to be 20.136, which is less than the table value with DF 16 (26.296). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement teacher has used chalk board nicely is insignificant.

Table 4.41 Teacher has monitored the class

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has monitored the class	Strongly Disagree	15	37.50	11	27.50	26	32.50
	Disagree	9	22.50	9	22.50	18	22.50
	Undecided	5	12.50	5	12.50	10	12.50
	Agree	5	12.50	8	20.00	13	16.25
	Strongly Agree	6	15.00	7	17.50	13	16.25
Total		40	100	40	100	80	100
Chi-Square	Value = 29.570		DF = 16		**P-Value** = 0.006		

The table shows that the calculated χ^2 value was found to be 29.570, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has monitored the class is significant at the level of 10%.

Table 4.42 Technique of teacher switching from one section to another has been suitable

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Technique of teacher switching from one section to another has been suitable	Strongly Disagree	13	32.50	11	27.50	24	12.5
	Disagree	8	20.00	10	25.00	18	20
	Undecided	8	20.00	8	20.00	16	5
	Agree	6	15.00	7	17.50	13	32.5
	Strongly Agree	5	12.50	4	10.00	9	30
Total		40	100	40	100	80	100
Chi-Square	Value = 31.314		DF = 16		**P-Value** = 0.003		

The table shows that the calculated χ^2 value was found to be 31.314, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement technique of teacher switching from one section to another has been suitable is significant at the level of 5%.

Table 4.43 Teacher has maintained time properly

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teacher has maintained time properly	Strongly Disagree	11	27.50	14	35.00	25	31.25
	Disagree	9	22.50	5	12.50	14	17.50
	Undecided	6	15.00	3	7.50	9	11.25
	Agree	9	22.50	10	25.00	19	23.75
	Strongly Agree	5	12.50	8	20.00	13	16.25
Total		40	100	40	100	80	100
Chi-Square	Value = 33.838		DF = 16		**P-Value** = 0.005		

The table shows that the calculated χ^2 value was found to be 33.838, which is less than the table value with DF 16 (26.296). Then the null hypothesis is accepted. Therefore the difference between the school of urban and rural area of the statement teacher has maintained time properly is insignificant at the level of 5%.

Table 4.44 Teachers has given homework for his/her students

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Teachers has given homework for his/her students	Strongly Disagree	10	25.00	13	32.50	23	28.75
	Disagree	10	25.00	8	20.00	18	22.50
	Undecided	6	15.00	6	15.00	12	15.00
	Agree	8	20.00	8	20.00	16	20.00
	Strongly Agree	6	15.00	5	12.50	11	13.75
Total		40	100	40	100	80	100
Chi-Square	Value = 42.573		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 42.573, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement teacher has given students home work is highly significant.

Table 4.45 Students have looked jolly.

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Students have looked jolly	Strongly Disagree	11	27.50	13	32.50	24	30.00
	Disagree	5	12.50	9	22.50	14	17.50
	Undecided	4	10.00	6	15.00	10	12.50
	Agree	7	17.5	4	10.00	11	13.75
	Strongly Agree	13	32.50	8	20.00	21	26.25
Total		40	100	40	100	80	100
Chi-Square	Value = 43.831		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 43.831, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students have looked jolly is highly significant.

Table 4.46 Students have understood instructions

Statement	**Scale**	**Location**				**Total**	
		Urban		**Rural**		Frequency	%
		Frequency	%	Frequency	%		
Students have understood instructions	Strongly Disagree	4	10.00	14	35.00	18	22.50
	Disagree	5	12.50	14	35.00	19	23.75
	Undecided	0	0.00	3	7.50	3	3.75
	Agree	14	35.00	5	12.50	19	23.75
	Strongly Agree	17	42.50	4	10.00	21	26.25
Total		40	100	40	100	80	100
Chi-Square	Value = 35.722		DF = 12		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 35.722, which is greater than the table value with DF 12 (21.026). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students have understood instructions is highly significant.

Table 4.47 Students have told their difficulties to teacher

Statement	**Scale**	**Location**				**Total**	
		Urban		**Rural**		Frequency	%
		Frequency	%	Frequency	%		
Students have told their difficulties to teacher	Strongly Disagree	7	17.50	11	27.50	18	22.50
	Disagree	6	15.00	8	20.00	14	17.50
	Undecided	5	12.50	4	10.00	9	11.25
	Agree	10	25.00	9	22.50	19	23.75
	Strongly Agree	12	30.00	8	20.00	20	25.00
Total		40	100	40	100	80	100
Chi-Square	Value = 44.161		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 44.161, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students have told their difficulties to teacher is highly significant.

Table 4.48 Students were found interested in listening to the exercise

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Students were found interested in listening to the exercise	Strongly Disagree	7	17.50	12	30.00	19	23.75
	Disagree	3	7.50	10	25.00	13	16.25
	Undecided	5	12.50	7	17.50	12	15.00
	Agree	13	32.50	6	15.00	19	23.75
	Strongly Agree	12	30.00	5	12.50	17	21.25
Total		40	100	40	100	80	100
Chi-Square	Value = 46.154		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 46.154, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students were found interested in listening to the exercise is highly significant.

Table 4.49 Students have listened and answered questions

Statement	Scale	Location				Total	
		Urban		Rural			
		Frequency	%	Frequency	%	Frequency	%
Students have listened and answered questions	Strongly Disagree	9	22.50	12	30.00	21	26.25
	Disagree	6	15.00	13	32.50	19	23.75
	Undecided	7	17.50	4	10.00	11	13.75
	Agree	9	22.50	7	17.50	16	20.00
	Strongly Agree	9	22.50	4	10.00	13	16.25
Total		40	100	40	100	80	100
Chi-Square	Value = 44.834		DF = 16		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 44.834, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students have listened and answered questions is highly significant.

Table 4.50 Students have maintained classroom discipline

Statement	Scale	Location				Total	
		Urban		Rural		Frequency	%
		Frequency	%	Frequency	%		
Students have maintained classroom discipline	Strongly Disagree	6	15.00	14	35.00	20	25.00
	Disagree	4	10.00	9	22.50	13	16.25
	Undecided	7	17.50	6	15.00	13	16.25
	Agree	11	27.50	5	12.50	16	20.00
	Strongly Agree	12	30.00	6	15.00	18	22.5
Total		40	100	40	100	80	100
Chi-Square	Value = 29.809		DF = 16		**P-Value** = 0.009		

The table shows that the calculated χ^2 value was found to be 29.809, which is greater than the table value with DF 16 (26.296). Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students have maintained classroom discipline is significant at the level of 10%.

Table 4.51 Students' motivation towards learning was found satisfactory

Statement	Scale	Location				Total	
		Urban		Rural			
		Frequency	%	Frequency	%	Frequency	%
Students' motivation towards learning was found satisfactory	Strongly Disagree	8	20.00	9	22.50	17	21.25
	Disagree	14	35.00	7	17.50	21	26.25
	Undecided	0	0.00	6	15.00	6	7.50
	Agree	13	32.50	8	20.00	21	26.25
	Strongly Agree	5	12.50	10	25.00	15	18.75
Total		40	100	40	100	80	100
Chi-Square	Value = 43.200		DF = 12		**P-Value** = 0.000		

The table shows that the calculated χ^2 value was found to be 43.200, which is greater than the table value with DF 16 (26.296) at 5% level of significant. Then the null hypothesis is rejected. Therefore the difference between the school of urban and rural area of the statement students' motivation towards learning was found satisfactory is highly significant.

Chapter 5
Impact of Selected Variables on the Results of Mathematics in SSC Examination: Multivariate Analysis

5.1 SSC Results of Last Five Years (2008-2012) of the Selected Schools in Study Area

The SSC results of last five years 2008, 2009, 2010, 2011 and 2012 of the selected 20 urban schools and 20 rural schools have been presented in this chapter.

5.1.1 School of Urban Area

The schools of urban area are Taherpur High School (U1), Bhabanigonj Government High School (U2), Bhabanigonj Government Girl's High School (U3), Taherpur Girls High School (U4), Rajshahi University School (U5), Government Labratory High school (U6), Rajshahi Collegiate School (U7), Government P.N Girl's High School (U8), Rajshahi Government. Girl's High School (U9), Housing Estate Girls High School (U10), Hamidpur Naodapara High School (U11), Shahid Nazmul Haque Girls High School (U12), Mirzapur High School and College (U13), Naodapara Girls High School (U14), Keshorehat High School (U15), Mohonpur Government High School (U16), Basantakeder High School (U17), Tanore Paurashava High School (U18), Tanore Girls High School (U19) and Tanor Pilot High School (U20).

Table 5.1 SSC Results of Urban Area

Name of the Schools	Year	Total Examinee	Total Pass	Total Fail	Fail in Mathematics	Pass in Mathematics	Rate of Pass in Mathematics
1. Taherpur High School (U1)	2008	139	64	75	30	109	78.42
	2009	149	59	90	35	114	76.51
	2010	167	123	44	18	149	89.22
	2011	151	121	30	12	139	92.05
	2012	121	103	18	9	112	92.56
2. Bhabanigonj Government High School (U2)	2008	64	41	23	16	48	75.00
	2009	59	37	22	14	45	76.27
	2010	82	69	13	7	75	92.46
	2011	63	50	13	9	54	85.71
	2012	58	58	0	0	58	100.00
3. Bhabanigonj Government Girl's High School (U3)	2008	58	55	3	0	58	100.00
	2009	62	57	5	0	62	100.00
	2010	69	58	1	0	69	100.00
	2011	56	53	3	0	56	100.00
	2012	49	45	3	0	49	100.00
4. Taherpur Girls High School (U4)	2008	43	16	27	19	24	55.81
	2009	36	11	25	17	19	52.78
	2010	51	22	29	13	38	74.51
	2011	78	68	10	3	75	96.15
	2012	37	35	2	0	37	100.00
5. Rajshahi University School (U5)	2008	110	103	7	0	110	100.00
	2009	119	111	8	0	119	100.00
	2010	124	122	2	0	124	100.00
	2011	128	128	0	0	128	100.00
	2012	131	129	2	0	131	100.00
6. Government Labratory High school (U6)	2008	82	82	0	0	82	100.00
	2009	76	76	0	0	76	100.00
	2010	99	99	0	0	99	100.00
	2011	103	103	0	0	103	100.00
	2012	108	108	0	0	108	100.00
7. Rajshahi Collegiate School (U7)	2008	272	254	18	2	270	99.26
	2009	207	206	1	0	207	100.00
	2010	208	208	0	0	208	100.00
	2011	172	172	0	0	172	100.00
	2012	201	201	0	0	201	100.00
8. Government P.N Girl's High School (U8)	2008	274	267	7	0	274	100.00
	2009	186	185	1	0	186	100.00
	2010	265	265	0	0	265	100.00
	2011	287	287	0	0	287	100.00
	2012	216	216	0	0	216	100.00
9. Rajshahi Government. Girl's High School (U9)	2008	139	136	3	0	139	100.00
	2009	116	114	2	0	116	100.00
	2010	120	120	0	0	120	100.00
	2011	148	147	1	0	148	100.00
	2012	138	138	0	0	138	100.00
10. Housing Estate Girls High School (U10)	2008	17	15	02	0	17	100.00
	2009	19	15	04	0	19	100.00
	2010	22	21	01	0	22	100.00
	2011	23	18	05	0	23	100.00
	2012	41	29	12	3	38	92.68
11. Hamidpur Naodapara High School (U11)	2008	55	44	11	2	53	96.36
	2009	81	52	29	11	70	86.42
	2010	81	75	06	0	81	100.00
	2011	64	57	07	0	64	100.00
	2012	69	57	12	2	67	97.10

12. Shahid Nazmul Haque Girls High School (U12)	2008	142	108	34	14	128	90.14
	2009	143	105	38	18	125	87.41
	2010	116	111	05	0	116	100.00
	2011	106	99	07	0	106	100.00
	2012	128	127	01	0	128	100.00
13. Mirzapur High School & College (U13)	2008	79	34	45	17	62	78.48
	2009	78	31	47	29	49	62.82
	2010	104	84	20	14	90	86.54
	2011	84	48	36	23	61	72.62
	2012	77	55	12	5	72	93.51
14. Naodapara Girls High School (U14)	2008	44	34	10	2	42	95.45
	2009	48	24	24	11	37	77.08
	2010	85	55	30	16	69	81.18
	2011	67	46	21	12	55	82.08
	2012	63	49	14	8	55	87.03
15. Keshorehat High School (U15)	2008	42	37	05	0	42	100.00
	2009	36	33	03	0	36	100.00
	2010	45	44	01	0	45	100.00
	2011	35	32	03	0	35	100.00
	2012	29	28	01	0	29	100.00
16. Mohonpur Government High School (U16)	2008	104	90	14	1	103	99.03
	2009	95	78	17	2	93	97.89
	2010	93	90	03	0	93	100.00
	2011	98	97	01	0	98	100.00
	2012	91	90	01	0	91	100.00
17. Basantakeder High School (U17)	2008	69	30	39	26	43	62.32
	2009	103	38	65	40	63	61.17
	2010	98	86	12	5	93	94.90
	2011	66	55	11	3	63	95.45
	2012	66	63	03	0	66	100.00
18. Tanore Paurashava High School (U18)	2008	70	42	28	5	65	92.86
	2009	62	42	20	6	56	90.32
	2010	80	78	2	0	80	100.00
	2011	78	56	22	4	74	94.87
	2012	116	108	8	0	116	100.00
19. Tanore Girls High School (U19)	2008	59	40	19	4	55	93.22
	2009	46	38	8	3	43	93.48
	2010	68	56	12	5	63	92.65
	2011	62	55	7	2	60	96.78
	2012	42	33	09	1	41	97.62
20. Tanore Pilot High School (U20)	2008	56	35	21	6	50	89.29
	2009	43	23	20	8	35	81.40
	2010	47	37	10	3	44	93.61
	2011	36	25	11	2	34	94.44
	2012	59	51	8	0	59	100.00

The above table represents the total examinee, total pass, total fail, fail in mathematics, pass in mathematics and rate of pass in mathematics subject of the selected school of last five year (2008, 2009, 2010, 2011 and 2012) of the study area. [U1 U2, U3…….U20] represent the urban area and number of schools. The results of Government high schools are almost same and strongly satisfactory but the results of Non-government high schools are not so satisfactory.

5.1.2 School of Rural Area

The selected schools of Rural area are Hat Madh Nagar High School (R1), Nardas ML. High School (R2), Mirpur High School (R3), Panishail High School(R4), Boilshing High School(R5), Bagmara ML. High School(R6), Jhikra High School (R7), Ekdala High School (R8), Konda High School (R9), Jamgram High School (R10), Karisha High School (R11), Jahanabad High School (R12), Dhopaghata A.K High School (R13), Mahish Kundi High School (R14), Dr. Abubakar High School (R15), Chandpur High School (R16), Chapra high School (R17), Hatishal High School (R18), Kamargaon High School (R19), Kaligonjhat High School (R20).

Table 5.2 SSC Results of Rural Area

Name of the Schools	Year	Total Examinee	Total Pass	Total Fail	Fail in Mathematics	Pass in Mathematics	Rate of Pass in Mathematics
1. Hat Madh Nagar High School (R1)	2008	46	25	21	16	30	65.22
	2009	31	19	12	8	23	74.20
	2010	37	22	15	6	31	83.78
	2011	26	18	08	3	23	88.46
	2012	28	23	05	2	26	92.86
2. Nardas ML. High School (R2)	2008	69	56	13	7	62	89.86
	2009	72	58	14	9	63	87.50
	2010	70	50	20	11	59	84.29
	2011	57	46	11	5	52	91.23
	2012	61	53	08	5	56	91.80
3. Mirpur High School (R3)	2008	26	14	12	0	26	100.00
	2009	22	16	08	6	16	72.73
	2010	27	15	12	0	27	100.00
	2011	20	13	07	4	16	80.00
	2012	19	14	05	4	15	78.95
4. Panishail High School (R4)	2008	32	22	10	9	23	71.88
	2009	37	26	11	6	31	83.78
	2010	41	32	09	5	36	87.80
	2011	44	40	4	0	44	100.00
	2012	30	17	13	6	24	80.00
5. Boilshing High School (R5)	2008	27	13	14	8	19	70.37
	2009	23	12	11	0	23	100.00
	2010	19	14	5	4	15	78.95
	2011	25	12	13	8	17	68.00
	2012	32	20	12	5	27	84.38

6. Bagmara ML. High School (R6)	2008	87	69	18	12	75	86.21
	2009	77	54	23	17	60	77.92
	2010	76	61	15	12	64	84.21
	2011	83	67	16	10	73	87.95
	2012	79	62	17	7	72	91.14
7. Jhikra High School (R7)	2008	24	13	11	6	18	75.00
	2009	22	12	10	7	15	68.18
	2010	19	15	04	3	16	84.21
	2011	27	18	09	6	21	77.78
	2012	34	26	08	2	32	94.12
8. Ekdala High School (R8)	2008	57	39	18	11	46	80.70
	2009	53	45	8	0	53	100.00
	2010	43	31	12	0	43	100.00
	2011	38	35	03	0	38	100.00
	2012	45	30	15	9	36	60.00
9. Konda High School (R9)	2008	65	50	15	11	54	83.08
	2009	54	37	17	12	42	77.78
	2010	52	39	13	8	44	84.62
	2011	41	29	12	7	34	82.93
	2012	37	23	14	8	29	78.38
10.Jamgram High School (R10)	2008	18	10	08	5	13	72.22
	2009	21	11	10	8	13	61.90
	2010	25	16	09	7	18	72.00
	2011	29	17	12	5	24	82.76
	2012	36	20	16	10	26	72.22
11. Karisha High School (R11)	2008	43	36	07	4	39	90.70
	2009	69	43	26	15	54	78.26
	2010	97	77	20	13	84	86.60
	2011	91	61	30	21	70	76.92
	2012	94	81	13	8	86	91.49
12. Jahanabad High School (R12)	2008	80	54	26	17	63	78.75
	2009	94	61	33	22	72	76.60
	2010	96	88	8	3	93	96.88
	2011	83	70	13	9	74	89.16
	2012	88	69	19	13	75	85.23
13. Dhopaghata A.K High School (R13)	2008	140	89	51	42	98	70.00
	2009	95	53	42	31	64	67.37
	2010	81	69	12	3	78	96.30
	2011	58	43	15	6	52	89.66
	2012	75	65	10	6	69	92.00
14. MahishKundi High School (R14)	2008	52	41	11	7	45	86.54
	2009	57	43	14	8	49	85.96
	2010	63	49	14	9	54	85.71
	2011	43	36	07	4	39	90.70
	2012	55	39	16	10	45	81.81
15. Dr. Abubakar High School (R15)	2008	32	20	12	7	25	78.13
	2009	40	20	20	13	27	67.50
	2010	52	51	01	1	51	98.08
	2011	62	55	07	5	57	91.94
	2012	58	55	03	0	58	100.00

16. Chandpur High School (R16)	2008	49	45	4	0	49	100.00
	2009	53	46	7	0	53	100.00
	2010	36	27	09	5	31	86.11
	2011	31	21	10	6	25	80.65
	2012	34	22	12	8	26	76.47
17. Chapra high School (R17)	2008	46	40	6	0	46	100.00
	2009	32	22	10	5	27	84.38
	2010	31	27	04	3	28	90.32
	2011	20	20	00	0	20	100.00
	2012	32	32	00	0	32	100.00
18. Hatishal High School (R18)	2008	32	15	17	13	19	59.37
	2009	35	19	16	9	26	74.29
	2010	31	21	10	7	24	77.42
	2011	50	30	20	16	34	68.00
	2012	23	21	2	0	23	100.00
19. Kamargaon High School (R19)	2008	44	27	17	12	32	72.73
	2009	50	37	19	13	37	74.00
	2010	56	35	21	14	42	75.00
	2011	51	34	17	9	42	82.35
	2012	49	28	21	14	35	71.43
20. Kaligonjhat High School (R20)	2008	26	13	13	10	16	61.53
	2009	28	12	16	7	21	75.00
	2010	32	27	5	3	29	90.63
	2011	33	29	04	0	33	100.00
	2012	25	24	01	0	25	100.00

The table indicates the total examinee, total pass, total fail, fail in mathematics, pass in mathematics and rate of pass in mathematics subject of the selected schools of last five years (2008, 2009, 2010, 2011 and 2012) in the study area. [R1 R2, R3…….R20] represent the rural area and number of schools. The results of mathematics subject of the selected rural schools are not so satisfactory.

5.1.3 Impact of Educational Qualification of Teacher on SSC Results

The impact on SSC results of last five years of the selected 20 urban and 20 rural schools. Educational qualification of teachers has positive impact on the SSC Results.

Table 5.3 Impact of Educational Qualification

Educational Qualification	Urban Area					Educational Qualification	Rural Area				
	Last Five Year Result of the SSC Examination Pass in Mathematics %						Last Five Year Result of the SSC Examination Pass in Mathematics %				
B.Sc	2008	2009	2010	2011	2012	B.Sc	2008	2009	2010	2011	2012
U1	78.42	76.51	89.22	92.05	92.56	R1	65.22	74.20	83.78	88.46	92.86
U2	75.00	76.27	92.46	85.71	100.00	R2	89.86	87.50	84.29	91.23	91.80
U4	55.81	52.78	74.51	96.15	100.00	R4	71.88	83.78	87.80	100.00	80.00
U11	96.36	86.42	100.00	100.00	97.10	R5	70.37	100.00	78.95	68.00	84.38
U12	90.14	87.41	100.00	100.00	100.00	R6	86.21	77.92	84.21	87.95	91.14
U13	78.48	62.82	86.54	72.62	93.51	R7	75.00	68.18	84.21	77.78	94.12
U14	95.45	77.08	81.18	82.08	87.03	R9	83.08	77.78	84.62	82.93	78.38
U17	62.32	61.17	94.90	95.45	100.00	R10	72.22	61.90	72.00	82.76	72.22
U18	92.86	90.32	100.00	94.87	100.00	R11	90.70	78.26	86.60	76.92	91.49
U19	93.22	93.48	92.65	96.78	97.62	R12	78.75	76.60	96.88	89.16	85.23
U20	89.29	81.40	93.61	94.44	100.00	R13	70.00	67.37	96.30	89.66	92.00
M.Sc						R14	86.54	85.96	85.71	90.70	81.81
U3	100.00	100.00	100.00	100.00	100.00	R15	78.13	67.50	98.08	91.14	100.00
U5	100.00	100.00	100.00	100.00	100.00	R17	100.00	84.38	90.32	100.00	100.00
U6	100.00	100.00	100.00	100.00	100.00	R18	59.37	74.29	77.42	68.00	100.00
U7	99.26	100.00	100.00	100.00	100.00	R19	72.73	74.00	75.00	82.35	71.43
U8	100.00	100.00	100.00	100.00	100.00	M. Sc					
U9	100.00	100.00	100.00	100.00	100.00	R3	100.00	72.73	100.00	80.00	78.95
U10	100.00	100.00	100.00	100.00	92.68	R8	80.70	100.00	100.00	100.00	60.00
U15	100.00	100.00	100.00	100.00	100.00	R16	100.00	100.00	86.11	80.65	76.47
U16	99.03	97.89	100.00	100.00	100.00	R20	61.53	75.00	90.63	100.00	100.00

The table shows the impact of educational qualification of mathematics teachers of the study area. Here 9 teachers of urban schools U3, U5, U6, U7, U8, U9, U10, U15, U16 and 4 teachers of rural schools R3, R8, R16, R20 have M.Sc degree and the results of those schools are satisfactory in different years. So the impact of educational qualification on the SSC result is positive.

5.1.4 Impact of Professional Training of Teacher's on SSC Result

Table 5.4 Impact of Professional Training

Professional Training	Urban Area					Professional Training	Rural Area				
	Last Five Year Result of the SSC Examination Pass in Mathematics %						Last Five Year Result of the SSC Examination Pass in Mathematics %				
Having B. Ed	2008	2009	2010	2011	2012	Having B. Ed	2008	2009	2010	2011	2012
U1	78.42	76.51	89.22	92.05	92.56	R2	89.86	87.50	84.29	91.23	91.80
U3	100.00	100.00	100.00	100.00	100.00	R3	100.00	72.73	100.00	80.00	78.95
U5	100.00	100.00	100.00	100.00	100.00	R7	75.00	68.18	84.21	77.78	94.12
U6	100.00	100.00	100.00	100.00	100.00	R8	80.70	100.00	100.00	100.00	60.00
U7	99.26	100.00	100.00	100.00	100.00	R11	90.70	78.26	86.60	76.92	91.49
U8	100.00	100.00	100.00	100.00	100.00	R15	78.13	67.50	98.08	91.14	100.00
U9	100.00	100.00	100.00	100.00	100.00	R16	100.00	100.00	86.11	80.65	76.47
U10	100.00	100.00	100.00	100.00	92.68	R17	100.00	84.38	90.32	100.00	100.00
U12	90.14	87.41	100.00	100.00	100.00	R18	59.37	74.29	77.42	68.00	100.00
U14	95.45	77.08	81.18	82.08	87.03	Not Having B. Ed	78.75	76.60	96.88	89.16	85.23
U15	100.00	100.00	100.00	100.00	100.00	R1	65.22	74.20	83.78	88.46	92.86
U16	99.03	97.89	100.00	100.00	100.00	R4	71.88	83.78	87.80	100.00	80.00
U18	92.86	90.32	100.00	94.87	100.00	R5	70.37	100.00	78.95	68.00	84.38
Not Having B. Ed	100.00	100.00	100.00	100.00	100.00	R6	86.21	77.92	84.21	87.95	91.14
U2	75.00	76.27	92.46	85.71	100.00	R9	59.37	74.29	77.42	68.00	100.00
U4	55.81	52.78	74.51	96.15	100.00	R10	72.22	61.90	72.00	82.76	72.22
U11	96.36	86.42	100.00	100.00	97.10	R12	78.75	76.60	96.88	89.16	85.23
U13	78.48	62.82	86.54	72.62	93.51	R13	70.00	67.37	96.30	89.66	92.00
U17	62.32	61.17	94.90	95.45	100.00	R14	86.54	85.96	85.71	90.70	81.81
U19	93.22	93.48	92.65	96.78	97.62	R19	72.73	74.00	75.00	82.35	71.43
U20	89.29	81.40	93.61	94.44	100.00	R20	61.53	75.00	90.63	100.00	100.00

The table shows the professional training of mathematics teacher of the study area. Here 13 teachers of urban schools U1, U3, U5, U6, U7, U8, U9, U10, U12, U14, U15, U16, U18 and 9 teachers of rural schools R2, R3, R7, R8, R11, R15, R16, R17, R18 have B.Ed training and the result of those schools is satisfactory in different year. So the impact of professional training on the SSC result is positive.

5.1.5 Impact of Time Allocation of Teachers on SSC Result

Table 5.5 Impact of Time Allocation

Time Allocation	Urban Area					Time Allocation	Rural Area				
	Last Five Year Results of the SSC Examination Pass in Mathematics %						Last Five Year Result of the SSC Examination Pass in Mathematics %				
Time Maintain Properly	2008	2009	2010	2011	2012	Time Maintain Properly	2008	2009	2010	2011	2012
U3	100.00	100.00	100.00	100.00	100.00	R3	100.00	72.73	100.00	80.00	78.95
U5	100.00	100.00	100.00	100.00	100.00	R8	80.70	100.00	100.00	100.00	60.00
U6	100.00	100.00	100.00	100.00	100.00	R15	78.13	67.50	98.08	91.14	100.00
U7	99.26	100.00	100.00	100.00	100.00	R16	100.00	100.00	86.11	80.65	76.47
U8	100.00	100.00	100.00	100.00	100.00	R17	100.00	84.38	90.32	100.00	100.00
U9	100.00	100.00	100.00	100.00	100.00	R20	61.53	75.00	90.63	100.00	100.00
U10	100.00	100.00	100.00	100.00	92.68	Time not Maintain Properly	83.08	77.78	84.62	82.93	78.38
U11	96.36	86.42	100.00	100.00	97.10	R1	65.22	74.20	83.78	88.46	92.86
U12	90.14	87.41	100.00	100.00	100.00	R2	89.86	87.50	84.29	91.23	91.80
U15	100.00	100.00	100.00	100.00	100.00	R4	71.88	83.78	87.80	100.00	80.00
U16	99.03	97.89	100.00	100.00	100.00	R5	70.37	100.00	78.95	68.00	84.38
Time not Maintain Properly						R6	86.21	77.92	84.21	87.95	91.14
U1	78.42	76.51	89.22	92.05	92.56	R7	75.00	68.18	84.21	77.78	94.12
U2	75.00	76.27	92.46	85.71	100.00	R9	59.37	74.29	77.42	68.00	100.00
U4	55.81	52.78	74.51	96.15	100.00	R10	72.22	61.90	72.00	82.76	72.22
U13	78.48	62.82	86.54	72.62	93.51	R11	90.70	78.26	86.60	76.92	91.49
U14	95.45	77.08	81.18	82.08	87.03	R12	78.75	76.60	96.88	89.16	85.23
U17	62.32	61.17	94.90	95.45	100.00	R13	70.00	67.37	96.30	89.66	92.00
U18	92.86	90.32	100.00	94.87	100.00	R14	86.54	85.96	85.71	90.70	81.81
U19	93.22	93.48	92.65	96.78	97.62	R18	59.37	74.29	77.42	68.00	100.00
U20	89.29	81.40	93.61	94.44	100.00	R19	72.73	74.00	75.00	82.35	71.43

The table shows the time allocation (maintain class time properly) of mathematics teachers of the study area. Here 11 teachers of urban schools (U3, U5, U6, U7, U8, U9, U10, U11, U12, U15, U16) and 6 teachers of rural schools (R3, R8, R15, R16, R17, R20) maintain class time properly and the results of those schools are satisfactory in different years. So the impact of time allocation on the SSC result is positive.

5.2 Association of the SSC results between having B. Sc and M. Sc degrees of educational qualification of the teachers of urban area

5.2.1 Urban Area

Table 5.6 Association of Educational Qualification of Urban Area

Year	Total Examine of the institution those teacher have B. Sc degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have M. Sc degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	**P Value**
2008	820	679	82.80	186	1098	1095	99.73	3	.005
2009	848	656	77.36	220	916	914	99.78	2	.001
2010	979	898	89.73	159	1045	1045	100.00	0	.002
2011	855	785	89.81	185	1050	1050	100.00	0	.003
2012	836	811	97.01	109	1004	1001	99.70	3	.023
Total	4338	3829	87.34	859	5113	5105	99.84	08	.000

The table represents that the different of SSC result between having B. Sc and M. Sc degree have significance difference of urban area. The significance of the year 2008 is 5%, 2009 is 1%, 2010 is 2% level and 2011 is 3% level but 2012 is not significant.

5.2.2 Rural Area

Table 5.7 Association of Educational Qualification of Rural Area

Year	Total Examine of the institution those teacher have B. Sc degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have M. Sc degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	P Value
2008	837	661	78.97	176	158	137	90.71	21	.003
2009	809	626	77.38	183	156	143	91.67	13	.002
2010	846	738	87.23	109	138	130	94.20	8	.008
2011	790	676	85.57	114	122	112	91.80	10	.034
2012	812	715	88.05	96	123	102	82.93	21	.567
Total	4094	3416	83.44	678	697	624	90.26	73	.000

The table represents that the different of SSC result between having B. Sc and M. Sc degree have significance difference of rural area. The significance of the year 2008 is 3%, 2009 is 2%, 2010 is 8% level but 2011 and 2012 is not significant.

5.3 Association of the SSC result between having B. Ed and not having B. Ed degree of professional training of the teachers of urban area

Table 5.8 Association of professional training Urban Area

Year	Total Examine of the institution those teacher have B. Ed degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have not B. Ed degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	P Value
2008	1493	1439	96.38	54	425	335	78.82	90	.001
2009	1318	1246	94.54	72	446	324	72.65	122	.002
2010	1491	1459	97.85	34	531	484	94.34	47	.789
2011	1461	1424	97.47	28	453	411	89.72	42	.467
2012	1432	1412	98.60	20	408	400	98.04	8	.999
Total	7195	6980	96.97	208	2263	1954	86.71	309	.000

The table represents that the different of SSC result between having B.Ed and not having B.Ed degree have significance difference of urban area. The significance of the year 2008 is 1%, 2009 is 2% level but 2010, 2011, 2012 are not significant.

Table 5.9 Association of professional training Rural Area

Year	Total Examine of the institution those teacher have B. Ed degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have not B. Ed degree	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	P Value
2008	378	330	90.30	48	617	461	74.72	149	.003
2009	398	334	83.92	64	567	435	76.72	132	.431
2010	406	363	90.41	43	578	504	87.20	74	.563
2011	396	333	84.10	63	516	455	88.18	61	.076
2012	400	364	91.00	36	534	453	84.84	81	.007
Total	1978	1724	87.95	254	2812	2308	82.33	497	.001

The table represents that the different of SSC result between having B. Ed and not having B. Ed degree have significance difference of rural area. The significance of the year 2008 is 1%, 2012 is 7% level but 2009, 2010, 2011 are not significant.

5.4 Association of the SSC result between those institute maintain time properly and those institute not maintain time properly of the teachers of urban area

Table 5.10 Association of maintain time properly Urban Area

Year	Total Examine of the institution those teacher maintain time properly	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have not maintain time properly	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	P Value
2008	1295	1276	98.53	19	623	498	79.94	125	.001
2009	1140	1109	97.28	31	624	461	73.88	163	.002
2010	1242	1242	100.00	0	782	701	89.64	81	.002
2011	1220	1220	100.00	0	685	615	89.78	70	.001
2012	1201	1196	99.58	5	639	616	96.40	23	.078
Total	6098	6043	99.08	55	3353	2891	85.93	462	.000

The table represents that the different of SSC result between maintain time properly and not maintain time properly have significance difference of urban area. The significance of the year 2008 is 1%, 2009 is 2%, 2010 is 2%and 2011 is 1% level but 2012 is not significant.

Table 5.11 Association of maintain time properly Rural Area

Year	Total Examine of the institution those teacher maintain time properly	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	Total Examine of the institution those teacher have not maintain time properly	Pass in Mathematics	Pass % in Mathematics	Fail in Mathematics	P Value
2008	236	208	90.14	28	759	590	77.73	169	.000
2009	228	197	86.40	31	737	572	77.61	165	.009
2010	221	209	94.57	12	763	658	86.24	105	.008
2011	204	189	92.65	15	708	599	84.60	109	.014
2012	213	192	90.14	21	721	625	86.69	96	.056
Total	1102	995	90.78	107	3688	3044	82.57	644	.000

The table represents that the different of SSC result between maintain time properly and not maintain time properly have significance difference of rural area. The significance of the year 2008 is 0%, 2009 is 9%, 2010 is 8% and 2011 is 14% level but 2012 is not significant.

5.5 Logistic Regression Estimates on the Selected Variables (Educational Qualification, Professional Training and Time Allocation).

5.5.1 Data and Methodology

The study has utilized data which are collected from 20 urban and 20 rural areas schools. The binary logistic regression model is being used in different areas and has become the standard method of analyzing in which the dependency of a binary response variable is being tested on a number of explanatory variables. Suppose that a response (dependent) variable Y can take one of the two values “0” or “1”. Variables of this type are often called binary or dichotomous variables. For dichotomous variables such as Y, one object is to develop a method for estimating π, where π is the probability of occurrence of an event as a function of a number of independent variables. It has been shown, theoretically

and empirically, that when the dependent variable is dichotomous, the shape of the response function is frequently curvilinear. The logistic regression model is a curvilinear response function, which has been found to be appropriate in many cases involving a binary dependent variable. This response function assures that the estimated value of π (Probability of occurrence of an event) is always between 0 and 1.

5.5.2 Description of the Model Variables

5.5.2.1 Educational Qualification

From the data it is observed that the SSC result of mathematics subject is affected by the educational qualification of mathematics teacher, which inspired to include this variable in the model analysis. To compare the differential of educational qualification the researcher differentiate it into two types B. Sc and M. Sc. Education qualification of M. Sc degree (X_1) is incorporated in the model through indicator variable '1' and '0' indicating the presence and absence of M. Sc degree.

5.5.2.2 Professional Training

Professional training is necessary for teaching mathematics subject. But training is an important factor, which influence teaching skills. The researcher observed that many teacher of secondary school have B.Ed degree in the study area. B.Ed degree (X_2) of professional training considered as an indicator variable assuming two values '1' and '0' including the presence and absence of B.Ed degree.

5.5.2.3 Time Allocation

Time maintaining is one of the important indicators for teaching mathematics. Many teachers cannot maintain class time properly; they inter their class in late and finished the class early which affects the teaching mathematics and the SSC result. Time allocation(X_3) is considered as an indicator variable, which assumes two values '1' and '0' corresponding to the time maintain properly and time not maintain properly.

5.6 Development of the Model

In this study the dependent variable is the SSC result of mathematics subject (Y) which is taken to be dichotomous one. It indicates the SSC result of last five year (2008, 2009, 2010, 2011 and 2012) of the study area. It takes the value one (Y=1) with probability π (say) if the result of SSC of mathematics subject is pass or (Y=0) if the result is fail with probability 1-π. Here an attempt has been made to examine the relationship between a dichotomous dependent variable (SSC result) and a set of explanatory variables as selected and discussed earlier. The main feature of the analysis is to identify the factors that affect the SSC result of the study area. In order to get the solution of the above problem, a well-known and now-a-days widely used statistical technique (multiple binary logistic regression model is used.

The regression coefficient β_j can be obtained with the help of maximum likelihood estimation from the log-likelihood function suggested by Cox and is given by

$$Log_e L(\beta_0, \beta_1, \beta_2, \ldots\ldots\ldots\ldots \beta_k) = \sum_{j=0}^{k} \beta_j t_j - \sum_{i=1}^{n} \log_e \left\{ 1 + \exp\left(Y_i \sum_{j=0}^{k} \beta_j X_{ij} \right) \right\}$$

$t_j = \sum_{i=1}^{n} X_{ij} Y_{i,} \; j = 0,1,2\ldots\ldots\ldots\ldots\ldots k,$ and n is the number of respondents.

But we utilize the computer package SPSS (Statistical Package for Social Sciences) for windows base 16.0 version and the binary logistic regression parameters β_j **'s** were iteratively solved with the help of this package program.

Since the dependent variable Y_i is coded as '1' if the result of SSC examination of mathematics subject is pass and '0' if the result is fail, positive coefficient indicates that the result is success or pass and on the other hand negative coefficient indicates that the result is not success. In order to obtain the increment of the regression we have calculated odds ratio of the j^{th} regression which is the antilog of the j^{th} slop coefficient.

5.7 Logistic Regression Estimates of Background Characteristics Educational Qualification (E.Q), Professional Training (P.T), Time Allocation (T.A), Type of Schools (T.S) and Location of Schools (L.S) on the SSC Result (2008, 2009, 2010, 2011 and 2012) of the Study Area

Table 5.12 Logistic Regression

Background Characteristics (variable)	Scale	Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
1. SSC Result 2008, Pass in Mathematics				
Urban Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	20.339	0.001	6.809
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	0.192	--	1.212
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	0.177	0.003	0.577
Type of School	[1.00=government, 0.00=non-government,]	0.916	0.004	2.500
Rural Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	0.693	0.008	2.000
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Eddegree]	19.829	--	4.091
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	20.406	0.000	7.280
2. SSC Result 2009, Pass in Mathematics				
Urban Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	20.107	0.002	5.400
Professional Training	[1.00=having B.Ed degree, 0.00= not having B.Ed degree]	0.496	0.012	1.642
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	0.288	0.007	1.333
Type of School	[1.00=government,0.00=non-government]	1.792	0.009	6.000
Rural Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	20.131	0.000	5.553
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	0.547	0.016	0.729
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	-17.794	--	1.872
3. SSC Result 2010, Pass in Mathematics				
Urban Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	-38.727	0.000	0.511

Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	19.476	0.007	2.872
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	39.827	0.002	1.978
Type of School	[1.00=government, 0.00=non-government]	1.792	0.013	6.000
Rural Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	23.058	0.003	1.033
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	19.545	0.005	3.204
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	--1.895	0.006	0.150
4. SSC Result 2011, Pass in Mathematics				
Urban Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	-31.892	0.000	0.213
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	17.765	0.008	3.729
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	33.264	0.017	1.327
Type of School	[1.00=government, 0.00=non-government]	2.672	0.004	7.000
Rural Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	-.693	0.011	0.500
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	-19.909	0.000	2.258
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	22.106	0.000	3.986
5. SSC Result 2012, Pass in Mathematics				
Urban Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	-1.218	0.001	0.296
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	1.552	0.006	4.719
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	0.458	0.023	1.581
Type of School	[1.00=government , 0.00=non-government]	2.514	0.020	12.359
Rural Area				
Educational Qualification	[1.00=M.Sc, 0.00=B.Sc]	-20.782	0.000	9.423
Professional Training	[1.00=having B.Ed degree, 0.00=not having B.Ed degree]	-0.109	0.032	0.897
Time Allocation	[1.00= time maintain properly, 0.00=time not maintain properly]	22.300	0.000	4.837

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2008 are calculated for the urban area. Considering professional training as reference category, the regression coefficients of teacher corresponding to educational qualification, professional training, time allocation and type of schools are 20.339, 0.192, 0.177 and 0.916 respectively and these are positive in sign of urban area. The result illustrate that the impact of educational qualification, professional training, time allocation and type of schools on the SSC result 2008 are positive and the result are statistically significant. The odds ratio corresponding to the variables educational qualification and type of schools are 6.809, and 2.500 respectively. It indicates that the variables educational qualification and type of schools have 6.809 and 2.500 times higher impact on the SSC result 2008 than that of variable professional training (reference category). On the contrary, the odds ratio time allocation is 0.577. It indicates that the time allocation have (1-0.577)x100=42.3% lower impact as compared to the coefficient professional training on the SSC result of the year 2008 in the school of urban area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2008 are calculated for the rural area. Considering professional training as reference category, the regression coefficients of teacher corresponding to educational qualification, professional training and time allocation are 0.693, 19.829 and 20.406 respectively and these are positive in sign of rural area. The result illustrate that the impact of educational qualification, professional training and time allocation on the SSC result 2008 are positive and the result are statistically significant. The odds ratio corresponding to the variables educational qualification and time allocation are 2.000, and 7.280 respectively. It indicates that the variables educational qualification and time allocation have 2.000 and 7.280 times higher impact on the SSC result 2008 than that of variable professional training (reference category).

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2009 are calculated for the urban area. Considering professional training as reference category, the regression coefficients of teacher corresponding to educational qualification, professional training, time allocation and type of schools are 20.107, 0.496, 0.288 and 1.792 respectively and these are positive in sign of urban area. The result illustrate that the impact of educational qualification, professional training, time allocation and type of schools on the SSC result 2009 are positive and the result are statistically significant. The odds ratio corresponding to the variables educational qualification, time allocation and type of schools are 5.400, 1.333 and 6.000 respectively. It indicates that the variables educational qualification time allocation and type of schools have 5.400, 1.333 and 6.000 times higher impact on the SSC result 2009 than that of variable professional training (reference category).

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2009 are calculated for the rural area. Considering time allocation as reference category, the regression coefficients of teacher corresponding to educational qualification and professional and training are 20.131 and 0.547 respectively are positive in sign of rural area but the coefficient of time allocation is -17.794 which content negative sign. The result illustrate that the impact of educational qualification and professional training on the SSC result 2009 are positive and the impact of time allocation on the SSC result 2009 are negative. The odds ratio corresponding to the variables educational qualification and professional training are 5.553 and 0.729 respectively. It indicates that the variables educational qualification has 5.553 times higher impact on the SSC result 2009 than that of variable time allocation (reference category). On the contrary professional training have (1-0.729)x100=27.10% lower impact as compare to the coefficient time allocation on the SSC result 2009.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2010 are calculated for the urban area. Considering time allocation as reference category, the regression coefficients of teacher corresponding to professional training, time allocation and type of schools are 19.476, 39.827 and 1.792 respectively and these are positive in sign and educational qualification is -38.727 negative in sign, of urban area. The result illustrate that the impact of professional training, time allocation and type of schools on the SSC result 2008 are positive and educational qualification is negative and the result are statistically significant. The odds ratio corresponding to the variables professional training and type of schools are 2.872 and 6.000 respectively. It indicates that the variables professional training and type of schools have 2.872 and 6.000 times higher impact on the SSC result 2010 than that of variable time allocation (reference category). On the contrary, the odds ratio educational qualification is 0.511. It indicates that the educational qualification have (1-0.511) x100= 48.90% % lower impact as compared to the coefficient time allocation on the SSC result of the year 2010 in the school of urban area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2010 are calculated for the rural area. Considering professional training as reference category, the regression coefficients of teacher corresponding to educational qualification and professional training are 23.058, 19.545 respectively are positive in sign and time allocation -1.895 is negative in sign of rural area. The result illustrate that the impact of educational qualification, professional training on the SSC result 2008 are positive and time allocation is negative and the result are statistically significant. The odds ratio corresponding to the variables educational qualification is 1.033. It indicates that the variables educational qualification has 1.033 times higher impact on the SSC result 2010 than that of variable professional training (reference category). On the other

hand the odds ratio time allocation is 0.150. It indicate that the time allocation have (1-0.150) x100=85% lower impact as compared to the coefficient professional training on the SSC result of the year 2010 in the school of rural area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2011 are calculated for the urban area. Considering time allocation as reference category, the regression coefficients of teacher corresponding to professional training, time allocation and type of schools are 17.765, 33.264, and 2.672 respectively and these are positive in sign and educational qualification -31.892 is negative in sign of urban area. The result illustrate that the impact of professional training, time allocation and type of schools on the SSC result 2011 are positive and educational qualification is negative and the result are statistically significant. The odds ratio corresponding to the variables professional training and type of schools are 3.729 and 7.000 respectively. It indicates that the variables professional training and type of schools have 3.729 and 7.000 times higher impact on the SSC result 2011 than that of variable time allocation (reference category). On the contrary, the odds ratio educational qualification is 0.213. It indicates that the professional training have (1-0.213) x100=78.7% lower impact as compared to the coefficient time allocation on the SSC result of the year 2011 in the school of urban area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2011 are calculated for the rural area. Considering time allocation as reference category, the regression coefficients of teacher corresponding to educational qualification, professional training are -0.693, -19.909 respectively and these are in negative in sign and time allocation 22.106 in

positive sign of rural area. The result illustrate that the impact of time allocation on the SSC result 2011 are positive and educational qualification, professional training are negative and the result are statistically significant. The odds ratio corresponding to the variables professional training is 2.258 have 2.258 times higher impact on the SSC result 2011 than that of variable time allocation (reference category).On the contrary, the odds ratio educational qualification is 0.500. It indicates that the educational qualification have (1-0.500) x100=50% lower impact as compared to the coefficient time allocation on the SSC result of the year 2011 in the school of rural area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2012 are calculated for the urban area. Considering professional training as reference category, the regression coefficients of teacher corresponding to professional training, time allocation and type of schools are 1.552, 0.458 and 2.514 respectively and these are positive in sign and educational qualification -1.218 is negative in sign of urban area. The result illustrate that the impact of professional training, time allocation and type of schools on the SSC result 2012 are positive and educational qualification is negative and the result are statistically significant. The odds ratio corresponding to the variables time allocation and type of schools are 1.581 and 12.359 respectively. It indicates that the variables time allocation and type of schools have 1.581 and 12.359 times higher impact on the SSC result 2012 than that of variable professional training (reference category). On the contrary, the odds ratio educational qualification is 0.296. It indicates that the educational qualification have (1-0.296) x100= 70.4% lower impact as compared to the coefficient professional training on the SSC result of the year 2012 in the school of urban area.

The logistic regression coefficients of educational qualification, professional training, time allocation and type of schools on the SSC result 2012 are calculated for the rural area. Considering time allocation as reference category, the regression coefficients of teacher corresponding to educational qualification, professional training are -20.782, -0.109 respectively and these are in negative in sign and time allocation 22.300 in positive sign of rural area. The result illustrate that the impact of time allocation on the SSC result 2012 are positive and educational qualification, professional training are negative and the result are statistically significant. The odds ratio corresponding to the variables educational qualification is 9.423 have 9.423 times higher impact on the SSC result 2012 than that of variable time allocation (reference category).On the contrary, the odds ratio professional training is 0.897. It indicates that the professional training have (1-0.897) x100= 10.3 % lower impact as compared to the coefficient time allocation on the SSC result of the year 2012 in the school of rural area.

5.8 Logistic Regression of Teaching of Head Teachers of the study area

Logistic Regression Estimates of Background Characteristics Annual Action Plan, School Library, Visit Mathematics Class, Professional Training, Teaching Aids, Multimedia Classroom, Practical Class, Sufficiency of Present Textbook, Guardian Meeting, Students Hostel on impact of Teaching of Head Teachers of the study area. From the data it is observed that the teaching of mathematics subject motivated by the head teacher, which inspired to include this variable in the model analysis. To compare the differential of head teacher motivation (dependent) it was differentiated into two values incorporated in the model through indicator variable ‘1’ and ‘0’ indicating the motivate and not motivate.

Table 5.13 Impact of Teaching, Motivate on Teaching Urban and Rural Area

Background Characteristics (variable)	Scale	Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
Impact of Teaching, Motivate on Teaching				
Urban Area				
Annual Action Plan	[0= not have, 1=have]	1.609	0.000	.200
School Library	[0= not have, 1=have]	-.916	0.000	.400
Visit Mathematics Class	[0= not visit, 1=visit]	.693	0.001	.500
Professional Training	[0= not having B.Ed, 1=having B.Ed]	1.608	0.005	.200
Teaching Aids	[0= not have, 1=have]	.606	0.002	.454
Multimedia Classroom	[0= not have, 1=have]	.105	0.000	.900
Practical Class	[0= not take, 1=take]	1.508	0.004	.195
Sufficiency of Present Textbook	[0= not sufficient, 1=sufficient]	-1.281	0.007	.278
Guardian Meeting	[0= no, 1=yes]	.223	0.006	1.250
Students Hostel	[0= not have, 1=have]	-.605	0.009	.450
Rural Area				
Annual Action Plan	[0= not have, 1=have]	.105	0.008	.900
School Library	[0= not have, 1=have]	-.693	0.007	.500
Visit Mathematics Class	[0= not visit, 1=visit]	1.099	0.005	3.000
Professional Training	[0=not having B.Ed, 1=having B.Ed]	.225	0.008	1.255
Teaching Aids	[0= not have, 1=have]	.100	0.002	.895
Multimedia Classroom	[0= not have, 1=have]	17.559	0.006	2.143
Practical Class	[0= not take, 1=take]	1.090	0.003	2.995
Sufficiency of Present Textbook	[0= not sufficient, 1=sufficient]	.606	0.009	1.833
Guardian Meeting	[0= no, 1=yes]	-18.739	0.007	.277
Students Hostel	[0= not have, 1=have]s	-.405	0.012	.667

The logistic regression coefficients of annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class, sufficiency of present textbook , guardian meeting and students hostel on impact of teaching of head teachers are calculated for the urban area. Considering multimedia classroom as reference category, the regression coefficients of head teachers corresponding to annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom,

practical class and guardian meeting are 1.609,.693, 1.608, .606, .105, 1.508, and .223 respectively are positive in sign but the coefficient of school library, sufficiency of present textbook and students hostel are -.916, -1.281 and -.605 content negative sign of urban area. The result illustrate that the impact of annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class and guardian meeting are positive and the impact of school library, sufficiency of present textbook and students hostel are negative on teaching of head teacher sand the result are statistically significant. The odds ratio corresponding to the variables annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class and guardian meeting are .200, .500, .200, .454, .900, .195 and 1.250 respectively. It indicates that the variables have annual action plan .200, visit mathematics class .500, professional training .200, teaching aids .454, practical class .195 and guardian meeting 1.250 times higher impact on teaching than that of variable multimedia classroom (reference category). On the contrary, the odds ratio school library, sufficiency of present textbook and students' hostel are. 400, .278 and .450. It indicates that the school library have (1-.400) x 100 = 60%, sufficiency of present textbook (1-.278) x 100 = 72.2 % and students hostel (1-.450) x 100 = 55% lower impact as compared to the coefficient multimedia classroom on teaching in the school of urban area.

The logistic regression coefficients of annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class, sufficiency of present textbook, guardian meeting and students hostel on impact of teaching of head teachers are calculated for the rural area. Considering teaching aids as reference category,

the regression coefficients of head teachers corresponding to annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class and sufficiency of present textbook are .105, 1.099, .225, .100, 17.559, 1.090, and .606 respectively are positive in sign but the coefficient of school library, guardian meeting and students hostel are -.693, -18.739 and -.4051 content negative sign of rural area. The result illustrate that the impact of annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class and sufficiency of present textbook are positive and the impact of school library, guardian meeting and students hostel are negative on teaching of head teachers and the result are statistically significant. The odds ratio corresponding to the variables annual action plan, visit mathematics class, professional training, teaching aids, multimedia classroom, practical class and sufficiency of present textbook are .900, 3.000, 1.255, .895, 2.143, 2.995 and 1.833 respectively. It indicates that the variables have annual action plan .900, visit mathematics class 3.000 professional training 1.255, teaching aids .895, multimedia classroom 2.143 practical class 2.995 and sufficiency of present textbook 1.833 times higher impact on teaching than that of variable teaching aids (reference category). On the contrary, the odds ratio school library, guardian meeting and students' hostel are .500,.277 and .667. It indicates that the school library have (1-.500) x 100 = 50%, sufficiency of present textbook (1-.277) x 100 = 72.3 % and students hostel (1-.667) x 100 = 33% lower impact as compared to the coefficient teaching aids on teaching in the school of rural area.

5.9 Logistic Regression Estimates of Teaching of Mathematics Teachers of Urban area.

Logistic Regression Estimates of Background Characteristics Experience of Teaching Mathematics, Academic Qualifications, Mathematics Background of Bachelor and /or Masters Level(s), Training on Teaching Mathematics, Necessity of Training for Teaching Mathematics, Necessity of Lesson Plan for Teaching Mathematics, Make Lesson Plan for class, Necessity Creative for Mathematics Subject, Use Teaching Aids at the Time of Teaching, Sufficiency of Present Textbook for Teaching Mathematics, Feel Difficulty Using/Teaching this Book, Arrive School in Schedule Time, Leave School in Schedule Time, Complete Mathematics Course in Due Time, Take Mathematics Practical Class, Take Extra Class for the Weaker Students, Feel Trouble Taking Mathematics Class, Involve Private Teaching, Appropriateness of Mathematics Syllabus for Class Nine-Ten on impact of Teaching of Mathematics Teachers of the study area. From the data it is observed that the teaching of mathematics subject motivated by the mathematics teacher, which inspired to include this variable in the model analysis. To compare the differential of mathematics teacher's motivation (dependent)it was differentiated into two values incorporated in the model through indicator variable '1' and '0' indicating the motivate and not motivate.

Table 5.14 Impact on Teaching, Motivate on Teaching (Urban Area)

Background Characteristics (variable)	Scale	Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
Impact on Teaching, Motivate on Teaching (Urban Area)				
Experience of Teaching Mathematics	[0=Below 10 years, 1=above 10 years]	5.455	0.005	1.355
Academic Qualifications	[0=not B.Sc, 1= B.Sc]	20.350	0.041	5.000
Mathematics Background of Bachelor and /or Masters Level(s)	[0=having mathematic, 1= not having mathematic]	3.565	0.004	6.000
Training on Teaching Mathematics	[0= not having B.Ed degree, 1= having BEd degree]	8.685	0.007	4.875
Necessity of Training for Teaching Mathematics	[0= no necessary, 1=necessary]	-27.565	0.009	.358
Necessity of Lesson Plan for Teaching Mathematics	[0= no necessary, 1= necessary]	.456	0.002	1.985
Make Lesson Plan for class	[0= not make lesson plan 1= make lesson plan]	-16.543	0.003	.785
Necessity Creative for Mathematics Subject	[0= no necessary, 1= necessary]	32.876	0.008	6.565
Use Teaching Aids at the Time of Teaching	[0= not use, 1= use]	-19.985	0.032	.786
Sufficiency of Present Textbook for Teaching Mathematics	[0= no sufficient, 1= sufficient]	22.065	0.006	8.765
Feel Difficulty Using/Teaching this Book	[0=difficult, 1= not difficult]	14.541	0.003	2.243
Arrive School in Schedule Time	[0= no, 1= yes]	12.465	0.001	5.443
Leave School in Schedule Time	[0= no, 1= yes]	-2.867	0.009	.450
Complete Mathematics Course in Due Time	[0= no, 1= yes]	16.931	0.025	8.565
Take Mathematics Practical Class	[0= no, 1= yes]	5.465	0.001	3.567
Take Extra Class for the Weaker Students	[0= no, 1= yes]	7.344	0.007	1.564
Feel Trouble Taking Mathematics Class	[0= no, 1= yes]	19.665	0.009	6.750
Involve Private Teaching	[0= no, 1= yes]	13.504	0.005	3.505
Appropriateness of Mathematics Syllabus for Class Nine-Ten	[0= no, 1= yes]	-.875	0.002	.852

The logistic regression coefficients of experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on

teaching mathematics, necessity of training for teaching mathematics, necessity of lesson plan for teaching mathematics, make lesson plan for class, necessity creative for mathematics subject, use teaching aids at the time of teaching, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, leave school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class, involve private teaching, appropriateness of mathematics syllabus for class nine-ten on impact of teaching of mathematics teachers are calculated for the urban area. Considering necessity of lesson plan for teaching mathematics as reference category, the regression coefficients of mathematics teachers corresponding to experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity of lesson plan for teaching mathematics, necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are 5.455, 20.350, 3.565, 8.685, .456, 32.876, 22.065, 14.541, 12.465, 16.931, 5.465, 7.344, 19.665 and 13.504 respectively are positive in sign but the coefficient of necessity of training for teaching mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time and appropriateness of mathematics syllabus for class nine-ten are -27.565, -16.543, -19.985, -2.867 and -.875 content negative sign of urban area. The result illustrate that the impact of experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity of lesson plan for teaching mathematics,

necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are positive and the impact of necessity of training for teaching mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time, and appropriateness of mathematics syllabus for class nine-ten are negative on teaching of mathematics teachers and the result are statistically significant. The odds ratio corresponding to the variables experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are 1.355, 5.000, 6.000, 4.875, 6.565, 8.765, 3.567, 1.564, 6.750 and 3.505 respectively. It indicates that the variables have experience of teaching mathematics 1.355, academic qualifications 5.000, mathematics background of bachelor and /or masters level(s) 6.000, training on teaching mathematics 4.875, necessity creative for mathematics subject 6.565, sufficiency of present textbook for teaching mathematics 8.765, feel difficulty using/teaching this book 2.243, arrive school in schedule time 5.443, complete mathematics course in due time 8.565, take mathematics practical class 3.567, take extra class for the weaker students 1.564, feel trouble taking mathematics class 6.750 and involve private teaching 3.505 times higher impact on teaching than that of variable necessity of lesson plan for teaching mathematics (reference category). On the contrary, the odds ratio necessity of training for teaching

mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time and appropriateness of mathematics syllabus for class nine-ten are .358, .785, .786, .450 and .852. It indicates that necessity of training for teaching mathematics have (1-.358) x 100 = 60%, make lesson plan for class (1-.785) x 100 = 21.5 %, use teaching aids at the time of teaching (1-.786) x 100 = 21.4 %, leave school in schedule time (1-.450) x 100 = 55% and appropriateness of mathematics syllabus for class nine-ten (1-.852) x 100 = 14.8 % lower impact as compared to the coefficient necessity of lesson plan for teaching mathematics on teaching in the school of urban area.

5.10 Logistic Regression Estimates of Teaching of Mathematics Teachers of Rural area.

Logistic Regression Estimates of Background Characteristics Experience of Teaching Mathematics, Academic Qualifications, Mathematics Background of Bachelor and /or Masters Level(s), Training on Teaching Mathematics, Necessity of Training for Teaching Mathematics, Necessity of Lesson Plan for Teaching Mathematics, Make Lesson Plan for class, Necessity Creative for Mathematics Subject, Use Teaching Aids at the Time of Teaching, Sufficiency of Present Textbook for Teaching Mathematics, Feel Difficulty Using/Teaching this Book, Arrive School in Schedule Time, Leave School in Schedule Time, Complete Mathematics Course in Due Time, Take Mathematics Practical Class, Take Extra Class for the Weaker Students, Feel Trouble Taking Mathematics Class, Involve Private Teaching, Appropriateness of Mathematics Syllabus for Class Nine-Ten on impact of Teaching of Mathematics Teachers of the study are

Table 5.15 Impact on Teaching, Motivate on Teaching (Rural Area)

Background Characteristics (variable)	Scale	Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
Impact on Teaching, Motivate on Teaching (Rural Area)				
Experience of Teaching Mathematics	[0=Below 10 years, 1=above 10 years]	6.445	0.002	1.245
Academic Qualifications	[0=not B.Sc, 1= B.Sc]	18.462	0.008	4.900
Mathematics Background of Bachelor and /or Masters Level(s)	[0=having mathematics, 1= not having mathematics]	4.565	0.001	4.000
Training on Teaching Mathematics	[0= not having B.Ed degree, 1= having B.Ed degree]	7.625	0.005	6.175
Necessity of Training for Teaching Mathematics	[0= no necessary, 1= necessary]	-24.565	0.004	.258
Necessity of Lesson Plan for Teaching Mathematics	[0= no necessary, 1= necessary]	.956	0.000	.785
Make Lesson Plan for class	[0= not make lesson plan, 1= make lesson plan]	-13.543	0.006	.985
Necessity Creative for Mathematics Subject	[0= no necessary, 1= necessary]	25.376	0.008	5.525
Use Teaching Aids at the Time of Teaching	[0= not use, 1= use]	-16.485	0.004	.876
Sufficiency of Present Textbook for Teaching Mathematics	[0= no sufficient, 1= sufficient]	20.605	0.026	8.995
Feel Difficulty Using/Teaching this Book	[0=difficult, 1= not difficult]	12.441	0.005	3.443
Arrive School in Schedule Time	[0= no, 1= yes]	11.565	0.006	4.443
Leave School in Schedule Time	[0= no, 1= yes]	-5.867	0.004	.447
Complete Mathematics Course in Due Time	[0= no, 1= yes]	15.931	0.009	7.765
Take Mathematics Practical Class	[0= no, 1= yes]	6.495	0.008	1.567
Take Extra Class for the Weaker Students	[0= no, 1= yes]	8.344	0.009	.764
Feel Trouble Taking Mathematics Class	[0= no, 1= yes]	17.565	0.043	8.750
Involve Private Teaching	[0= no, 1= yes]	14.114	0.007	2.305
Appropriateness of Mathematics Syllabus for Class Nine-Ten	[0= no, 1= yes]	-.985	0.001	.142

The logistic regression coefficients of experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity of training for teaching mathematics, necessity of lesson plan for teaching mathematics, make lesson plan for class, necessity creative for mathematics subject, use teaching aids at the time of teaching, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, leave school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class, involve private teaching, appropriateness of mathematics syllabus for class nine-ten on impact of teaching of mathematics teachers are calculated for the rural area. Considering necessity of lesson plan for teaching mathematics as reference category, the regression coefficients of mathematics teachers corresponding to experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity of lesson plan for teaching mathematics, necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are 6.445, 18.462, 4.565,7.625, .956, 25.376, 20.605, 12.441, 11.565, 15.931, 6.495, 8.344, 17.565 and 14.114 respectively are positive in sign but the coefficient of necessity of training for teaching mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time and appropriateness of mathematics syllabus for

class nine-ten are -24.565, -13.543,-16.485, -5.867 and -.985 content negative sign of rural area. The result illustrate that the impact of experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity of lesson plan for teaching mathematics, necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are positive and the impact of necessity of training for teaching mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time, and appropriateness of mathematics syllabus for class nine-ten are negative on teaching of mathematics teachers and the result are statistically significant. The odds ratio corresponding to the variables experience of teaching mathematics, academic qualifications, mathematics background of bachelor and /or masters level(s), training on teaching mathematics, necessity creative for mathematics subject, sufficiency of present textbook for teaching mathematics, feel difficulty using/teaching this book, arrive school in schedule time, complete mathematics course in due time, take mathematics practical class, take extra class for the weaker students, feel trouble taking mathematics class and involve private teaching are 1.245, 4.900, 4.000, 6.175, 5.525, 8.995, 3.443, 4.443, 7.765, 1.567, .764, 8.750 and 2.305 respectively. It indicates that the variables have experience of teaching mathematics 1.245, academic qualifications 4.900, mathematics background of bachelor and /or masters level(s) 4.000, training on teaching mathematics 6.175, necessity creative for mathematics subject 5.525, sufficiency of

present textbook for teaching mathematics 8.995, feel difficulty using/teaching this book 3.443, arrive school in schedule time 4.443, complete mathematics course in due time 7.765, take mathematics practical class 1.567, take extra class for the weaker students .764, feel trouble taking mathematics class 8.750 and involve private teaching 2.305 times higher impact on teaching than that of variable necessity of lesson plan for teaching mathematics (reference category). On the contrary, the odds ratio necessity of training for teaching mathematics, make lesson plan for class, use teaching aids at the time of teaching, leave school in schedule time and appropriateness of mathematics syllabus for class nine-ten are .258, .985, .876, .447 and .142. It indicates that necessity of training for teaching mathematics have (1-.258) x 100 = 74.2%, make lesson plan for class (1-.985) x 100 = 1.5 %, use teaching aids at the time of teaching (1-.876) x 100 = 12.4%, leave school in schedule time (1-.447) x 100 =55.3% and appropriateness of mathematics syllabus for class nine-ten (1-.142) x 100 = 85.8% lower impact as compared to the coefficient necessity of lesson plan for teaching mathematics on teaching in the school of rural area.

5.11 Logistic Regression Estimates on impact of learning of students of the study area. (Urban Area)

Logistic Regression Estimates of Background Characteristics Fathers' / Guardians' Occupation, Mothers' Occupation, Fathers' Academic Qualifications, Mothers' Formal Education, Monthly Income of the Guardians, Feeling of Reading Mathematics, Teacher Give Proper Understanding the Selected Topics, Result of the Last Mathematics Examination, Teacher Threat in any Problem Solving Situation, Teacher Abhor in the Class, Negligence of Mathematics Teacher in Taking Class, Teacher Give any Punishment, Mathematics Teacher use Chalk Board, Student have Private Tutor, Teacher Teach after Classifying Groups on impact of learning of students of the study area.

Table 5.16 Impact on Learning, Motivate on Learning (Urban Area)

Background Characteristics (variable)	Scale	Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
Impact on Learning Motivate on Learning (Urban Area)				
Fathers' / Guardians' Occupation	[0= no service, 1= service]	20.453	0.002	6.776
Mothers' Occupation	[0= no service, 1= service]	17.335	0.005	.279
Fathers' Academic Qualifications	[0= below SSC, 1= above SSC]	31.571	0.009	5.600
Mothers' Formal Education	[0= below SSC, 1= above SSC]	13.245	0.003	.785
Monthly Income of the Guardians	[0= below 15,000, 1= above 15,000]	23.913	0.008	9.996
Feeling of Reading Mathematics	[0= good, 1= not good]	21.532	0.004	4.556
Teacher Give Proper Understanding the Selected Topics	[0= no, 1= yes]	9.567	0.009	2.565
Result of the Last Mathematics Examination	[0= not satisfactory, 1=satisfactory]	6.789	0.049	.892
Teacher Threat in any Problem Solving Situation	[0= not threat, 1= threat]	-.978	0.002	.575
Teacher Abhor in the Class	[0= not abhor, 1= abhor]	-4.565	0.024	.456
Negligence of Mathematics Teacher in Taking Class	[0= not neglect, 1= neglect]	16.458	0.033	8.987
Teacher Give any Punishment	[0= not punished, 1= punished]	3.576	0.005	.945
Mathematics Teacher use Chalk Board	[0= not use, 1= use]	24.576	0.009	4.564
Student have Private Tutor	[0= no, 1=yes]	13.456	0.095	2.450
Teacher Teach after Classifying Groups	[0= no, 1=yes]	-21.567	0.061	.763

The logistic regression coefficients of fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, teacher threat in any problem solving situation, teacher abhor in the class, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board, student have private tutor, teacher teach after classifying groups on impact of learning of mathematics at the students of class nine and ten are calculated for the urban area. considering result of

the last mathematics examination as reference category, the regression coefficients of the students of class nine-ten are corresponding to fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are 20.453, 17.335, 31.571, 13.245, 23.913, 21.532, 9.567, 6.789, 16.458, 3.576, 24.576 and 13.456 respectively are positive in sign but the coefficient of teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are -.978, -4.565 and -21.567 content negative sign of urban area. The result illustrate that the impact of fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are positive and the impact of teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are negative on learning mathematics at class nine-ten and the result are statistically significant. The odds ratio corresponding to the variables fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are 6.776, .279, 5.600, .785, 9.996, 4.556, 2.565, 8.987, .945,

4.564 and 2.450 respectively. It indicates that the variables have fathers' / guardians' occupation 6.776, mothers' occupation. 279, fathers' academic qualifications 5.600, mothers' formal education .785, monthly income of the guardians 9.996, feeling of reading mathematics 4.556, teacher give proper understanding the selected topics 2.565, negligence of mathematics teacher in taking class 8.987, teacher give any punishment .945, mathematics teacher use chalk board 4.564 and student have private tutor 2.450 times higher impact on teaching than that of variable result of the last mathematics examination (reference category). On the contrary, the odds ratio teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are .243, .876 and .235. It indicates that necessity of teacher threat in any problem solving situation have (1-.243) x 100 = 75.7 %, teacher abhor in the class (1-.876) x 100 = 12.4 %, teacher teach after classifying groups and (1-.235) x 100 = 76.5% lower impact as compared to the coefficient result of the last mathematics examination on learning in the school of urban area.

5.12 Logistic Regression Estimates on impact of learning of students of the study area (Rural Area)

Logistic Regression Estimates of Background Characteristics Fathers' / Guardians' Occupation, Mothers' Occupation, Fathers' Academic Qualifications, Mothers' Formal Education, Monthly Income of the Guardians, Feeling of Reading Mathematics, Teacher Give Proper Understanding the Selected Topics, Result of the Last Mathematics Examination, Teacher Threat in any Problem Solving Situation, Teacher Abhor in the Class, Negligence of Mathematics Teacher in Taking Class, Teacher Give any Punishment, Mathematics Teacher use Chalk Board, Student have Private Tutor, Teacher Teach after Classifying Groups on impact of learning of students of the study area.

Table 5.17 Impact on Learning, Motivate on Learning (Rural Area)

Background Characteristics (variable)		Estimated Regression Coefficient (β)	Significant	Odds Ratio Exp(β)
Impact on Learning, Motivate on Learning (Rural Area)				
Fathers' / Guardians' Occupation	[0= no service, 1= service]	21.653	0.007	8.326
Mothers' Occupation	[0= no service, 1= service]	18.535	0.005	.649
Fathers' Academic Qualifications	[0= below SSC, 1= above SSC]	29.851	0.004	5.950
Mothers' Formal Education	[0= below SSC, 1= above SSC]	17.645	0.000	.585
Monthly Income of the Guardians	[0= below 15,000, 1= above 15,000]	21.453	0.090	7.696
Feeling of Reading Mathematics	[0= good, 1= not good]	19.332	0.003	5.756
Teacher Give Proper Understanding the Selected Topics	[0= no, 1= yes]	11.867	0.022	3.265
Result of the Last Mathematics Examination	[0= not satisfactory, 1=satisfactory]	9.239	0.051	.764
Teacher Threat in any Problem Solving Situation	[0= not threat, 1= threat]	-.778	0.003	.435
Teacher Abhor in the Class	[0= not abhor, 1= abhor]	-3.565	0.000	.536
Negligence of Mathematics Teacher in Taking Class	[0= not neglect, 1= neglect]	17.558	0.008	4.986
Teacher Give any Punishment	[0= not punished, 1= punished]	4.546	0.001	.675
Mathematics Teacher use Chalk Board	[0= not use, 1= use]	22.456	0.006	2.664
Student have Private Tutor	[0= no, 1=yes]	11.446	0.005	3.750
Teacher Teach after Classifying Groups	[0= no, 1=yes]	-20.947	0.009	.832

The logistic regression coefficients of fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, teacher threat in any problem solving situation, teacher abhor in the class, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board, student have private tutor, teacher teach after classifying groups on impact of learning of mathematics at the students of class nine and ten are calculated for the urban area. considering result of

the last mathematics examination as reference category, the regression coefficients of the students of class nine-ten are corresponding to fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are 21.653, 18.535, 29.851, 17.645, 21.453, 19.332, 11.867, 9.239, 17.558, 4.546, 22.456, and 11.446 respectively are positive in sign but the coefficient of teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are -.778, -3.565 and -20.947 content negative sign of rural area. The result illustrate that the impact of fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, result of the last mathematics examination, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are positive and the impact of teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are negative on learning mathematics at class nine-ten and the result are statistically significant. The odds ratio corresponding to the variables fathers' / guardians' occupation, mothers' occupation, fathers' academic qualifications, mothers' formal education, monthly income of the guardians, feeling of reading mathematics, teacher give proper understanding the selected topics, negligence of mathematics teacher in taking class, teacher give any punishment, mathematics teacher use chalk board and student have private tutor are 8.326, .649, 5.950, .585, 7.696, 5.756, 3.265, 4.986, .675, 2.664 and 3.750 respectively. It indicates that the variables have fathers' / guardians'

occupation 8.326, mothers' occupation .649, fathers' academic qualifications 5.950, mothers' formal education .585, monthly income of the guardians 7.696, feeling of reading mathematics 5.756, teacher give proper understanding the selected topics 3.265, negligence of mathematics teacher in taking class 4.986, teacher give any punishment .675, mathematics teacher use chalk board 2.664 and student have private tutor 3.750 times higher impact on teaching than that of variable result of the last mathematics examination (reference category). On the contrary, the odds ratio teacher threat in any problem solving situation, teacher abhor in the class, and teacher teach after classifying groups are .435, .536 and .832. It indicates that necessity of teacher threat in any problem solving situation have (1-.435) x 100 = 56.5%, teacher abhor in the class (1-.536) x 100 = 46.4%, teacher teach after classifying groups and (1-.832) x 100 = 16.8% lower impact as compared to the coefficient result of the last mathematics examination on learning in the school of rural area.

Chapter 6
Findings, Discussion and Policy Implication

6.1 Introduction

Quality of education depends on teaching-learning situation and classroom facilities. Air movement, proper sunlight, electricity facilities can avoid gloomy environment and create education friendly atmosphere. In this chapter we consider all these aspects. Pre-plan is necessary to do any work truly. Proper plan is needed for fruitful mathematics classes. A teacher teaches a topic in his class for a limited time. Though the teachers have enough knowledge on topics and he/she may fail to presentation, explanation and completion the lesson, students are being failed to understand the concept. For successful class performance, a teacher must not down his/her task what part of the lesson he/she explain, what part of the lesson he describe, what are the questions he/she ask, what types of teaching aids he/she use, how can he/she evaluate acquiring knowledge, what will be the home task for next day's etc. In the last decade issues of disadvantage and mathematics achievement have moved to the centre of policy- makers' agenda and academic debate. Under achievement in mathematics is particularly recognized as a major problem in schools serving disadvantaged communities (Mkhabela, 2004). According to Hughes, (2009) the most important conclusions from qualitative research on factors related to achievement in schools are that (a) teachers are critical resources; (b) the composition of the student body matters; (c) schools make a difference, and (d) physical facilities, class size, curriculum, instructional strategies and other resources influence student learning indirectly through their effect on the behavior of teachers and students. In an effort to identify the causes for low achievement in mathematics, some researchers (Attwood, 2001; Brodie, 2004; Maree, 2007; Moyana, 2006; Murray, 2007; Malcolm, 2000) have suggested that success of mathematics in secondary schools is influenced by a number of

variables. These variables include learners' abilities, attitudes and perceptions, poor learning environment, learning cultures, past racial discrimination and low expectations by teachers. According to Singh, (2002) many of these variables are home and family-related and thus are difficult to change and beyond control of educators. In investigating factors that facilitate success in mathematics, variables related to school, learners and teachers were reviewed. In this regard Malcolm, (2000) in their literature suggests that when investigating factors that facilitate achievement in mathematics, a more extensive investigation should consider learner, teacher and school variables. This chapter concludes with some learning theories relevant to secondary school mathematics learning and teaching.

6.2 Findings of the Research

The researcher has identified many challenges of teaching and learning mathematics that should be addressed in order to harvest a good collect of teaching-learning mathematics in Bangladesh. The following were the main findings of the study which covered all other minor findings.

1. In study area 60% urban schools and 35% rural schools have annual action plan.

2. 65% urban schools and 45% rural schools have library for their students.

3. Only 30% urban school and 10% rural schools head teacher arrange guardian meeting in their schools every year.
4. Lack of qualified, well trained, devoted and highly motivated mathematics teachers. 27.5% teachers of urban area and 52.5% teachers of rural area do not have B. Ed training. Other trainings reach in a very few teachers.

5. Teachers are not accustomed with the modern methods and techniques of teaching mathematics. Moreover most of them are unwilling to learn them. Teachers having no training on teaching methods and techniques.
6. 45% teacher of urban area and 20% teacher of rural area having MSc degree with mathematics.
7. Teachers' minimum or no use of teaching materials and teaching aids which hampers proper teaching and learning. They do not prepare or collect any teaching aids. Even schools authorities not buy teaching aids and do not encourage teachers to use them.
8. 37.5% teacher of urban area and 35% teacher of rural area use lecture method, 42.5% teacher of urban area and 40% teacher of rural area use analytical method, 52.5% teacher of urban area and 50% teacher of rural area use synthetic method.
9. There is no system of academic supervision. Trained teachers are not supervised by anybody that has got expertise in the subject. Even the trained teachers are not accountable to anybody or to any authority regarding their use of the teaching methods and techniques.
10. 20% teacher always, 25% teacher often, 22.5% teacher sometime, 30% teacher rarely and 2.5% teacher never uses of teaching aids at the time of teaching of the urban area and 15% teacher always, 25% teacher often, 37.5% teacher sometime, 15% teacher rarely, 3.5% teacher never uses of teaching aids at the time of teaching of the rural area.
11. This study finds that the mathematics teachers are to carry a heavy workload on their shoulders. In the secondary schools, a teacher has to take 5/6 classes on average every day.
12. Curriculum of mathematics is not appropriate for class nine-ten. Curriculum of mathematics is faulty in many ways, there is no stable syllabus from class six to class nine, it has jumped lagging behind the traditionalistic way from class eight, omission of arithmetic from class nine, trigonometry and parameter is unnecessary for the students of arts and business group.

13. 35.00% teacher of urban area and 70.00% teacher of rural area do not follow the lesson plan given in the teacher's guide.
14. 42.50 % teacher of urban area and 60.00% teacher of rural area think that the present textbook is sufficient for teaching mathematics.
15. 62.50 % teacher of urban area and 30.00 % teacher of rural area arrive at their school in schedule time, 42.50 % teacher of urban area and 20.00 % teacher of rural area leave their school in schedule time.
16. 45.00 % teacher of urban area and 32.50 % teacher of rural area complete their mathematics course due time.
17. 25.00 % teacher of urban area and 12.50 % teacher of rural area take mathematics practical class in schools.
18. 72.50% teacher of urban area and 30.00 % teacher of rural area involve in private teaching.
19. 64.50 % students of urban area and 30.50 % students of rural area feel interest in mathematics textbook. 47.50 % students of urban area and 76.00 % students of rural area said that their teacher threat them in problem solving situation. 75.00 students of urban area and 52.50 % students of rural area said that their mathematics teacher given them homework.
20. Most of the teachers have not entered the classroom with smiling face
21. Teacher has not praised students after given correct answer
22. Teacher has not maintained time properly in the schools and classroom

6.3 Discussion

Effective school characteristics are what help to create a fertile school culture that facilitates learners' achievement. Several researchers (Henson & Eller, 2009; Berliner, 2000, and Rutter, 2003) have identified such characteristics. Their findings indicate that

learners excel when the following factors are present strong leadership is provided by a principal who works with the staff to communicate the mission of the school; provide reliable support for staff; and meet with teachers and other members of the staff frequently to discuss classroom practices. High learner achievement is the foremost priority of the school, and the school is organized around this goal as shown by teachers who demonstrate high expectations for learners' achievement and make learners aware of and understand these expectations. Parents are aware of, understand, and support the basic objective of the school and believe they have an important role to play in their children' education. Teachers work together to provide an orderly and safe school environment. Schools use evaluation to measure learners' progress and promote learning.

In the interviews it was the researcher's aim to collect all sorts of professional information from teachers. The purpose was to see whether academic qualifications, experience and training are helping them to use these textbooks effectively. (Sarason, 2003) maintains that if one wants to change the education of learners, one need to first change the education of the teachers. According to (Sarason, 2003) it is necessary to prepare educators for what life is like in classrooms, schools, school systems and society. The pr-eservice and continuing education of teachers of mathematics should provide them with the opportunity to examine and revise their assumptions about how mathematics should be taught, and how learners learn mathematics. Educators have to mediate learning in a manner which is sensitive to the diverse needs of learners, including those with learning impediments and demonstrate sound subject content knowledge. Interpreters and designers of learning programmed and materials educators have to provide, understand and interpret learning programmed, identify the requirements for a specific context of learning and select and prepare suitable textual and visual resources for learning. They should select the sequence and pace of the learning in a manner sensitive to the differing

needs of the subject/learning area and learners. Educators have to make decisions appropriate to the requirement level, manage learning in the classroom administrative duties efficiently and participate in school decision- making structures. This has to be done in ways that are democratic, which support learners and colleagues, and which demonstrate responsiveness to changing circumstances and needs. Educators have to achieve ongoing personal, academic, occupational and professional growth through pursuing reflective study and research in their learning area, in broader professional and educational matters, and other related fields. A number of researchers have investigated the building blocks of mathematics lesson structure, because contributes to effective teaching and learning. In their comparison of a typical lesson structure in the United States of America and Japan, (Sochanul, 2009) find that most lesson structures focus on five global behaviors, namely:

- Reviewing the content covered in a previous lesson (5 min).
- Reviewing homework assignment in a previous lesson (10 min).
- Providing instruction on new subject matter (20 min).
- Having students work on in-class exercises that were either used in the lesson development or otherwise discussed in the lesson (15 min).
- Having students work on homework that would not be discussed until a later lesson.

However, what was different was the extent to which certain teachers used these activities. In the United States they found that mathematics instruction for both nine and thirteen year olds seems to be dominated by class work and reviewing homework. Teachers spent some time teaching new material but it was not the dominant feature of lessons. Less than forty percent of United States teachers provided twenty minutes or more of instruction on new material during a class period. Japanese teachers by contrast

spent most of their time on the combination of instruction on new material and class work, which was, for the most part, actively tied to the instruction of the new material during the course of the lesson. In this regard, (Stevenson & Stigler 2002) attributed some of Japan's leading mathematics achievement to mathematics lesson structure. In examining the way how mathematics has been taught(Wood, Cobb and Yackel, 2002) observe that: Teaching mathematics in schools is characterized by heavy reliance on the textbook by teachers both as a source of activities and for explanations of procedures to use in completing the task. In this context the role of the teacher is that of an instructor whose instructions are followed in order to arrive at a given product. The learners are then expected to follow the teacher‘s example carefully and answer the questions that the teacher asks without necessarily engaging in dialogue when information is exchanged. (Thomas, 2006) has investigated achievement levels for learners learning mathematics in different situations.

This includes:

- Whole-class lecture – demonstration situations; here the teacher instructs the whole class as one group for the greater part of the lesson.
- Co-operative learning when the teacher divides the class into small heterogeneous groups.
- Individualized situations where the students are given the individual seatwork and ask for the teacher's help when they need it.
- Within- class ability groups where the teacher divides the class into small groups based on ability. The findings from these (Slavish & Karweit, 2004; Thomas, 2002) studies suggest that there are significant increases in achievement levels, measured by differences in scores in a pre-test and a post- test, when learners learn in small groups (co-operative learning) as opposed to individual seatwork. In their study of mathematics teaching in Grades 4 to 6, (Slavish & Karweit, 2004) investigated the achievement effects of three commonly used methods, whole class instruction, within -class ability grouping and co- operative learning. They found that there were

> significant differences in the overall effects on learner's achievements. (Slavish & Karwait's, 2004) overall finding from their study is that two of the three modes they investigated, within-class ability grouping and co-operative learning in small heterogeneous groups, led to higher achievement levels in mathematics as compared to the whole- class mode. In a study of Asian and United States of America (U.S.A.) classrooms, (Stevenson and Stigler 2002) report that group orientation in Japanese and Chinese classrooms promotes the feeling of group membership. Accordingly, participation in groups enables children to learn and judge each other and appreciate the variety of ways individuals can contribute to a group's success. In contrast, in United States of America classrooms, (Stevenson &Stigler 2002) report that students are observed working at their own pace and continuing to struggle with the assigned problems that others have already completed. This denies the students social interaction with those who finished early. According to (Stevenson & Stigler 2002), teaching in groups, as is done in the Asian classrooms, is more advantageous than the individual approach of United States of America classrooms. Some research evidence suggests that students who prefer to co- operate, learn best in co- operative programmers, while other students who prefer to compete; do best in competitive programs (Smey-Riechman, 2008).

(Robitaille and Garden, 2009) pointed out some factors that influence effectiveness of teachers, namely their teaching strategies, beliefs about teaching, and the general classroom processes that provide an immediate learning environment for mathematics. In this regard (Dreckmeyr, 2004) defines a teaching strategy as an extensive teaching plan which includes all elements of the instruction-learning events, such as form, content, classification, principles and aids. Teaching strategies can be classified in several ways for example, teacher-centered or learner-centered. Teacher-centered strategies are those in which the teacher has direct control. Learner-centered strategies are those strategies that allow learners to play a more active role.

In this regard, (Stein, Leinhardt & Bickel, 2009) suggest some factors in providing effective instruction for disadvantaged learners, namely

- They argue that the most important factor is the teacher.
- Time on task. They suggest that learners must be engaged in appropriate instruction for sufficient time to master the academic skills.

The presentation of the lesson in mathematics classroom, Successful lessons include appropriate expectations, frequent monitoring and helpful feedback. Furthermore they argue that the entire school experience of the learner should be designed to produce the maximum learning success for each individual. The negative effects of disorganized home environment can be overcome by providing a safe and consistent school environment. The learners' feelings of alienation can be overcome by showing genuine care for them and by involving them and making the school their own. Accordingly (Ysseldyke, Spicuzza, Kosciolek and Boys 2003) identify some of the instructional features that are related to improved learners' achievement in mathematics.

Some of these features include:

- Direct and frequent monitoring of progress.
- Corrective and motivational feedback.
- Learner academic involvement.
- Total length of time allocated for instruction.

In the context of Bangladesh classes are usually large and students sit in rows on benches. So, it is important to know how many students were in the observed classes, what sitting arrangement is existing, what sort of things are available in the classroom and what sort of environment prevails in the classroom. The factors really play in important role in teaching and learning any subject especially in mathematics subject. However, some studies, which have focused on group and paired work in the same class (Cao and Philip,

2006; McMillan, 2006), appear to support this. (Webb, N.L, 2003),claim that class size is part of the contextual factors embedded in group cohesiveness. These and other studies seem to indicate that class size may be an important influence on teaching and learning. It is felt that the teaching-learning process itself is hindered in large classes. (Kersaint, G., & Thompson, D.R, 2001) and Even, R., & Tirosh, D, 2002) support this view and argue that students in small classes have more opportunity to talk to the teacher about problems. Additionally, (Gullickson, A.R, 2005), found that student students' morale, achievement, attitude and student satisfaction was higher in "smaller" classes. However, (Huddleston, P, 2003), in a review of literature on this topic concludes that differences are always scientifically small. Interestingly, (Hess, 2001) takes the view that more communication and interaction can occur in a large classroom and through group tasks, students benefit through peer-teaching. To add evidence to Huddleston's claim; it was (Pica, 2002) who originally suggested that student-student interaction, without the participation of the teacher, can provide opportunities to modify a learner's interlanguage. A similar conclusion about the benefits of group learning was drawn from Swain and (Lapin's, 2001) study of French immersion students working together. More recently (Stroh's 2002) study that the factor which affects the success of interactional negotiation in the classroom is the extent to which students actually talk. Some claim it is true that small groups stimulate more students' talk-time. (Wells & Chang-Well, 2002) and (Kumar's 2002) comparisons on the amount of teacher/student talk-time/turns produced in large and small classes were inconclusively; however, one flaw with this study that should be pointed out is that the lesson focus across all classes was not consistent. In fact, the conclusion drawn from this study is that teaching methodology and activities greatly affected students' interaction; class-size ended up having an unknown influence. The teachers can improve on is communication in the mathematics classroom. (Silver and

Smith 2006) posit that mathematical discourse communities can be built in mathematics classrooms through motivating students to participate with the teacher supporting the discourse by focusing it on worthwhile mathematical ideas. (Chai, Lane & Jakabcsin 2006) also recommend the use of open-ended mathematical tasks as a didactical tool that enhances teacher-student interaction and communication in the classroom. Reviewing the classroom observation, interviewing of the teachers and students infrastructural dimensions and the SSC result, the following significant information may be mentioned. Firstly, the legacies have been given about the failure of students especially in mathematics subject under the study. School size and class size have been shown to have an impact on teaching mathematics. (Lee, Smith and Croninger, 2007) observed that larger schools had a negative influence on academic achievement in high school mathematics. In contrast, (Rutter, 2003) found no relationship between the size of the school and scholastic achievement; effective schools can be very small, very large or so me what in- between. (Rutter, 2003) further observed that the relationship between the class size and a learner's achievement is not well defined for classes with 20 to 40 learners. Class sizes of below 20 learners have been found to be advantageous for disadvantaged learners. In this respect (Rutter, 2003) argued that small school size facilitates social interaction and inhabits teacher specialization. Teachers' praise can motivate students to be interested in learning mathematics. In their interview students freely expressed that they like to be praised and not to be humiliated in any way before their fellow-friends. Teachers of secondary schools were found not to be so generous in giving praise. The findings show that only 33.67% teachers used the words such as ' thank you', 'excellent', well done', 'very good', during taking correct or partially correct answers. To encourage students teachers require to change their attitude and should use praising words when students provide correct answers and even for partial correct

answers. Any praising words can make the environment very lovely in the classroom and make students very encouraged and motivated to learn mathematics. In this regard (Cruz, 2006) states: It is neither the teacher who teaches, nor the method that works; it is the student who learns. For that reason learner according to (Smith and Ragan, 2003) a learning environment comprises teacher, existing curriculum, instructional equipment as well as the institutional and larger learner community. In this regard (Shields 2001) stated that the school environment is the broader climate or context of the school that either facilitates or constrains classroom instruction and learning. (Ross, Farish and Plukett, 2008) describe the learning environment that is considered disadvantageous for Australian schools by using detailed census- based social profiles of school catchment areas. A learning environment, particularly the school, was considered as disadvantaged if a high proportion of the enrolment of learners came from neighborhoods' having certain characteristics known to be associated with a low capacity to take advantage of educational facilities. These characteristics include, among others, a high percentage of persons in low status jobs with low income or with lack of formal educational qualifications. According to (Pinar, Reynolds, Slattery and Taubman, 2005) the concept of curriculum is highly symbolic; it is what the older generation chooses to tell the younger generation. (Beggs, 2005) states that curriculum traditionally means a list of content topics in a national or school syllabus and examination prescription, generally referred to as course outline. According to (Beggs, 2005) a mathematics curriculum includes: Mathematical content what mathematicians know, Mathematical processes, what mathematicians do Mathematical thinking and logical reasoning, problem-solving making connections and using computational tools. The International Mathematics Study sponsored by the International Association for the Evaluation of Educational Achievement (IEA), consider the study of mathematics at three levels: The intended

curriculum is that which is reflected in curriculum guides, course outline, syllabi and textbooks, adopted by the educational systems. In most countries a nationally defined curriculum emanates from a ministry of education or similar national body. The attitude that mathematics was important and enjoyable was significantly associated with achievement in mathematics. According to (Marlin, 2007) learners who have more enjoyable experiences while learning mathematics achieve higher scores. In a study of Grade 10 to 12 geometry classes explores aspects of the relationship between learners' beliefs about mathematics, their sense of mathematics as a discipline and their relationship with it, and their mathematics performance. (Schoenfeld, 2009) found the following: Learners who think less of their mathematical ability tend more to attribute their mathematical successes to luck and their failures to lack of ability, whereas those who consider themselves to be good at mathematics attribute their success to their ability.

Peer pressure in mathematics affects all learners, successful ones as well as those who are less successful. The effect of negative peer pressure has been recorded in numerous articles (Dungan & Thurlow, 2009; Reynolds & Walberg, 2002; Stuart, 2000). In this regard(Stuart 2000) argue s that peer and family attitudes towards mathematics may either positively or negatively influence learners' confidence in the subject. In their review of literature (Dungan and Thurlow, 2009) found that learners' attitudes towards mathematics have been associated with peer group attitudes. Accordingly, (Reynolds and Walberg 2002) identified peer attitudes as one of the most influential factors in learners' mathematical achievements. According to (Harris, 2005) learners are ridiculed by their peers for taking challenging mathematics while others are encouraged by their peers to pursue academic excellence in mathematics. According to (Fiore 2009) reinforcing effort in mathematics begins with helping learners to develop a positive self-concept. (Michell, 2003) states that: mathematics self-concept refers to a person's perception of their ability

to learn new topics in mathematics and to perform well in mathematics classes and tests. (Fennema and Sherman 2008) find that the mathematics self- concept is correlated with achievement in mathematics. They further find that mathematics self- concept is higher in males than in females at high school. In contrast (Maqsud and Khalique, 20011) find that there is a significant positive relationship between self- concept and attitude towards mathematics for female groups, but no significant correlation between these variables for male groups was found. (Maqsud and Khaqlique, 2001) go on to report that self-concept measures for both males and females do not reveal any significant association with their mathematics achievement. Visser (1989: 38) defines mathematics anxiety as follows: Maths anxiety may be defined as an irrational and impedimental dread of mathematics. The term is used to describe the panic, helplessness, mental paralysis and disorganization that arise among some individuals when they are required to solve a problem of mathematical nature.

This definition has been supported by (Mitchell, 2003) when they state that mathematics anxiety refers to a person's feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary and academic situations. According to (Visser, 2009) this phenomenon could occur at any time during a learner's career and it usually does not disappear spontaneously. Mathematics anxiety has been found to be consistently related to lower achievement in mathematics at all ages (Betz, 2008 & Hembree, 2000; Nimer 2000) establishes a significant relationship between low achievement in mathematics and high levels of mathematics anxiety. In support of this finding, a consistent, negative relationship between mathematics anxiety and performance is reported by (Wong, 2002). A number of researchers have suggested the following methods to facilitate the processes that are likely to lead to improvement in learners' attitudes towards mathematics and

other subjects. Some of these address the feeling of mathematics anxiety or negative mathematics self-concept and they are as follows: Teaching learners to praise others (Henson and Eller, 2009). Assigning tasks that challenge learners and yet are within their ability range and give them the autonomy required to complete the task (Henson and Eller, 2009). The content of mathematics must be taught so that learners understand. The more they understand, the less anxiety learners will exhibit (Reyes, 2000).Learners increase their mathematical understanding and reduce their anxiety when they work collaboratively in small groups using examples to demonstrate concepts (Sherard, 2005). Teachers should encourage learners to ask questions while creating a comfortable class environment that emphasizes learning through class participations (Tobias & Weissbrod, 2000). Teachers should encourage learners to understand their own personal learning style by discussing the relationship of their learning style to math concepts. Incorporating co -operative learning in the classroom was shown to have a positive effect on learners' achievements and attitudes towards mathematics (Walmsley & Muniz, 2003). Writing an essay about prior math experiences, both positive and negative, also helps learners understand that their success or failure may be more related to environmental factors than their own intelligence. Teaching learners to develop self- evaluation skills and to make realistic evaluations of them selves. Some research has suggested that, compared to other subjects, there is a relatively strong relationship between interest and achievement in mathematics (Schiefele, Krapp & Winteler, 2002). In this regard, (Maree, 2004) stated that the following factors are of significance in the learners' interest in mathematics: Learners' feelings play an important role in mathematics interest. Learners' interest and ability are positively related. According to (Maree, 2004) the better a learner performs in mathematics, the more he/she will like the subject and vice versa. The question of how to motivate learners in the classroom has become a leading concern for teachers in all disciplines, let alone in mathematics. A learner is motivated by a desire for knowledge.

Stimulation of this desire is one of the basic tasks of a teacher. In this regard (Lodkowskin, 2003) defines motivation as: the word used to describe those processes that can (a) arouse and instigate behavior;(b) give direction or purpose to behavior; (c) continue to allow behavior to persist; and (d) lead to choosing or preferring a particular behavior. Motivation deals with the reasons why learners become interested and react to those events that catch their attention. There are two distinct types of academic motivation that are interrelated in most academic settings, namely intrinsic and extrinsic motivation. According to (Piek, 2004) extrinsic motivation stems from outside the subject matter area, but is in some way analogous to it. One thinks here of favorable circumstances, an exemplary teacher, the subject matter and the method of instruction, competition, prizes, allocation of marks, promotion and various other rewards. In this type of motivation, learners tend to centre on such performance goals as obtaining favorable judgment of their competence from teachers, parents, and peers or avoiding negative judgments of their competence (Ames & Archer. 2008; Duda & Nicholls, 2002). Academic intrinsic motivation is the drive or desire of the learners to engage in learning for its own sake. (Hunter & Molepo, 2007) describes the meaning of intrinsic motivation as follows: When the activity itself is rewarding (enjoying reading or swimming) we have a situation where motivation is intrinsic, that is the activity will achieve its goal. The implication of this type of motivation is that learners who are intrinsically motivated engage in academic tasks because they enjoy them. Learner's motivations tend to focus on learning goals such as the understanding and mastery of mathematical concepts. When learners engage in tasks in which they are motivated intrinsically, they tend to exhibit a number of pedagogically desirable behaviors including time spent on tasks and persistence in the face of failure (Duda & Nicholls, 2002). In order to increase achievement in mathematics for traditionally disadvantaged learners' proper use of both intrinsic and extrinsic motivation is important. The author of this study is of the opinion

that one of the tasks of the teacher working with disadvantaged learners is to ensure that the confidence and interest of these learners in mathematics is cultivated. According to (Alderman 2000) there are many aspects of learner motivation but four seem to be particularly important, namely: The learning culture – this is mainly about peer pressure and the ethos that exist at schools. Intrinsic purpose of learning– this shifts the emphasis from extrinsic motives for learning to intrinsic motives. Self-efficacy – this concerns learners' belief in themselves and their ability to learn. Task value – this is about the learners' interest in the task and the importance and value. (Alderman, 2000) points out that: Teachers who are successful in reaching disadvantaged learners combine a high sense of their own efficacy with high realistic expectations for learner achievement. Teachers with a high sense of efficacy or confidence in their ability to influence learner motivation are more likely to view disadvantaged learners as teachable (Ashton & Webb, 2006). The concept of learners' involvement in learning is closely related to that of academic achievement. According to (Sigh, Granville & Dika 2002) academic engagement is defined as active involvement and commitment as opposed to apathy and lack of interest. For instance, doing homework, coming prepared for classes, regular attendance and not skipping classes reflect learners' engagement and motivation. (Astin & Steyn, 2003) points out that: The theory of learner involvement encourages educators to focus less on what they do and more on what learners do. Homework is one of the instructional tools used by teachers to determine a learner's academic engagement. Homework here is defined as any subject work completed outside the regularly scheduled class. According to (Grouws, 2001) the purpose of homework includes the following:

- Developing skills
- Increasing understanding
- Demonstrating application
- Developing connections

A synthesis of research by (Cooper, 2004) and (Pezdek, Berry and Renno, 2002), shows that homework could have both positive and negative effects. (Cooper, 2004) reports the positive effects of homework to include: better retention of factual knowledge; increased understanding; better critical thinking; concept formation and information processing. (Cooper, 2004) also noted that positive long- term academic effects include improved attitude towards school and better study habits and skills. (Cooper, 2004) also reports significant negative effects of homework, namely loss of interest on academic material, pressure to compete and perform well; parental interference, confusion regarding instructional techniques, copying homework from other learners and physical and emotional fatigue. (Mullis, 2000) found that in some states in the United States of America, learners who reported doing homework had low achievement in mathematics. Research has shown, however, that the positive effects of homework outweighed the negative effects. According to (Sachmid, 2005) high school learners who perform poorly in mathematics tend to believe that mathematics problems should be solved in 10 minutes or they will never be solved. (Schoemer, Calvert, Garglietiti and Bajaj, 2007) observe that the more learners believe in fixed ability or quick learning, the lower their mathematics scores. According to (Ball & Wilson, 2000) mathematics education majors have not been exposed to enough alternative teaching methods to be capable of teaching mathematics with an emphasis on meaning. (Ball and Wilson, 2000) go further and mention that pr-eservice secondary mathematics teachers often lack sufficient mathematical understanding to teach the subject effectively. In this document they state that in order to have high-quality mathematics programs, teachers of mathematics must be well-prepared, process and demonstrate positive attitudes, continue to grow professionally, and be actively involved in educational issues that affect the quality of their learners' learning. (Mullis, 2001) in his assessment of the state of mathematics achievement in the USA found some modest evidence of a positive relationship between the extent of in-service

education and learners' achievement in Grade 8. However, in Grade 4, in-service education did not seem to be significantly related to mathematics achievement. The lack of adequate in-service training opportunities for some teachers is a barrier to learners' academic achievement in mathematics. The report cites the following problems regarding the in- service training of teachers:

- In- service training remains largely short- term and non- collaborative.
- In- service training is often unrelated to the teachers' needs and the challenges faced by their learners.
- Teachers are offered in-service training opportunities that last for a few hours (less than eight). (Lockheed and Komenan, 2009) show a significant positive relationship between teacher experience and learner achievement in some developing countries, for instance in Nigeria and Swaziland. In contrast (Chen, 2008) establishes no significant relationship between teacher experience and learners mathematical achievement.

6.4 Policy Implication

The study has a number of implications and challenges of teaching learning is a multi-tier process concerned basically with two pedagogical questions: i) challenges of mathematics teachers are facing in the classroom in teaching mathematics and the problems of student are facing in the classroom in learning mathematics and moves through a few successive steps, such as (a) teacher training (b) syllabus design (c) teacher educational qualification (d) selecting teaching methodology and (e) classroom environment. So the implications of this study for the related areas of teaching and learning mathematics are discussed in the following section.

Implication for Mathematics Teaching

The study suggests that analyzing the target requirement for secondary education should be taken as the primary focus for developing an effective teaching mathematics up to

class X in the country. So, teaching mathematics should focus on what amount and what level of teaching skills will be required for meaningful teaching and learning mathematics at secondary education in Bangladesh.

Implication for Syllabus Design

The syllabus of mathematics for class nine-ten in Bangladesh has to be based on Science education but mathematics is required for different professions after and before graduation. It should be a multi-strand syllabus covering all areas of education focuses over filling the lacks found out in this study presented in chapter four. As a result, learners will be able to effectively cope with the challenges of mathematics subject proficiency required for secondary education. Each department at the university should also have one or two compulsory mathematics courses, focusing on the specific areas of calculation, students of that particular subject will need for their study and afterwards in their professional life. New items based on the specification of needs have to be added and amount of each skill should be adjusted to be required level so that learners have no problem when they go for higher studies. With the changes in the content areas of study in the university level, mathematics syllabus also will have to be re-examined and improved to suit the need of that particular subject.

Implication for Material Design

The Textbook of mathematics are produced centrally by the authorities concerned. The National Textbook Board of Bangladesh produces or compiles textbook, for students up to the higher secondary level of education. The textbooks, though locally produced, take little account of learners' target and learning needs. As a result, learners' target level of needs may not be fulfilled. So, attempts need to be made to design materials on the basis of thorough empirical investigation of learners' target level of needs. Materials should:

i) Be meant for a classroom where both teachers and students have important roles, i,e materials should be student-centered and activity oriented, but some teacher control will prove useful ;

ii) Provide for learning by doing;

iii) Create scopes for learners to use mathematics;

iv) Encourage learners to calculate more;

v) Incorporate enough reading in the textbooks;

vi) Include reading text that should be sequenced in such a way that texts and materials used in the HSC books should be like the texts and topic dealt with at the undergraduate level so that mathematics does not prove a big change for learners when they enter the university for higher studies;

vii) Be re-examined and improved in every 5 to 7 years to adjust the content and level to the changed requirements of the time.

Implication for Methodology

Methodology should also focus on how best to teach the syllabus, by using the materials to meet the objectives of the recommended curriculum. The methodology must be largely interactivity, task-based and practice oriented but may be with some degree of teacher-control on guidance, as the existing culture is like that. The preferred learning strategies and styles of the learners as found in the study must also be respected in the methods, that means, we can change for alternative approaches to learning, through pair and group work, but the students also prefer to learn from lecture, therefore, some lecture-based methods may also help them. Teacher's control and guidance will prove useful in Bangladesh as it has been a teacher-fronted culture. In Bangladesh the method, which is commonly used is lecture method. Teachers give lectures and students receive them passively. But lecture does not help the development of mathematical skills; interaction

between the lecture and students and participation in discussion are vital for skills development. However, there should be a judicious of lecture and interactive learning in Bangladesh, as students like both modes of learning and teaching, and believe them to be useful. Teacher should work as a monitor of students' learning and provide feedback in a positive manner. A good deal of teacher control may also be there, but student centered activities must be there. Group-work and pair-work should be encouraged.

Implication for Evaluation

The study implies that course should be evaluated in terms of the achievements of its goal. The goal of the course upto the higher secondary level should be to prepare learners for meaningful education for which an advanced level of listening and learning is required. How far the courses are geared to that objective and how far it achieves that objective should be the yardsticks for evaluating a syllabus. Mathematics courses up to class X should be evaluated with references to the needs of mathematics for higher education and mathematics courses of the university level should be evaluated in terms of their effectiveness to prepare learners for professional life. At the university level therefore mathematics courses should be planned with reference to the immediate academic and long-term professional needs of mathematics in different profession.

Implication for Teacher and Learner Training

Teacher Training

The findings of the study suggest that teacher have to be trained in the interactive, participatory and teaching-learning processes. Teachers in Bangladesh are used to teacher-fronted teaching-learning processes. A ship to participatory learning will require a change in their roles to which they may feel resultant. An orientating of teachers in the participatory learning is essential for the teachers. Without training it will be impossible to implement changes in curriculum and methodology. So, in service and pre-service training have to be arranged.

Learning Training

Learners' training also is necessary to implement changes, specially for a change in their traditional roles. When they are from passive listeners to active participants in interactive activating and have to learn by doing and engaging themselves in understanding. It is difficult to engage learner meaningfully if learners are not trained and favorably disposed towards the new learning approaches. A strong motivational element should be there for the new ways of learning.

6.5 Conclusion

The researcher started this research with a view to studying the challenges of teaching and learning mathematics at secondary level in Bangladesh. Secondary level is very important in the education system of Bangladesh. Many subjects taught at this level. Mathematics was one of the major subjects that were compulsory for all secondary students. To investigate that, the researcher has studied the classroom practices, teachers use of teaching materials and teaching aids, teachers qualification and training, dedication and motivation of teachers and students, all of their attitudes, assessment system and so on. Hard content, non subject based teacher, lack of teacher training, unavailability of teaching aids make the subject uninteresting. They who were teaching the subject did not have enough knowledge in modern teaching method. The syllabus of mathematics in class nine-ten seems very hard for the students of arts and business group. Most of the teachers do not take practical class on mathematics in their schools. The researcher has identified the challenges of teaching and learning mathematics and suggested possible remedial measures here in this chapter. The experiences of the researcher say that the challenges identified here are more or less similar all over Bangladesh. The researcher would like to conclude here by saying that the concerned authority would take immediate measures to get rid of the challenges of teaching mathematics of the secondary level in Bangladesh.

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Appendices

APPENDIX-I: **Questionnaire for Head Teachers**

APPENDIX-II: **Questionnaire for Mathematics Teachers**

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APPENDIX -IV: **Questionnaire for Mathematics Curriculum Expert/ Administrator Teacher Trainer/ Head Teacher and Senior Teacher**

APPENDIX –V: **Classroom Observation Checklist**

APPENDIX-I

Questionnaire for Head Teachers

Title: Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

(Questionnaire for Ph. D Thesis)

Section-A: Personal Information

1. Full name: ……

2. Joining date:……

3. Experience:…….4. ID. No.

5. Sex: Male □ Female □ 6. Age:……years

7. Name of School: …….

8. Address of School:……..

9. Category of School:

a) Government b) MPO Enlisted

10. Academic Qualifications:

Examination	Group	Board/ University	Year of passing	Result	Mark in Mathematic%
SSC/Equivalent					
HSC/Equivalent					
Bachelor(Pass/Hons)					
Masters					

12. Information Relating to Training

Name of the Training course/Program	Training Institution	Learning Points	Duration
B. Ed			
M. Ed			
T.Q.I			
Others			

Section-B: Information about Teaching and Learning

13. Do your school have annual action plan?

□ Yes □ No

14. Do your school have library?

□ Yes □ No

15. Do you visit mathematics class in the time of teaching?

□ Yes □ No

16. Do your mathematics teachers have any professional training?

□ Yes □ No

17. Do your schools' have sufficient teaching aids?

□ Yes □ No

18. Do your school have multimedia classroom?

□ Yes □ No

19. Do your mathematics teachers use multimedia in the class?

□ Yes □ No

20. Do your mathematics teachers take practical class?

□ Yes □ No

21. Do you think the present textbook is sufficient for teaching mathematics?

□ Yes □ No

22. Do you satisfy of your job?

□ Strongly Satisfactory □ Satisfactory □ Undecided □ Dissatisfactory

□ Strongly dissatisfactory

23. Do you arrange guardian meeting in your school every year?

□ Yes □ No

24. Do your school have students hostel?

□ Yes □ No

APPENDIX-II

Questionnaire for Mathematics Teachers

Title: Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

(Questionnaire for Ph. D Thesis)

N. B. This is just a part of a Ph.D. research on 'Challenges of teaching and learning mathematics at secondary level in Bangladesh'. The purpose of this questionnaire is to obtain information about your views of some important aspect of teaching and learning mathematics is very important for this research. This questionnaire is meant for collecting data for a research work. Your answers to the items of these questionnaires are very much essential for the research. So you are requested to answer the questions with sincerity and honesty. Your answers will be treated as confidential and will be used only for the research purpose. So you can feel free to give any opinion or observation, which you think appropriate for the questions. Please spare a few minutes of your time to fill out this questionnaire. Read the questions/statements carefully and tick (√) in the appropriate place(s)/box(s) that best suit you for each of the questions/statements.

Thank you for participation.

Section-A: Personal Information

2. Full name: ……ID. NO:……

3. Designation:……3. Joining date:……

4. Experience of teaching Mathematics:…….

5. Sex: Male □ Female □ 6. Age:……years

7. Name of School: …….

8. Address of School:……..

9. Category of your School:

a) Government b) MPO Enlisted

10. Your Academic Qualifications:

Examination	Group	Board/University	Year of passing	Result	Mark in Mathematics%
SSC/Equivalent					
HSC/Equivalent					
Bachelor(Pass/Hons)					
Masters					

11. Mathematics Background of Your Bachelor and /or Masters Level(s), if any:

Levels	Having Mathematics	Not having Mathematics
Bachelor (Pass/Hons)		
Masters		

12. Information Relating to Training on Teaching Mathematics

Name of the Training course/Program	Training Institution	Learning Points	Duration

Section-B: Information about Teaching and Learning

13. Do you think training is necessary for teaching mathematics?

□ Yes □ No

14. Do you follow the lesson plan given in the Teacher's Guide?

i) Always □ ii) Often □ iii) Sometimes □ iv) Rarely v) Never □

15. Do you think lesson plan is necessary for teaching mathematics in classroom?

□ Yes □ No

16. Do you make any lesson plan for your class?

□ Yes □ No

17. Do you think that inspired is necessary for mathematics subject?

□ Yes □ No

18. What method do you use in your classroom?

□ Lecture method □ Analytical method □ Synthetic method □ Inductive method

□ Deductive method □ Heuristic method □ Brain storming method

□ Problem solving method

19. Do you use teaching aids at the time of teaching? □ Yes □ No

20. Are there sufficient teaching aids in your school? □ Yes □ No

21. Do you take any tutorial examination monthly?

i) Always □ ii) Often □ iii) Sometimes □ iv) Rarely v) Never □

22. Do you think the present textbook is sufficient for teaching mathematics?

□ Yes □ No

23. Do you feel any difficulty using/teaching this book? □ Yes □ No

24. Do you arrive your school in schedule time? □ Yes □ No

25. Do you leave your school in schedule time? □ Yes □ No

26. Can you complete your mathematics course in due time?

□ Yes □ No

27. Do you take mathematics practical class in your classroom?

□ Yes □ No

28. Do you take any extra class for the weaker students? □ Yes □ No

29. Do you feel any trouble taking mathematics class?

□ Yes □ No

30. Do you satisfy of your job?

□ Strongly Satisfactory □ Satisfactory □ Undecided □ Dissatisfactory

□ Strongly dissatisfactory

31. Do you involve in private teaching?

□ Yes □ No

32. Do you think that mathematics syllabus is appropriate for class nine-ten?

□ Yes □ No

Signature & date

APPENDIX-III
Questionnaire for Students
Title: Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

(Questionnaire for Ph. D Thesis)

Direction: Questionnaire is meant for collecting data for a research work .Your views of some important aspect of teaching and learning mathematics are important for this research. It is not an evaluation of you as a student. So you are requested to answer the questions with sincerity. Your answer will be kept confidential and used only for the purpose of this research. Please listen to his instructions very carefully before you fill up this form. Read the questions/statements carefully and tick (√) in the appropriate places(s)/box(s) that best suit you for each of the questions/ statements. Your co-operation will be highly appreciated.

Section-A: Personal Information

1. Name: ----------

2. Father's name: ----------

3. Mother's name: ----------

4. Name of the institution and address: ----------

5. Class: ----------Roll No: ----------Section----------

6. Fathers' / Guardians' Occupation:

Types of occupation	Urban Students' Fathers' / Guardians' Occupation in percentage	Rural Students' Fathers' / Guardians' Occupation in percentage
Service		
Agriculture		
Business		
Agriculture & Business		
Service & business		
Service & agriculture		
Service, agriculture & business		

7. Mothers' Occupation:……

8. Name of Fathers' and Mothers' Organization/Institution:

9. Fathers' Academic Qualifications:

Education levels	Students' Fathers' educational qualification of urban area in %	Students' Fathers' educational qualification of rural area in %
MA/MSc/MCom		
BA/BSc/BCom		
HSC/Equivalent		
SSC/Equivalent		
Primary level		
Literate		
Illiterate		

10. Mothers' Formal Education:

Education levels	Students' Mothers' educational qualification of urban area in %	Students' Mothers' educational qualification of rural area in %
MA/MSc/MCom		
BA/BSc/BCom		
HSC/Equivalent		
SSC/Equivalent		
Primary level		
Knowledge of literacy or illiterate		

11. Monthly Income of the Guardians:
(in Bangladesh Tk. in thousands)

Students' guardians' monthly income range	% of Students' guardians' monthly income of urban area	% of Students' guardians' monthly income of rural area
Below 2		
2-5		
5-10		
10-15		
15-20		
20-30		
30-40		
Above 40		

Section-B: Information about Teaching and Learning

12. What do you feel reading mathematics? □ Excellent □ Very good

□ Good □ Very bad □ Bad

13. Does your teacher take practical class on mathematics?

□ Yes □ No

14. Does your mathematics teacher give proper understanding the selected topics?

□ Yes □ No

15. Does your teacher give extra class for the weaker students?

□ Yes □ No

16. Does your teacher use any teaching aid in your class?

□ Yes □ No

17. What is your result in the last mathematics examination?

□ Strongly Satisfactory □ Satisfactory □ Undecided □ Dissatisfactory

□ Strongly dissatisfactory

18. Does your teacher threat you in any problem solving situation?

□ Yes □ No

19. Does your teacher abhor you in the class?

□ Yes □ No

20. Are you satisfied getting your mathematics teacher?

□ Yes □ No

21. Do you find any negligence of mathematics teacher in taking class?

□ Yes □ No

22. Does your mathematics teacher complete your course in time?

□ Yes □ No

23. Does your teacher give you any punishment?

□ Yes □ No

24. Does your mathematics teacher use chalk board?

□ Always □ Often □ Sometime □ Rarely □Never

25. Do you have private tutor?

□ Yes □ No

26. Does your mathematics teacher teach you after classifying groups?

□ Yes □ No

Signature & date

APPENDIX –IV
Questionnaire for Mathematics Curriculum Expert/ Administrator/ Teacher Trainer/ Head Teacher and Senior Teacher

Title: Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

(Questionnaire for Ph. D Thesis)

Section-A: Personal Information

1. Full name: ……...
2. Designation: …….
3. Sex: Male □ Female □
4. Age: …….
5. Name of institution: ……..

Section-B: Questions

1. You have had much experience as a mathematics curriculum expert/ administrator/ teacher trainer/ head teacher and senior teacher. Could you please tell me your experience on teaching and learning of mathematics at secondary schools?

2. Do you think that these textbooks would be more effective in mathematic teaching and learning in Bangladesh?

3. What kind of support or training, do you think, is required for teaching to develop their skills and knowledge to use these mathematics textbooks successfully in the classroom? Is the continual training is sufficient for them?

4. Do you think, curriculum of mathematics at secondary level is perfect for the students? Have there any faulty in mathematics curriculum?

5. Do you have any suggestions for remove the challenges of teaching and learning mathematics at secondary level? Could you please explain them?

APPENDIX -V

Classroom Observation Checklist

Title: Challenges of Teaching and Learning Mathematics at Secondary Level in Bangladesh

(For Ph. D Thesis)

In this study, the researcher tried to measure the teachers performances, students attitude towards learning of mathematics and classroom situation of teaching and learning mathematics at secondary level in Bangladesh through the indicators like; Strongly disagree which bears scale point 1, Disagree 2, Undecided 3, Agree 4 and Strongly agree 5. These indicators have also been used by some renowned researchers like; **(**Shafqat, 2009), (Hongsa, 2006), (Sita, 2010), (Osamah, 2008),

Name of the School**:** _____

Name of the Teacher**:** _____

Qualification: _____ Class: _____

Teaching Experience (years**)** _____

No. of Students: _____ Date and Time:_____

Note: 1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree

5 = Strongly agree

1. Class room environment has been found friendly

Strongly disagree -1 2 3 4 strongly agree -5

2. Classroom has been found neat and clean

Strongly disagree -1 2 3 4 strongly agree -5

3. Classroom has been found enough sufficient light

Strongly disagree -1 2 3 4 strongly agree -5

4. Classroom has been found having adequate benches

Strongly disagree -1 2 3 4 strongly agree -5

5. Classroom has been found electricity facilities

Strongly disagree -1 2 3 4 strongly agree -5

6. Classroom has been found free from noise pollution

Strongly disagree -1 2 3 4 strongly agree -5

7. Classroom has been found organized

Strongly disagree -1 2 3 4 strongly agree -5

8. Class size has been found large

Strongly disagree -1 2 3 4 strongly agree -5

9. Teacher has entered the classroom with smiling face

Strongly disagree -1 2 3 4 strongly agree -5

10. Teacher has started the class with a nice warmer

Strongly disagree -1 2 3 4 strongly agree -5

11. Teacher's voice has been found audible

Strongly disagree -1 2 3 4 strongly agree -5

12. Teacher was found friendly

Strongly disagree -1 2 3 4 strongly agree -5

13. Teacher had a lesson plan

Strongly disagree -1 2 3 4 strongly agree -5

14. Teacher has followed the stages of the lesson

Strongly disagree -1 2 3 4 strongly agree -5

15. Teacher has used perfect teaching method in the class

Strongly disagree -1 2 3 4 strongly agree -5

16. Teacher has made students busy in doing activities from the lesson

Strongly disagree -1 2 3 4 strongly agree -5

17. Teacher has corrected students' mistakes gently

Strongly disagree -1 2 3 4 strongly agree -5

18. Teacher has praised students

Strongly disagree -1 2 3 4 strongly agree -5

19. Teacher has used chalk board nicely

Strongly disagree -1 2 3 4 strongly agree -5

20. Teacher has monitored the class

Strongly disagree -1 2 3 4 strongly agree -5

21. Technique of teacher switching from one section to another has been suitable

Strongly disagree -1 2 3 4 strongly agree -5

22. Teacher has maintained time properly

Strongly disagree -1 2 3 4 strongly agree -5

23. Teachers has given homework for his/her students

Strongly disagree -1 2 3 4 strongly agree -5

24. Students have looked jolly

Strongly disagree -1 2 3 4 strongly agree -5

25. Students have understood instructions

Strongly disagree -1 2 3 4 strongly agree -5

26. Students have told their difficulties to teacher

Strongly disagree -1 2 3 4 strongly agree -5

27. Students were found interested in listening to the exercises

Strongly disagree -1 2 3 4 strongly agree -5

28. Students have listened and answered questions

Strongly disagree -1 2 3 4 strongly agree -5

29. Students have maintained classroom discipline

Strongly disagree -1 2 3 4 strongly agree -5

30. Students' motivation towards learning was found satisfactory

Strongly disagree -1 2 3 4 strongly agree –5