Trends and Problems of Science and Technology Education at Secondary Level of Bangladesh with Special Reference to Munshigonj District: British Period to Till Date.

Doctor Philosophy

Ph. D. Researcher Md. Saidul Islam khan Institute of Education

& Research University of Dhaka

Supervisor

Professor Dr. Md. Abdul Awal Khan

Institute of Education & Research

University of Dhaka

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Md. Saidul Islam Khan
Ph.D Researcher, IER,
University of Dhaka

Abstract

The study was descriptive in nature. The researcher intends to use both qualitative and quantitative approaches for collecting and analysis data. From 120 High school of Munshigonj District only 58 schools, 116 teachers and 580 students were selected by purposive sampling.

Main Research Question of this study was the present Scenario of class Ten Science Students in Munshigonj District, From findings

Munshigonj Sadar: Science students at grade ten in 2015 were 15.90 % out of students 2467 (All Group) , on the contray in the year of 2016, Science students at grade ten are 14.50 % out of students 2560 (All Group), That Means Science students Decrease all most 1% in 2016

Tongibari : Science students at grade ten in 2015 were 16.00 % out of students 2021(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 18.00 % out of students 2456 (All Group), That Means Science students Increase all most 2% in 2016

Sreenagar: Science students at grade ten in 2015 were 12.71 % out of students 1433(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 11.13 % out of students 2230 (All Group), That Means Science students Decrease all most 1% in 2016

Serajdikhan: Science students at grade ten in 2015 were 15.24 % out of students 1641(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 16.14 % out of students 1927 (All Group), That Means Science students Increase all most 1% in 2016

Louhajang: Science students at grade ten in 2015 were 12.00 % out of students 1064(All Group) , on the contray in the year of 2016, Now Science students at grade

ten are 9.00 % out of students 1320 (All Group), That Means Science students Decrease all most 3% in 2016

Gazaria: Science students at grade ten in 2015 were 18.26 % out of students 767(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 19.4 % out of students 857 (All Group), That Means Science students Decrease all most 1% in 2016.

Research question of this study was to find out the present situation of teaching strategies practiced in the science classrooms as well as the knowledge, skills and classroom activities and assessment procedure used for Secondary Science in the Secondary schools of Munshigonj District. It was found from the study that, Most of the teacher uses question-answer method and lecture method as classroom teaching and learning method, do not use lesson plan properly, could not properly apply Secondary science teaching methods perfectly and most of the teachers also do not use the teaching aid properly.

Most of the teacher uses question-answer method and lecture method during classroom teaching and learning. According to the teachers question-answer method is appreciated for make students' attention towards their lesson.

Findings from the study indicate that The majority of teachers opine that they always use charts/pictures in the class, most of the students discoursed that their teacher uses charts/pictures occasionally. On the other hand, models and real objects are told to be sometimes used but considerable number of students declared their view against these opinions. However, scientific apparatus is not used at all.

Findings from the study indicate that science teachers trends towards usefulness of ICT tolls in their science class room.The teacher responded positively to the statements.The data reflects teachers have positive perception towards usefulness of

Ict tools and this perception can guide them towards professional development. Scince Teacher agreed on the benefits of attending class supported by multimedia. Most of the teacher and students agreed that Learning become enjoyable and attractive, Learning become easier and realistic, Learning become more practical, Student pay more attention, Tendency develop to attend class regularly, Learning become permanent and lasting, Tendency to memorize reduced, Students participation in classroom activities increased, Can learn new topics, Can know Updated information, Can learn through seeing picture. Experience of uses of computer (computer starts, cut, copy, pest, file opening and shutdown), data shows that teacher have some expertise.

Moreover, findings from the study indicate that Teacher faces various challenges in conducting class through multimedia, most of teacher agreed that they faces electricity problems , Insufficient space of classroom, Lack of trained teacher, Lack of speed of internet, Teacher has no personal laptop, Lack of sufficient infrastructure, Shortage of time, Lack of sufficient skill in computer operation, Lack of fund, Disorder of equipment.

DEDICATED

TO

MY PARENTS

LATE MD. MUOSTAFIZUR RAHMAN KHAN

&

HAMIDA KHATOON

DECLARATION

I, Md. Saidul Islam Khan, hereby declare that the thesis entitled "Trends and problems of Science and Technology Education at the Secondary level of Bangladesh with special reference to Munshigonj district, British Period to till date" submitted to the Institute of Education and Research, University of Dhaka, in partial fulfillment of the degree of Doctor of Philosophy in Education, is an original research work done by me under the supervision and guidance of Professor Dr. Md. Abdul Awal Khan. Neither the whole nor any part of it was submitted to any other degree or diploma. My indebtedness to other researchers and their contribution has been duly acknowledged at the relevant places of the thesis.

…….....……
Md. Saidul Islam Khan
Ph.D Researcher
Dhaka
Dated: November, 2017
Roll No: 146
Session: 2013-2014
Institute of Education and Research
University of Dhaka

CERTIFICATE

This is to certify that the thesis entitled "Trends and problems of Science and Technology Education at the Secondary level of Bangladesh with special reference to Munshigonj district, British Period to till date" submitted to the Institute of Education and Research, University of Dhaka, Bangladesh in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education is a record of original research work done by Md. Saidul Islam Khan under my supervision and guidance. To the best of my knowledge, this thesis has not been previously submitted to any other university or institution for the award of any degree /diploma or any other similar title.

Professor Dr. Md. Abdul Awal Khan Dhaka
Dated: December, 2017.
Department of Science, Mathematics and Technology Education
Institute of Education and Research
University of Dhaka

List of Acronym

BANBEIS	:	Bangladesh Bureau of Educational information and Statistics
CPD	:	Continuous Professional Development
DPE	:	Directorate of Primary Education
DSHE	:	Directorate of Secondary and Higher Education
EFA	:	Education for All
ERHEC	:	Educational research Human Ethics Committee
MDG	:	Millennium Development Goal
MOE	:	Ministry of Education
NDF	:	National Disabled Forum
NGO	:	Non-Government Organization
SEN	:	Special Education Needs
SWSEN	:	Student with special educational needs
TQI-SEP	:	Teaching Quality Improvement in Secondary Education Project
UNESCO	:	United Nations Educational, Scientific and cultural organization
UNCRC	:	United Nations Conventions on the Rights of the Child
GOB	:	Government of Bangladesh
NEP	:	National Education Policy
MOE	:	Ministry of Education
NRC	:	National Research Council
OECD	:	Organization for Economic Co-operation and Development
SBC	:	Subject Based Cluster

CHAPTER: ONE

1.1 Introduction of the Study:

The government of Bangladesh has declared to make this country as knowledge based society and a digital one by 2021 (Ganguly, 2013.)

Today‘s children are the first generation of the _digital age‘. The world is changing rapidly with the advent of new technologies and those technological equipment influenced greatly in our daily life. The changes among our HR came to taken place in our education system as well where no teachers and students are using different sorts of technologies on their learning purpose. The important thing is that how teacher teach student digitally and how the students are learnt their lesson digitally using those new technologies.

_The Government of Bangladesh aiming to turn the huge number of its potential young intelligent populace into a resourceful one, has emphasized on ICT in education by introducing multimedia classrooms‘ and _teacher-led content development‘ in 500 primary schools‘ (a21, 2013). We now have a task to prep our children for a future— a future that we cannot predict. _As Dewey 1938 suggests, the best we can do is to help them experience the present world to its fullest extent. This involves extracting meaning from experience‘ (DLIPS, 2009 pp-12).

Today‘s digital technologies make it possible to capture the world through pictures, sounds, audio visual sequences or animations and to assemble and present all of these with or without text In this way children of all ages and abilities can engage with the world and make their own meaning.

Science is an important subject at Secondary level. If teachers follow their responsibilities properly then they will be able to make the teaching-learning activities more effective for learners. This subject also demands proper content knowledge, appropriate teaching aids as other subjects. So, teachers have to know their responsibilities and also have to perform these properly. Thus their science teaching will be more organized and then they will be able to show more professionalism. This will result in a well facilitation for learners.

The qualification of teacher is important in determining the extent with ICT related innovations which are adopted and implemented in different kinds of educational practices. Therefore, professional training and regular development of teachers‘ content and pedagogical knowledge is

important for integration of technology into daily educational practice (Howie, et. al., 2005). The use of teaching aids helps the students to make their conception clear about complicated and difficult idea, information, facts and principles (Singh, 2010). The methods of teaching for ICT like other subjects play a great role in enhancing the efficiency of the learners (Elizabeth, 2004).

ICT is such kind of a subject that without a computer lab it is a furtive attempt to deliver the contents of this subject. Hence, a computer lab is a crying need for learning by doing activities of ICT content for the better achievement of the students. The other facilities such as multimedia, internet, electricity, alternative power supply etc play a pivotal supporting role for the delivery of ICT content to the students. At the same time, as a developing country, Bangladeshi secondary schools normally are facing a lot of challenges to avail the required facilities and their better uses in the teaching-learning activities in the classroom (Salam, et. al., 2012).

1.2 Background and context of the study:

British Period:

Bangladesh is a new state in an ancient land. The territory constituting Bangladesh was under the Muslim rule for over five and a half centuries from 1201 to 1757 A.D. Subsequently, it came under the colonial rule of the British after defeat of the last sovereign ruler Nawab Sirajuddowala in 1757 (Islam, 1992). The British came in this subcontinent as merchants but ultimately they captured the political power and ruled over the entire Indian sub-continent including this territory for nearly 190 years from 1757-1947 (Mcleod, 2002). During that period Bangladesh was a part of the British Indian provinces of 'Bengal and Assam'. Education in Indian Sub-continent began from an indigenous educational system in ancient times, continued through an Islamic style of education in the medieval period as a result of Muslim invasions, and to imperialistic education delivered during British colonization. The East India Company and the British Crown were generally indifferent to education in Indian sub-continent until the early 19th century. Throughout the last decades of eighteen century and beginning of nineteenth century, European missionaries and the East India Company established several schools and colleges for developing educational programme of this area (Mukerji, 1957). Warren Hastings (1773-1744) the Governor General of the East India Company was sympathetic to Indian traditions and encouraged indigenous Indian thought to the exclusion of Western educational instruction (Mann, 2004). In 1781, 'Kolkatta Alia Madrasah', the first government college in the Indian sub-continent was set up to produce officials well versed in Islamic laws and in 1792 'Benaras

Sangskrit College' was established by company officials (Chatterjee, 1976). But the colonial officials had differences of opinion among themselves regarding the purpose of educating the people of this subcontinent, about the medium of education, management of schools, the way of expanding educational facilities to the whole country (Ali, 1986; Mukerji, 1957; Viswanathan, 1989).

The East India Company first recognized their responsibility towards education in British India in the Charter Act of 1813 (clause 43) where they highlighted the need to promote and uplift oriental languages and literature as well as increase the knowledge of western sciences among the Indian population (Kumar, 1991). Thomas Macaulay (1800-1859), a member of the Governor General's Council, in his influential minute in 1835, articulated the supremacy of the Western culture, and English language; supported the education of the upper classes, and made a vigorous plea for spreading Western learning through the medium of English (Ghosh, 1993; Mukerji, 1957). Consequently in 1837, English was made the language of administration, and thus the East India Company officially entered into the education field of this sub-continent.

As a result of the new policy there was a rapid growth in English schools and colleges (Mukerji, 1957; Seal, 1968) and English as the medium of instruction began to dominate the entire educational field (Ghosh, 1993; Roy, 1993). Giving attention and importance to secondary education system and for its expansion, the British established 12 Zila schools and 3 collegiate schools (Public schools) in present Bangladesh land area during the years 1832-1855.

Secondary education as a distinct level of the total education structure emerged only after the publication of famous Education Despatch (Mominullah, 1984). However, one of the first documents advocating formal education for girls in Bangladesh (then part of India) is 'Wood's Education Despatch' of 1854. In that document, 'female education' was discussed and promoted because it enhanced the educational and moral tone of the people (Jalaluddin & Chowdhury, 1997). What educational provision there was for girls focused on 'education for enlightened motherhood' (Chanana, 1994); they were being trained to be mothers, rather than, for example, being prepared for paid employment or for tertiary education. The universities of Calcutta, Madras and Bombay were established in 1857, which had a far reaching effect especially on the content, range and scope of secondary education. They dominated secondary schools in every respect and secondary education became a preparation for the university.

In 1882, Lord Ripon appointed the first Indian Education Commission with William Hunter as its Chairman (Nurullah & Naik, 1962). They suggested for leaving secondary education to private enterprise through a system of grants- in- aid, school-end 'Entrance examination' and appointment of trained teachers at secondary schools. After the all Indian Education Conference at Shimla in 1901, Lord Curzon published his education policy in the form of a government resolution in 1904 which contributed to the increase of vernacularisation at high school level especially in public schools,

Under the reforms of 1919-1921 the elementary education was made free within municipalities and rural unions and in Bangladesh the first steps towards universal primary education were taken through the Bengal primary education act 1930 (Memmi, 1957).

'The Bengal Education Code 1931' (The Bengal Education Code 1931) was a landmark legislation that created the 'District School Board' as the administrative body for primary and secondary education. A Central Advisory Board was established in 1935, for policy formulation in education recommended by the 'Hertz Committee-1927'.

In 1945, a separate Education Department was established under the Central Government and its responsibilities were entrusted to a member of the Central Executive (Nurullah & Naik, 1951).

Economic and socio-religious mobility were the major hindrances for the poor in British India to enroll in schools. The caste allied socio-religious restrictions were imposed upon the poor to prevent them from achieving knowledge. The cost of education was another important factor that pushed away the poor from schools. Nurullah and Naik (1951) also criticised the British for not having developed a truly national system of education; for failing to evolve a synthesis of eastern and western cultures; for neglecting indigenous education and for the absence of any overall plan or consistent drive to reach a predetermined goal.

Pakistan Period:

With the end of the British rule in 1947, the sub-continent was partitioned into two independent countries, India and Pakistan. Bangladesh became one of the provinces of Pakistan and was named as East Pakistan.

In the meantime, 'First Education Conference' was held in 1947 at Karachi, 27 November-1st December (GoP, 1947). This conference was convened to reassess the colonial education system and to restructure the existing educational system with due regard to ideological and literacy considerations.

In 1949, Maulana Akram Khan Committee on education was established and in 1951, Second Education Congress was held at Karachi, 4-6 December (GoP, 1949; GoP, 1951). Following the

reports of 'Akram Khan Committee' and 'Ataur Rahman Khan Commission 1957' the united front government wished for a universal single stream primary and secondary education system for all, based on scientific knowledge. In 1956, the constitution of Pakistan eventually recognized Bangla as one of the national languages. In the successive five-year plans and other national economic policy documents developed during the Pakistan period, the need of modern science education was also articulated but the impact of such policies was not felt in East Pakistan.

Newly formed Sharif Commission on education (1958) and the 'Curriculum committee for secondary education (classess vi-xii)' under military rule, also articulated in their report a need to shift the focus of school education away from rote memorization and to expand facilities for scientific and technological education (GoP, 1960). The Curriculum committee for secondary education (classess vi-xii) produced a report, a document of 647 pages, in the record time of three months. However, the new policy was an outcome of the political agenda of the government of that time. Its mandate was to evolve a national system of education that would reflect the spiritual, moral and cultural values of Independent Pakistan, and enable the system to meet the growing needs of the nation in the fields of agriculture, scientific and technological development. The objectives of this report for secondary education may be encapsulated as follows: "To develop, (a) a good worker (b) a good citizen (c) a good individual and (d) a good patriot." However, the 'Sharif Report' was comprehensive in its recommendations. They emphasized universal primary schooling, eradicating illiteracy and promoting the national language, among others. The committee also incorporated suggestions for a few basic changes in the administrative set-up, such as decentralizing the management of primary education, revamping the examination system, and envisaging a new management structure for technical education.

In 1959, breaking the traditional one stream secondary education, separate streams were introduced after Class-8, namely Arts, Science and Commerce. The East Pakistan Intermediate and Secondary Education Ordinance of 1961 spelt out the law regarding establishment of managing committees for secondary schools. Based on this ordinance, regulations were framed at various times on such matters as student fees, admission and registration, holding public examinations and terms of teachers' service. East Pakistan Secondary Education Board took charge of the affiliation and examination of secondary level institutions.

Bangladesh Period: Before 1960, no significant emphasis was given to science education at the secondary level in the then East Pakistan. General science was introduced at the primary level in grades 4 and 5 in 1951. In the lower secondary level, elementary science was then just initiated. *Elementary scientific knowledge*, an optional subject was offered at the secondary level. At that time science was taught as an additional/optional subject up to grade 10 and multi-stream courses were used to commence from grade 11.

Before independence, the major change in science curriculum was made in 1961. This was done following the recommendation of the Pakistan National Education Commission Report of 1959 (Ministry of Education, 1959). For the first time, science was made compulsory up to grade 10. Beside this a multi-stream system was introduced from grade 9. The courses were divided to different groups such as science, humanities, commerce, agriculture, home economics among others. The students of all but science group had to read a general science as one of their compulsory subject.

After the independence of Bangladesh, a National Curriculum and Syllabus Committee (NCSC) was set up in 1975, following the recommendations of the Bangladesh Education Commission Report 1974. The NCSC was entrusted with the responsibility of reviewing, redesigning and improving curricula and syllabuses up to higher secondary level. The NCSC accorded special emphasis to modernize science education of the country with reference to content, teaching strategy, evaluation and application of science and developed a new set of curricula and syllabuses from primary to higher secondary levels during 1981-84. The curricula for higher secondary level were not implemented at that time. In 1995 on the basis of the National Education Commission Reports (MOE, 1988) that curricula was modified.

On the basis of the National Education Commission Report in 1974 and the Curriculum Committee Report in 1976, two textbooks—General Science Part I (Physical Science) and General Science Part II (Biological Science)—were introduced for grades 9 and 10 in 1983. Physical Science covers physics and chemistry while biological science covers botany, zoology, agricultural science, sericulture, apiculture, horticulture, fisheries, poultry, farming, nutrition, population, public health and pollution and so on. According to the recommendations of the Education Commission Report of 1974, science was made compulsory for all students at the secondary level. The books were accordingly prepared and introduced by NCTB in 1983. But due to resistance from different sources such as teachers, school authorities, guardians, and students, science was made elective by the government in the same year. The reasons provided

at that time were that all secondary schools were not capable of teaching science as a compulsory subject because of lack of laboratories, equipment, teaching aids and trained teachers. Also, the teachers needed more time to be oriented with the texts. The students taking general science as their elective subject were treated as science-group students and the rest were treated social-science group students. The social-science group students could or could not take a paper on science. A book entitled *Modern Science* was prescribed by the NCTB as an elective subject for the social-science group students. The general science textbooks introduced in 1983 for grades 9 and 10 had been redesigned and modified on the basis of a nationwide evaluation of the trial edition introduced in 1983 by the science evaluation committee (1984) constituted by the MOE under NCTB. This revised edition was made effective from 1988. After revision no major changes in secondary science textbooks were brought about but some minor corrections were done with the help of experts.

The major change in secondary curricula was made in 1995 following the recommendations of National Education Commission Report of 1988. Just like in 1961, science was made compulsory up to grade 10 and a multi-stream system in general education was introduced from grade 9, the courses being divided into three groups—science, humanities, and business education. Physics, chemistry, mathematics, and biology were taught as separate disciplines in the science group. For other groups, general science was introduced as compulsory subject. The changed secondary science curriculum of 1995 was an updated one and was capable of maintaining standard of other developed and developing countries. It was comparable to O- level/GCSE curricula.

On the basis of changed curricula of 1995, textbooks in physics, chemistry, mathematics, and biology were developed keeping in view the standard and style of textbooks at O-level/GCSE level. The teachers, especially those in rural areas, are facing many difficulties teaching these subjects as they are not oriented with the modern and updated contents and their presentation style.

Science and Technology have shown a spectacular growth during last few decades. The progress has outstripped all expectations. For any country to maintain the position of strength in the world affairs to-day, and to continue its internal growth and development satisfactory, it is almost essential to ensure that satisfactory standards are maintained in science education (Laroia 1962). So science educations throughout the world have begun to make radical charge in the Science

curricula. First, objectives were clearly changed. The focus of the curriculum was not only the science content but also towards the acquisition by students of 'Scientific' skills and attitude and towards their understanding of how the discipline 'works' (Grahm 1980).

Bangladesh is a new born emergent nation. Immediately after her independence the then govt. felt the necessity to improve the condition of the existing education system. The Bangladesh Education Commission (1973) Curriculum and Syllabus Committee (1975) were formed. Both has given more importance and stress to science education at school level to help students to develop scientific sprite, knowledge, and skill to improve the quality of life and raise the standard of living, both individually and collectively.

The nation has passed 41 years plus. During this time several Education commission, curriculum committees were formed. All those commissions and committees continued the stress to enhancing the school science education. As the process of continuation, Present government has taken different steps for development of education system with the firm impression to build the Digital Bangladesh. For which we need and expect high enrolment of school students in science. But in practice it is not happening. In reality the enrollment of science is low and not increasing day by day.

Now the questions are: Why enrollment of Science is low? Why the rate is not increasing? Is not he curriculum enables to create interest to the students towards science learning? Is not it interesting or teachers failed to make it attractive? Are not the teachers qualified with proper knowledge, skill and attitude of teaching science? Or are not they well equipped? What is the weakness, threat? Or is there any strength or opportunity?

To find out the answer to those questions, an extensive investigation about the t situation of science and technology education in secondary level is necessary. Such investigation may result in the basic information to get answer to the above questions.

At national level we have three types of schooling systems. Those are General Education, Madrasha Education and Vocational Education System. In all system of Secondary level we have three streams viz. Science group, Humanities group and Business education group. If we compare the student's enrollment group wise, we will find that the rate of science groups

enrollment is decreasing year by year. 2011 to 2013 in Madrasah it has changed from 44% t o37% in rural non govt. schools 23% to 17% and govt. school 94% to 75% respectively. (Roy, 1913).

SSC results of BISEs also show similar down ward trend of science group students. For increasing the science enrollment vis-a-vis developing pupils interest in science a good number of projects has taken by the Ministry of Education. Out of those SESDP, SEDP, FSSAP, TQI etc are trying to develop science curriculum, text materials, teaching materials, science teachers and developing the physical facilities for science learning by supplying chemical, equipments even erecting well equipped science buildings. But why this down fall still persisting? What are the real situation of teaching science. What are the weakness and threat? Has not been created there any strength and opportunities in favour of learning science due to the effort of last decades? A special type of SWOT analysis is to days demand for finding the way for developing the present situation of science education of the school level of Bangladesh. In 2009 students appeared in science group were 1827744 (22.9%) out of total students 797891 in SSC examination of eight boards. Similarly these percentages were 22.4%, 21.9%, 22.6% and 22.9% in 2010, 2011. 2012 and 2013 respectively. What can we conclude from this output statistics? All these lead to fild out the situation of science education in secondary level of Bangladesh.

Why Science education is important in secondary level?

Science is the product and process of knowledge generation. Man throughout the ages has been sing knowledge as his weapon to cope with nature and to overcome his physical limitation to lead better and fuller life. Science and technology help to explore minerals and other resources of the earth, improve agriculture and industry, to improve health and communication systems, to fight diseases, poverty and calamites etc. So it can be undoubtedly say that science and technology are at the core of national and individual development activities anywhere or any person in the world. Thus to earn science is fundamental and essential as language and arithmetic for every individual.

If any one looks behind 50 years, can see, an experts Conference held at the University of Ceylon, Peradeniya, (Srilanka), in 1963, December. The Commonwealth Education Liaison Committee invited all governments to take part in the conference. Seventy delegates attended there. In the conference the liaison committee noted:

> A rapid improvement of science education is essential for accelerating economic development and for enabling the individual citizen to understand something of the complexities of an increasingly technological age. At the same time the extraordinary growth in scientific knowledge and technological achievement has led many to question whether the science course now provided in schools, where the foundation for later specialization in scientific and other disciplines are laid are in need of change.

The Commonwealth Education Liaison Committee believes that the need is urgent. No school curriculum therefore will be completed without science education (CELC, 1963). In modern curriculum "Science for all" is the basic motto. According to the experts (NCERT, 1973) it must be taught in a way that reflects the nature and structure of science.

At the end of last century all countries accept that science should have a prominent place perhaps an increasingly large place in the education of all boys and girls. By this time Bangladesh has emerged and has been trying hard to cope with the world situation. After half century Bangladesh Govt. announced The National Education Policy 2010. In the policy report it has stated (2012) 30 themes as the aims , objectives, goals and principles of the Education Policy out of which 3 are related to this study:

a. to evolve an education process that is oriented to creativity, practicability and productivity to achieve advancement in the economic and social fields of the country; to create a scientific mindset of the students and to develop in them the qualities of leadership; (Sl No. 6)
b. to ensure a creative, favorable and joyful environment for the students at the primary and secondary levels for their proper protection and congenial development; (Sl. No. 15),
c. to extend the use of information and communication technology (ICT) instrumental in educational process at every level. (Sl. No. 21)

Chapter 11, title Science education, the policy describes the following sentences as Aims and Objectives of science education

> The chief objective of science is to understand nature. Science has been unraveling the mystery of nature by experiment, observation and mathematical logic. On one hand, it

fulfils the inquisitiveness of human being and on the other; it helps human civilization to continuously move forward through the utilization of different technologies originated out of scientific knowledge. Proper study of science can only help the nation reach its destination quickly. The aims and objectives of science education are:

- to prepare the learners in a way that helps them develop their talent, practice of knowledge and creativity equal to an international standard.
- to provide science education to the learners in a way so that the learners understand that there exists a close relationship between technology and humanities and each of them is complementary to the other, Science will be taught as a coordinated discipline. (Ministry of Education, 2010)

Secondary Education

1. Since the study of science is closely related to mathematics (math), special emphasis will be given to the learning of math. Graduates in math will be appointed as math teachers.
2. Textbooks and teaching methods will be prepared in a way that these will help learners gain basic knowledge about different branches of science and make them feel comfortable in problem-solving and enable them to use this knowledge in real life.
3. Without practical classes, science education becomes useless. So, practical classes on a regular basis will be arranged for science and math. Proper evaluation of practical tests will be ensured so that arbitrary assessment does not take place.
4. In order to popularize science and mathematics to the students, science fair or Math Olympiad will be organized in every school in tune with annual sports or cultural week Science fair and Math Olympiad will also be organized at national level.

In this report grade VI, VII, VIII are considered in Primary level and grade IX-X, XI-XII as secondary level.

The Curriculum Committee's Report National Curriculum and Textbook Board (2012), says: For making the students knowledgeable for the present age, the Science curriculum of VI- VIII has attempted to acquaint them with modern knowledge of science and scientific process. Here students will get opportunities to acquire scientific attitude with theoretical knowledge and practical skill.

The curriculum General Science of IX-X are prepared for those students who will not select science or science education as profession. So to give them a complete concept of science, curriculum has considered living word, environment, and technological expansion as the main focus of science education. Avoiding to the theoretical analysis of theory and formula it has given more importance on its usage in daily life and related social facts. It has expected that through science study learners will be able to be science-minded, free from superstitions and open-minded.

Science curriculum has taken different attempts to build a science-minded society by introducing the knowledge of science and process to the learners of IX-X.

Objectives

1. To be acquainted with different fact and matter of the nature and to be inquiring and inquisitive towards those.
2. To understand that reasons are there behind the different facts occurring in the world.
3. To acquire knowledge about concepts, laws, principles and theory in different areas of science, and at the same time to acquire skills of drawing graph, table, symbol, diagram, illustration making model and express in language.
4. To acquire creativity, critical thinking skill and problem solving skill through practicing Science Process and Experimental Method.
5. To realize the importance of usability of science and understand the effectiveness of scientific rules for building different machines and to develop the technology.
6. To use the knowledge, skill and attitude of science for the improvement of living.
7. To ensure personal and social security and to be able to acquire necessary life skills and attitude to overcome different adverse situations through practicing science.
8. To realize the internal beauty and joy of Science study.
9. To be interested to lifelong education through understanding the blooming and changing trends of science.
10. To be authority of science minded, free from superstitions and logical thinking thought study of science.

What is Science and Science Teaching?

Many attempts have been made to define Science, but it is difficult to pick out any one of those as a universally acceptable definition. There exists different viewpoints each responsible for different definitions. According to Conant (1951) those fall into two categories, Static and Dynamic. The static view of science refers to the content or the subject matter of science (information and knowledge); and the dynamic view refers to the process, which are commonly called scientific method.

According to Sund and Trowbridge (1973) Science is both a body of Knowledge and a process.

Columbia Encyclopedia (1963) defines; Science is an accumulated and systematized learning in general usage restricted to natural phenomena. The process of Science is marked not only by an accumulation of fact, but by the emergence of scientific method and the scientific attitude.

Romey (1968) Suggested use of investigatory approach or mode in developing scientific concepts and the inclusion of projects in text and exercise.

Karl Pearson (1963) marked the scientific method by the following features:

(a) careful and accurate classification of facts and observation of their correlation and sequence;
(b) the discovery of scientific law by the aid of creative imagination;
(c) self-criticism and the final touch stone of equal validity for all normally constituted minds.

Traditional science teaching up to the middle of twentieth century was mostly cook book type. Science instructions usually had emphasized the product of scientific research. As a result teachers generally prepared for their science classes by memorizing the fact teachers had falsely assumed that learning the product of science would enable a student to use process of science (Sund and Trowbridge, 1973).

Piaget states to the teachers: The goal in education is not to increase the amount of knowledge, but to create possibilities for a child to invent and discover. Teaching means creating situations where structures can be discovered. (Eleanor, 1964)

Recently due to the work of educational psychologists and scientists, the teaching learning process of science has developed to a great extent. The process approach in teaching science is becoming more and more popular these days (Roy, 1987). According to Gagne (1966) the world

process corresponds to what scientists do or the process that they carry out, such as observation, classification, measurement, hypothesis formulation, experimentation and justification.

Bangladesh scenario

Teaching science in secondary schools in Bangladesh is difficult, because of such things as: class size; teaching load, resources; teachers' knowledge; teaching strategies; and, issues regarding professional development. Class size is one of the major stumbling blocks to the use of regular group activities and student-centered science teaching. In secondary schools in Bangladesh, the number of students in each class particularly in junior sections (from grade VI to VII) is a major concern. In most cases, this number can exceed 100 students per class (Holbrook, 2005).

Education has been the subject of much contemplation, discussion, review and planning in post-independence Bangladesh. During the colonial period (under the British rule), science education did not take priority in the school curriculum (Tapan, 2010). During the 1960s, some efforts had been made, however, with a focus on preparing skilled technicians to get good jobs or to take part in higher education in western counties. After independence, the government initiated the development of a national science and technology policy. However, for a long time after its independence in 1971, Bangladesh still suffered from lack of improvement in the standard of scientific knowledge al all levels from school to university, Bangladesh did not have an environment which promoted research and the strengthening of the science education arena. A Stable education policy did not exist and science education particularly struggled to identify objectives for learners. In National Education Policy 2010, it was slated that the objective of science education in Bangladesh should be to prepare learners in such a way that they may achieve an international standard by realizing their intelligence through the pursuit of knowledge and creativity (Ministry of Education, 2010).

In essence, the expectation was that the leaching of science should be imparted to children in such a way that they realize that science is a creative, dynamic and interesting method by which to study and explore the secrets of nature. Teachers therefore need to be confident in their subject matter, knowledge and pedagogy to deliver science lessons that can meet this objective effectively.

However, the effectiveness of teaching science in secondary school in Bangladesh raises many questions, issues and concerns among its stakeholders. The following section present review of some related study on science leaching and learning in secondary schools in Bangladesh.

Review of some related studies on science teaching and learning vis-a-vis Science in Secondary Schools in Bangladesh.

Aziz (1984) studied the science education program in die secondary school of Bangladesh. He surveyed the opinion of 50 Headmasters, 100 Science Teachers about the effectiveness of implemented curriculum, textbooks, teaching learning facilities, laboratory facilities. He found teacher student ratio is not suitable, science teachers are over loaded,, Science textbooks of VI, VII and VIII have been written in an enquiry approach, which is not fit for the teachers and school system; books are consistent with the syllabus and curriculum, coherent with the objectives of science teaching, He used 5 point attitude scale (opinionnaire), interview schedule and laboratory check list.

Hossain (2000) while Identifying shortcomings of school science teaching stated that the workload of science teachers is in most cases beyond their capacity. There is a shortage of trained subject-based science teachers at secondary level schools of Bangladesh.

According to Rahman (2011) In most schools, science teachers are over-loaded and have to teach about 27 classes every week. The situation is made all the more difficult when teachers also need to cover other teachers' absences in. their school.

Maleque, Begum and Hossain (2004) pointed out some aspects of teachers' performance in teaching 'General Science' in junior secondary school. According to their findings, 62.5% of science teachers have average (not good or excellent) content knowledge in science. Most of the science teachers are also not trained in the use of the new science curriculum or the textbook. In particular, most of them are not fully acquainted with the new content and concepts introduced in the textbook.

In a report Halbrook (2005) has marked that teaching science in secondary schools in Bangladesh is difficult because of such things as: class size; leaching load; resources; teachers' knowledge; teaching strategies; and issues regarding professional development. Class size is one of the major stumbling blocks to the use of regular group activities and student-centered science

teaching. In Secondary school in Bangladesh, the number of students in each class particularly in junior sections (from grade VI to VII) is a major concern. In most cases, this number can exceed 100 students per class. The Ministry of Education in Bangladesh has a recommendation for a maximum of 60 students per class but this number is hard to achieve both in government and non-government schools. Holbrook (2005),

Hossain (2000), Rahman (2011) stated, there are very few qualified teachers in secondary education in Bangladesh. More over according to Choudhury (2008), **Hossain (2000) and** Tapan (2010) teachers, especially those in rural areas, who may not have access to adequate training, face difficulties leaning these subjects.

Roy (2012) in his recent study on the Present Situation of Practical Science Education in Secondary level institutions, found that the physical facilities of science teaching (laboratory, apparatus, equipment, chemicals are very insufficient; there is shortage of science teachers in schools and madrasahs; 97% of working teachers have at least graduation/masters with BEd/MEd., but they arc not efficiently teaching, Their class load is too high. Roy also showed that the decreasing trends of student enrollment in science group are alarming. Those are higher in madrasahs then in non-govt. and rural schools.

Roy, surveyed 34 secondary schools and 10 madrasahs, The heads, 150 teachers 145 students 44 laboratories throughout Bangladesh and used questionnaire, opinionnaire. checklist as research instrument.

Tapan (2010) in a paper expressed that, no major change has occurred up until now with regard to the teaching-learning methods of science used in Bangladesh. Teachers, in most cases, tend to teach the same things in the same ways they were taught when they were students. Teachers are not confident about using appropriate leaching strategies in their science teaching and are very reluctant to use new methods of teaching due to a lack of motivation, interest and proper training and follow up. Even now science is taught everywhere in Bangladesh using traditional teacher-centered methods with less importance paid to student participation and interest. Largely, teachers encourage students to rote learn, Further co this, teachers are reluctant to find teaching aids on their own initiative due to a lack of motivation to improve their practice.

ICT Scenario :

The Science and Technology (S&T) policy of a country is the policy formulated for science education, research and training, and the process to implement them for the technological, economic, and social development of the nation. During the colonial period (under the British rule), science education was very much neglected. Therefore, there was no specific policy for science education and technological development. Before independence, efforts had been made to prepare skilled technicians but not scientists. Parents encouraged their children to learn science in order to get good jobs and to have a chance to go abroad for higher education or for a job (Ministry of Education [MOE], 1986).

After independence, discussions related to development of a S&T policy was initiated. In 1976 a National Council for Science and Technology was established with the President of the country as its chairman and an outline of S&T was proposed but the proposed outline was not materialized. In 1980 Bangladesh formulated a draft National Science & Technology Policy and that was finalized and gazetted in 1986. The policy was designed to fulfil the following aims: To attain scientific and technological competence and self-reliance; to help increase production and employment in various sectors and sub-sectors of the economy; to be in consonance with the socio-economic, cultural, educational, agricultural, and industrial policies of the nation; to contribute to the world-wide pool of scientific and technological knowledge; to seek out and recognize high talents in various areas of science and technology; to strengthen cooperation in science and technology between developed and developing countries, and particularly among developing countries themselves, and, to provide guidelines for institutional arrangements or rearrangements in the research and development (R&D) structure (including education and training) for attainment of the above objectives (Ministry of Education, 1986).

With a view of towards policy formulation in S&T and their cultivation and application in various sectors, the Government of Bangladesh constituted the National Committee on Science and Technology (NCST) on 16 May, 1983. The NCST was also headed by the President and was formulated for the following purposes: To organize and coordinate all R&D works concerning science and technology in the country; to establish scientific and research institutions/ laboratories/Centers for improvement of standard of scientific knowledge at all levels from the school to the university; to promote research and strengthening the competence and capability of research institutions; and to train personnel and specialized scientific and technological staff and encourage innovative activities, and, also creation of scientific awareness among the broad masses of people (Ministry of Education, 1986).

Over the last twenty years, the use of technology has become an essential facet in educational research (Drent & Meelissen 2008). Previous studies presented a significant proof that support the explicit effects of using ICT in the teaching-learning situation (Mumtaz 2000; Hattie 2009). For example, ICT is considered as an interactive media for engaging students, providing opportunities to group analysis and practice. It also provides better access to resource materials (subject content and other related resources) and relevant articles. ICT should be involved in the process of teaching in every subject and in every classroom, because of the very fact that ICT facilitates students' engagement in problem solving activities; decision-making to improve their thinking skills (Grabe 2001). Moreover, effective use of ICT can facilitate student-cantered active learning (Ellis et al. 2008), engage students in collaborative learning as well as enhance their social interaction (Dodge, Colker & Heroman 2003), improve their cognitive development, increase creativity, and improve their problem solving skills (khan, Hasan & Clement 2012).

In spite of the greater importance of using ICT in education, most of the teachers in Bangladesh (one of the developing countries) who have basic computer skills, basically use ICT for performing their administrative tasks. They frequently use ICT for their daily departmental activities, such as: preparing notes, upgrading knowledge, keeping administrative records, and searching information for basic purposes. This underlying argument is supported by Mahmud and Gope (2009), where they stated that very few teachers are using technology as delivery tools, such as in preparing effective presentation materials, and to engage students in active learning. Besides, they believe that introducing and using ICT into their teaching is time consuming. Very few teachers, in big cities of Bangladesh, are keen to use ICT supported delivery tools in their teaching while a significant number of them are still worried about using ICT in their teaching. These contentions were also found in the recent study conducted by Banu (2012) where she stated that teachers are facing many challenges in introducing ICT into classroom teaching due to lack of relevant knowledge and skills. Therefore, to improve this situation, emphasis should be given in enhancing teachers' ICT skills that largely depend on teacher's professional development programs. Previous research has also

shown that a developing country like Bangladesh, needs to concentrate on school-based technology and to improve the training of teachers for the overall improvement of the country's quality of education (Shohel & Banks 2010).

Integrating ICT as an effective delivery tool, is not as easy as learning how to use computers and the internet for basic administrative work. Therefore, teaching faculties need professional development programs not only in computer skills for administrative tasks but also on developing pedagogical knowledge and skills so that they could incorporate ICT in their teaching-learning tasks (UNESCO 2004; Jones 2004). In line with this argument, Balanskat et al (2006) pointed out that inaccurate training program is one of the hindrance for teachers to integrate technology into their teaching. They account this to lack of focus on teachers' pedagogical practices with ICT. Most of the teacher training programs in Bangladesh were criticized as poorly constructed as these failed to focus on teachers' actual needs such as the teachers' inability to integrate ICT into their real teaching-learning situation. The teachers, who had participated in training program to use ICT in teaching, still could not integrate it effectively into their tasks, except in demonstrating their basic generic skills such as operating a computer unit, a printer, and in performing simple administrative tasks. This argument is supported by Bingimlas (2009, p.240) who stated that the training programs only "focused on teachers acquiring basic ICT skills and did not often teach teachers how to develop the pedagogical aspects of ICT". Based on these arguments, this study proposes a model that is grounded on TPCK framework that entails the integration of ICT in terms of specific content and pedagogical knowledge

1.3 Significance of the Study:

The study is significant in many ways. There exist negligible research to evaluate science and technology education at secondary level.

Secondary education level students are supposed to study computer science along with mathematics and science. In vocational and technical education, there must be the scope of learning graphic design, multimedia, animation, CAD/CSM etc. In order to increase interest in information technology, IT Olympiad can be organized at national and international levels (National Education Policy 2010)

More than ever, the advent of the knowledge economy and global economic competition compel governments to priorities educational quality, lifelong learning and the provision of educational opportunities for all.

Access to Information (A2i) project under Prime Minister‘s Office (PMO) starts Digital Content training in 2010 in government Teachers Training Colleges and some teachers who completed ToT(Training of Trainer) training treated as master trainer. After that, ICT project continued Digital Content training up to 2013 and provided one Laptop, multimedia, screen, sound box, modem and a USB drive in 20,500 schools and Madrasas to established a Multimedia classroom in the institutions.

Policymakers widely accept that access to information and communication technology (ICT) in education can help individuals to compete in a global economy by creating a skilled work force and facilitating social mobility.

They emphasize that ICT in education has a multiplier effect throughout the education system, by enhancing learning and providing students with new sets of skills; by reaching students with poor or no access (especially those in rural and remote regions); by facilitating and improving the training of teachers; and by minimising costs associated with the delivery of traditional instruction. (http://www.unesco.org/open-access/terms-use-ccbysa-en).

Education policymakers have been formalising ICT policies as part of educational renewal and reform for almost four decades.

At the international level, policy for integrating ICT for development was first formulated in the Millennium Development Goals (MDGs) Target 8.F, which states that ―in cooperation with the private sector, make available the benefits of new technologies, especially information and communications‖ (United Nations, 2000; 2012).

Moreover, while not mentioned explicitly in the Education for All goals, it is arguable that ICT plays a pivotal role in achieving these goals, including broadening access, eliminating exclusion, and improving quality (UNESCO, 2000).

1.4 Statement of the problem:

"The problem for this study has been selected at "Trends and Problems of Science and Technology Education at Secondary Level of Bangladesh with Special Reference to Munshigonj District: British Period to Till Date`.

In the above problem there key phenomena are seen, i.e trends, problems, science and technology, ict and secondary education.

Trend: a trend is a grassroots- originated phenomenon that spread through networking, word-of –mouth,etc.trends tend to be bottom up movements in contrast to fads which are top down. Trends that have , for better or worse, influenced the teaching profession over the past few decades include a growing concern for the social aspect of teaching and learning, the widening of the curriculum beyond the academic disciplines, and a search for assessment techniques that better mirror the re ality students lives (Arthur.k , handbook of educational terms and condition, NJ,1996, Eye On Education,)

Trend: A trend is a change or development towards something new or different (Collins English Dictionary)

A general development or change in a situation or in the way tha tpeople are behaving (Cambridge Dictionary).

A general direction in which something is developing or changing (Oxford Dictionary).

TRENDS IN SCIENCE EDUCATION

The world at present is changing very fast. The human society also makes certain adjustment as it encounters the change. Science education too is experiencing a change in its nature as well as scope. Some of the trends in science education are discussed as below.

Declining trends in science education

The Organization for Economic Cooperation and Development (OECD), 2006 have found that although the number of students opting for science is on the increase but the relative proportion of students in science is on the decline as compared to the non-science subjects. The OECD formed a working group in 2003 in order to find the declining interest in science subjects. The group discovered that the content of science is dry and is not appealing to the students. Besides, the teaching in science is also poor which makes the students averse to choosing science related career. Another reason is the growing number of female students. The female students are not much inclined towards science related career. The

reason is that they have no role model in the field. Moreover, they are not encouraged by their families, teachers and career advisors to choose science related career (OECD report, 2006). However, the report of OECD cannot be generalized to all the countries. The report covers a few countries. Even within the OECD area, there are vast variations. If we take the example of Scotland; biology, chemistry and physics are the three MOST popular subjects at the upper stages of secondary education (the examinations which give entry to Higher Education) and have been so, in the case of chemistry and physics, for at least 45 years. University classes in all three sciences (and mathematics) are full of well-qualified students. The balance of boys-girls taking the sciences overall at upper school and university is about 50:50 although, in school physics, it is about 66:33, and, in biology, about 33:66. Manicom (2002) found that the reasons why the girls do not opt for science related career are that firstly, the girls regard science subjects as dry, hard, objective and a competitive subject. They think that science subjects have no imagination and creativity. Secondly, the female students regard themselves as less capable of learning science and arithmetic subjects. However, these may be the opinion of Manicom but is not supported by fact. It seems very subjective to regard science subjects as dry and hard. Will the majority of science students or a science expert share the same opinion? Will a science student agree that science subjects have no creativity or imagination? Moreover, Reid and Skryabina (2002) observed that physics is not less attractive to girls but that their interests are in different areas. However, if the interests of both boys and girls are balanced in a curriculum, both genders will have same attitude towards physics. Though, the social stereotyping may have a negative impact on girls.

Osborne and Collins (2001) while referring to the declining trends found that the over-loaded syllabus, lack of interesting science content, fragmenting nature of science subjects with little integration and the lack of creative expression in science are some of the contributing factor towards this trends. However, Osborne and Collins are well-reputed scholars but they are referring to England here and not other countries.

Dobson (2006) has also elaborated on the same issue and concluded that the declining enrolment in science is a global phenomenon. He showed that the same trends exist in countries like Australia and United Kingdom. Some of the reasons for these declining trends are given below:

i. Some of the non-science subjects have become more popular than the science subjects have and have thus attracted a large proportion of students.

ii. The increases participation of female students in education that have less inclination towards science subjects

iii. The growing number of science students from other countries. These foreign students take admission in non-science subjects. The percentage of these overseas students has increased from 4.8% to 16.6% between 1989 and 2002 in Australia.

iv. The non-science subjects have comparatively low fees and costs than the science subjects.

Though, Dobson has presented some good reasons attributing for the decline in science however, there are a few criticisms. Firstly, he gave the example of Australia and United Kingdom, but by United Kingdom, he actually means 'England' because Scotland has a reverse trend. Secondly, he referred to the popularity of non-science subjects; but this in no way implies that the science subjects have declined in popularity. Thirdly, the report is discussing higher education and has neglected the secondary education, which provides a base to higher education.

Goodrum et al. (2001) have also arrived at the same findings and conclusions. However, their findings are also limited to Australia and a few countries and cannot be applied to our country or elsewhere.

Reversing the declining trends in science education

In order to reverse the declining enrolment trends in science education, the OECD report (2006) suggested the following measures.

i. Improving interaction among all the stakeholders such as educationists, businesspersons, scientists etc. However, there is absolutely no evidence that such interaction can improve the declining trend. Such interaction may result in wastage of time and resources.

ii. Improving teachers' training. However, it is not mentioned how it can be improved? Does it mean that the present teachers training programs are inadequate? Is there any evidence that such training will make much difference? It is just putting the blame on teachers that they are responsible for the declining trend without any evidence, which is unjustifiable.

iii. Providing resources for science activities in classrooms. This might be helpful however, it is not clear who will pay for these resources and how?

iv. Updating science content and making it more interesting and utility based.

However, there is no evidence that updating the curriculum may reverse the declining trend. Moreover, making the curriculum interesting may attract the students towards science subjects but how to make it interesting is another debatable issue.

v. Promoting female participation in science by eliminating gender bias and providing equal opportunities to all without any prejudice or discrimination. It is a useful aspiration but it is not as simple as that. How to promote female participation in science? Is it so simple to eliminate gender bias? How equal opportunities can be provided and also ensured justifiable and honest distribution?

Goodrum et al. (2001) stated that the declining enrolment in science can be prevented by removing the students' misconception about science as a hard and dry subject. This misconception can be removed by involving the students more in the science related activities. Learning by doing will help a lot in this direction. However, some science educationists are critical about this point. They believe that science content is really hard because we are trying to teach the wrong science at the wrong age. Curriculum planners are at fault. According to them, activity will make no difference if the content taught does not suit the mental level of the students. However, they have their own perception about the curriculum, which may not be true for other countries. Indeed, learning by doing will make the difference and may integrate the knowledge with the real world of application.

Secondly, the use of modern teaching methodologies by the science teachers will also be helpful in making science simple and interesting. The science teachers should make use of multimedia and computer technology in their instruction. Although, some educationists are

of the view that the use of modern teaching methodologies will make the situation even worse but, it may not be true always. The use of new technologies has a positive impact on students' performance and the students like the use of computer and multimedia as supported by the research of Tabassum (2004) and Mehmood(2004).

Meanwhile, the teachers' training program also needs to be improved. The teachers' education program shall focus on teaching philosophy as well as pedagogy. In-service teachers training should also be conducted to provide an opportunity for learning the modern instructional technology and development in the science fields. However, this recommendation is not justifiable. It is akin to blaming the teachers and the teachers training institutions for low enrolment in science subjects. It is not the source of the problem. It is not the teachers' fault if there is an inappropriate curriculum, lack of resources, bad textbooks and inappropriate mode of assessment. Similarly, is the case of in-service teachers training. Providing in-service training and refresher courses may help the teachers improve his teaching methodology but, it is not evident whether it will increase the students' enrolment in science subjects.

Trends in ICT

Information and Communication Technology, popularly known as ICT, has become a useful tool in promoting quality of education worldwide. It has been introduced in education with a belief that it can turn teaching-learning into an enjoyable event to the learners. Transformation from traditional teacher- centric classroom to learner-centric classroom can also be possible using ICTs innovatively at anytime from anywhere. In recent years, aligned with the current trend, Bangladesh also has considered ICT seriously for educational enhancement. ICT has got importance in policies and curriculum. The government, NGOs and development-partners are playing a significant role in introducing ICT in education.

National ICT policy of Bangladesh, framed in 2009, perceived ICT as means of holistic development of the nation. The policy intended to bring necessary reforms in curriculum, pedagogy and teachers' capacity building where ICT would be an effective tool. This includes provision of ICT literacy to the teachers and learners of primary, secondary, and tertiary levels. ICT in education was further emphasised in National Education Policy, 2010. According to the policy, the government intends "to extend the use of information and communication technology (ICT) instrumental in education process at every level". The policy reminded the curriculum and material developers to accommodate ICT in the

teaching-learning process which has resulted in inclusion of ICT courses in the curriculum of different education levels and teacher training programmes.

As a consequence of the above, with financial support from UNDP and USAID, the government initiated Access to Information (a2i) project with an ambition of making teaching-learning more effective and enjoyable to the learners and teachers using ICT. This project followed a three-dimensional approach in its effort to enhance pedagogic improvement process: establishing Multi Media Classrooms (MMCs) at secondary schools, training of teachers on making ICT aided educational contents on hard-to-grasp topics, and making

electronic versions of the textbooks. In order to establish MMCs in schools, the government has provided ICT devices such as laptops and internet connections from early 2010. As of 2015, nearly 72% of the secondary schools got multimedia facilities and about 82% got computer facilities. Computer teachers were available in 61% of all secondary schools. Up to 2013, 18,500 secondary teachers received training on preparing digital multimedia contents independently.

1.5 Research Questions:

The main goal of this research is to explore how science and technology education is promoted through secondary science education in Bangladesh as well as in Munshigonj District.

To achieve the said objective, the following five main research questions have been formulated:

This study was conducted to explore answer to the following research questions:

RQ1.What is the present Scenario of class Ten Science Students in Munshigonj District?

RQ2.What are the teaching methods and strategies practiced in the secondary science classrooms at present?

RQ3.What challenges do science teachers usually face in science classes?

RQ4. what is the impact of Introducing ICT in Classrooms ?

RQ5.What challenges do science Teachers and students face during ICT class?

1.6 Some Initiatives Related To ICT in Bangladesh

The United Nations Development Programme (UNDP) supported project, *Access to Information Programme* widely known as **A2I** started in 2007 has launched dozens of citizen oriented e- services where pilots can be quickly implemented and successful ones scaled up. Some of them are discussed as follows:

(A) Union is the lowest administrative division of Bangladesh. There are 4,498 Unions in the country. *Union Information Service Centre* (UISC) has been installed in all unions of Bangladesh.

Internet access, e-mail, video calls, downloading forms, scanning, printing and digital photography etc. are the offered services by UISC. Some value-added services like mobile recharges and transfers via mobile phones are provided by the UISCs. Access to Bangla content increases day by day. The entrepreneurs charge a fee from the customer for services to ensure sustainability. The entrepreneurs have got the initial equipment and a room from the local governments. The average revenue for a UISC was USD40 in July 2011, a little less than the average per capita income. It is growing rapidly. Some three million people were served by the UISCs. There is also a target of 20 million people by 2016. About three quarters of the population of Bangladesh who live in the rural area are getting services by the UISCs. It is becoming the main source of information for them.

(B) The *Multimedia Classrooms* are introduced in secondary schools. A laptop with a projector and screen are used to assist teaching different subjects. In the case of shortage of science laboratories and illustrated textbooks, it is an ideal tool for illustrating topics. The Asian Development Bank was happy to see the quick achievement of the A2I staff and the Ministry of Education. They have become the partner to provide resources for teacher training. So far around 1,000 teachers have been trained with some 50,000 targeted over the next few years. The equipment is purchased by the schools. Bangladesh has the plans to eventually provide computer labs in all schools . The Multimedia Classroom is the first step in it.

(C) There are 64 districts in Bangladesh. Various licenses and certificates of the citizens are provided in the District Headquarters. The *District E-Service Center* (DESC) is another innovative application introduced here. Citizens requests for their file online or directly at the District Centre under the DESC. The files are processed there. A receipt is given to them or a tracking number is sent by SMS. The DESC was started in the Jessore District and the results were impressive there. The office could be able to handle a greater number of requests much faster than before.

E-services are growing through mobile. There are 80 million subscriptions of mobile at August 2011 according to the Bangladesh Telecommunication Regulatory Commission. And according to the Bureau of Statistics, a household penetration rate of 64% in 2010 which one was 11% in 2005. By sending an SMS, students can do all the jobs related to university admissions. The SMS-based admissions results are also becoming popular. Around 1/2 million students a year take the Higher Secondary Certificate (HSC) examination. They just send their HSC results through a mobile phone and get a reservation for the university exam. Application fees could be deducted from the applicant's mobile phone account. Following the success of the SMS registration, 28 post secondary educational institutions implemented the system in 2010 and others are encouraged to do so. People could pay their utility bills using their mobile phones.

(D) The first homemade laptop called the DOEL has been launched. The DOEL is priced in the range of Tk. 10,000 to Tk. 20,000 (US$131-262) depending on configuration. Bangladesh has a growing software sector. Some 400 members of the Bangladesh Association of Software and Information Services (BASIS) generating US$35 million of exports in 2009-10 are involved with this sector.

1.7 Problem in ICT Education:

Problems of computer education at secondary level

According to Banbeis , the main problems for the computer education at the secondary level were identified as:

1) *Shortage of computers:* This was the commonly uttered problem in the discussions. Almost none of the schools have adequate number of computers to cater their number of students.

2) *Irregular supply of electricity:* This was also a common mentioned point, the supply of electricity in most of the rural area were reported to be paltry.

3) *Unavailability of computer for use outside school:* Use of computer outside school is a integral requirement for better learning of computer, but given the socio-economic background of the majority of the students, access to computer outside school was found to be very rare.
4) *Time spent by teacher and their skills:* Although students were all in praise of their teachers, it apparently came out of some discussion that not all computer teachers were well trained and some of them were unable to spent enough time for computer teaching due to other responsibilities.
5) *Lack of regular maintenance:* High-tech devices like computers usually need regular professional maintenance which ts clearly absent in the secondary education institutes.

1.8 Problem in Science Education:

ICT problem: The government is committed in implementing ICT in the schools however, the process in hindered by a number of barriers. categorised the barriers into two sections; external and internal barriers. The first order barriers according to include lack of equipment, unreliability of equipment, lack of technical support and other resource related issues. Second order barriers include both school level factors, such as organisational culture and teacher level factors.

The Government of Bangladesh has given emphasis to the inclusion of ICT in the education system. For this purpose, different policies have been developed and are being implemented to integrate ICT in the education system. Here key elements in the National Information and Communication Technology Policy-2009 [NICTP-2009],

> Government of Bangladesh, while operating one of the largest education systems in the world, realizes and recognizes the challenges and limitations of successful implementation of ICT in education. With limited capacity in terms of resources and skills it is difficult for the government to address all the issues of ICT simultaneously with good quality interventions. Still, to meet the national and international commitments like constitutional obligation, National Education Policy, EFA and MDGs, government is continuously trying to increase access of more children in quality education. Several initiatives have been taken by the government to improve quality of learning through building teachers' skills and capacity as well as creating enabling environment in the classroom. MMC and teacher-led Multimedia content is one of such initiatives.

1.9 Trends in Science Education Worldwide:

Two very distinct and conflicting societal demands shape science education programs in different countries. These are:

1. Demand for specialist manpower so that societies and economies can keep pace in a world where scientific knowledge and technology is being exploited in a rapidly increasing way.
2. Demand for a more scientifically literate citizenry, i.e. science education should produce more members of the society who will be able to benefit from the personal and social applications of science and will be prepared to support the changes of a scientific and technological kind that are needed for a good balance between developmental and environmental concerns (Fensham, 1985, p. 417).

The first demand dominated in shaping the science curricula in 1960s and 1970s, i.e. the main aim of science education was to prepare an elite group of students for further study of science and related disciplines (Fensham, 1985). Usually such a curriculum involved the rote recall of large number of facts, concepts and algorithms which are not obviously socially useful. Social changes and international movements such as the movements for the social responsibility of science, the environmental movement, and the women's movement led science teachers and educators to rethink the goal(s) of science education (Fensham, 1992). In the 1970s, these movements had been integrated into a single movement: Science, Technology and Society (STS). Two other similar movements follow it, these are -'Science for All' and 'Scientific Literacy'. These movements are briefly discussed below.

1.9.1 Science, Technology and Society

As shown in Figure 1, Science, Technology and Society (STS) science is about making sense of students' social environment, their artificially constructed environment (or Technology) and their natural environment (Aikenhead, 1994). STS education aims to provide students with scientific knowledge that is applicable in students' everyday lives (Solomon, 1994). Most STS science courses have similar goals but give different priorities to different goals. A balanced STS education may include the following three general goals (Bybee, 1985b, p. 85, quoted in Aikenhead, 1994, p. 50):

1. "Acquisition of knowledge" (concepts within, and concepts about, science and technology) for personal matters, civic concerns, or cultural perspectives.
2. "Development of learning skills" (process of scientific and technological inquiry) for information gathering, problem solving, and decision making.
3. "Development of values and ideas" (dealing with the interactions among science, technology, and society) logical issues, public policies, and global problems.

1.9.2 Research contribution:

The science teaching-learning and technology education status of Bangladeshi schools is unknown, so it is difficult to identify areas of science education requiring improvement. The outcomes of this study are likely to benefit curriculum developers, textbook writers, teachers, trainers, and the researchers in this field and provide a new platform for all science education professionals to reshape and revise their practice. Moreover, these data provide a research foundation for science education researchers in Bangladesh.

1.9.3 Geographical location of the study:

The study will be confined within the boundary of Munshigonj District.

CHAPTER: TWO

Review of Literature

Introduction:

Technology ("science of craft", from Greek τέχνη, techne, "art, skill, cunning of hand";and - λογία, -logia[2]) is the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines which can be operated without detailed knowledge of their workings (https://en.wikipedia.org/wiki/Technology)

Science

(From the Latin scientia, meaning "Knowledge") usually describes the effort to understand how the universe works through the scientific method, with observable evidence as the basis of that understanding; a way of understanding the world through thought and experimentation. The sciences tend to be positivistic in their approach to truth and knowledge, in contrast to the humanities which tend toward relativism (https://en.wikipedia.org/wiki/Science (disambiguation))

Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits. Educational methods include storytelling, discussion, teaching, training, and directed research. Education frequently takes place under the guidance of educators, but learners may also educate themselves. Education can take place in formal or informal settings and any experience that has a formative effect on the way one thinks, feels, or acts may be considered educational. The methodology of teaching is called pedagogy (https://en.wikipedia.org/wiki/Education)

Science education **is** the field concerned with sharing science content and process with individuals not traditionally considered part of the scientific community. The learners may be children, college students, or adults within the general public; the field of science education includes work in science content, science process (the scientific method), some social science, and some teaching pedagogy. The standards for science education provide expectations for the development of understanding for students through the entire course of their K-12

education and beyond. The traditional subjects included in the standards are physical, life, earth, space, and human sciences
(https://en.wikipedia.org/wiki/Science_education)

Technology education is the study of technology, in which students "learn about the processes and knowledge related to technology". As a field of study, it covers the human ability to shape and change the physical world to meet needs, by manipulating materials and tools with techniques (https://en.wikipedia.org/wiki/Technology_education).

About Two centuries ago, civilization took a radical turn on the walk of industrial revolution. Change is again taking place in the 21st century because of ICT revolution. By becoming a part of this revolution, Bangladesh as a developing country , has found remarkable opportunities to alleviate poverty. Proper use of information technology can lead to the achievement of expected skills. Technology can play a pivotal role in eradication of corruption by bringing in transparency in the state machinery. More attention will be given to prospective areas of export such as software , data processing or call centre services industry including supply of skilled manpower in information technology (Gov. 2010).

The development of modern science in India is not an organic extension of the earlier tradition. It is an implant by the British in a language that was alien to its people. As with other implants, it needed nourishment and nurturing to be absorbed in the society. Science education was lacking and science was looked upon as an appendage thrust by the British for their own benefit.

Until a few decades towards the end of the British rule, the role of science education, scientific and technological research in economic growth and social transformation was rather limited. Only such developments were introduced that did not lead to a conflict with the interests of the colonial power. The only aim of education including that of science education was to turn out men competent to serve the civilian administration. Consequently, science education and research was uneven and patchy with no facilities. Even those few individuals educated in science lacked opportunities for either gainful employment or for scientific research. They could only procure clerical or teaching jobs.

It was only in 1857 that the universities of Bombay, Calcutta and Madras, modelled after the London University, were established. As a concession to the Indian aspirations the foundations for basic sciences were expanded and
academic science in the universities received a fillip. It must be stressed that even under such adverse conditions, globally competitive scientific research was carried out by a few scientists like, C.V. Raman, M.N. Saha, S.N. Bose, D.N. Wadia, P.C. Mahalanobis, S. R. Kashyap, Birbal Sahni, S.Ramanujan, S. Chandrashekhar. Many of these were trained in India and carried out their research in Indian universities.

The outbreak of the World War I brought about a radical change in science education and in the pattern of scientific research and technological developments. The colonial government being cut- off from Britain was forced to actively mobilize local resources of scientific and technical personnel to meet wartime needs.

2.1 Science at the Secondary Level

Before 1960, no significant emphasis was given to science education at the secondary level in the then East Pakistan. General science was introduced at the primary level in grades 4 and 5 in 1951. In the lower secondary level, elementary science was then just initiated. *Elementary scientific knowledge*, an optional subject was offered at the secondary level. At that time science was taught as an additional/optional subject up to grade 10 and multi-stream courses were used to commence from grade 11.

Before independence, the major change in science curriculum was made in

1961. This was done following the recommendation of the Pakistan National Education Commission Report of 1959 (Ministry of Education, 1959). For the first time, science was made compulsory up to grade 10. Beside this a multi-stream system was introduced from grade 9. The courses were divided to different groups such as science, humanities, commerce, agriculture, home economics among others. The students of all but science group had to read a general science as one of their compulsory subject.

After the independence of Bangladesh, a National Curriculum and Syllabus Committee (NCSC) was set up in 1975, following the recommendations of the

Bangladesh Education Commission Report 1974. The NCSC was entrusted with the responsibility of reviewing, redesigning and improving curricula and syllabuses up to higher secondary level. The NCSC accorded special emphasis to modernize science education of the country with reference to content, teaching strategy, evaluation and application of science and developed a new set of curricula and syllabuses from primary to higher secondary levels during 1981-84. The curricula for higher secondary level were not implemented at that time. In 1995 on the basis of the National Education Commission Reports (MOE, 1988) that curricula was modified.

On the basis of the National Education Commission Report in 1974 and the Curriculum Committee Report in 1976, two textbooks—General Science Part I (Physical Science) and General Science Part II (Biological Science)—were introduced for grades 9 and 10 in 1983. Physical Science covers physics and chemistry while biological science covers botany, zoology, agricultural science, sericulture, apiculture, horticulture, fisheries, poultry, farming, nutrition, population, public health and pollution and so on. According to the recommendations of the Education Commission Report of 1974, science was made compulsory for all students at the secondary level. The books were accordingly prepared and introduced by NCTB in 1983. But due to resistance from different sources such as teachers, school authorities, guardians, and students, science was made elective by the government in the same year. The reasons provided at that time were that all secondary schools were not capable of teaching science as a compulsory subject because of lack of laboratories, equipment, teaching aids and trained teachers. Also, the teachers needed more time to be oriented with the texts. The students taking general science as their elective subject were treated as science-group students and the rest were treated social-science group students. The social-science group students could or could not take a paper on science. A book entitled *Modern Science* was prescribed by the NCTB as an elective subject for the social-science group students. The general science textbooks introduced in 1983 for grades 9 and 10 had been redesigned and modified on the basis of a nationwide evaluation of the trial edition introduced in 1983 by the science evaluation committee (1984) constituted by the MOE under NCTB. This revised edition was made

effective from 1988. After revision no major changes in secondary science textbooks were brought about but some minor corrections were done with the help of experts.

The major change in secondary curricula was made in 1995 following the recommendations of National Education Commission Report of 1988. Just like in 1961, science was made compulsory up to grade 10 and a multi-stream system in general education was introduced from grade 9, the courses being divided into three groups—science, humanities, and business education. Physics, chemistry, mathematics, and biology were taught as separate disciplines in the science group. For other groups, general science was introduced as compulsory subject. The changed secondary science curriculum of 1995 was an updated one and was capable of maintaining standard of other developed and developing countries. It was comparable to O- level/GCSE curricula.

On the basis of changed curricula of 1995, textbooks in physics, chemistry, mathematics, and biology were developed keeping in view the standard and style of textbooks at O-level/GCSE level. The teachers, especially those in rural areas, are facing many difficulties teaching these subjects as they are not oriented with the modern and updated contents and their presentation style.

2.2 Laboratories, Equipment, and Teaching Aids at the Secondary Level

The requirement for practical examinations at the secondary level is to perform at least one experiment for each of the subjects (physics, chemistry, biology). Twenty-five out of 100 marks are allotted for practical examination in each of the subjects. Therefore, each secondary school offering science should have a laboratory or science room and some equipment. Most do not have separate laboratories but some of them have a science room with inadequate equipment and furniture.

The new secondary science courses demand a more practical approach to teaching, which requires a minimum package of simple and unsophisticated equipment, teaching aids, and consumables such as chemicals, raw materials, and specimens. There is a general shortage of science equipment in secondary schools and colleges and most of the non-government institutions lack facilities for

science teaching through practical work. Hence the opportunities for students to perform practical experiment themselves are very limited. There are two other issues and problems in science education at the secondary level, namely that of the non-government secondary schools and higher secondary colleges at the rural areas do not encourage many students to take science as an elective subject because of financial costs. Most of the secondary science teachers are also not trained or oriented with the new science curricula and the textbooks so they find difficulties in teaching science at these levels.

2.3 Innovations in Science Curriculum and Textbooks

Bangladesh is the victim of global environmental problems, climate changes, and natural disasters. Besides, there are problems of environmental degradation relating to land, water, forest, and other natural resources. Above all, the lack of environmental education at all stages is the important causes of environmental degradation. The introduction of Environmental Studies at primary level is an innovation in primary curriculum. In the secondary curriculum, some environment-related topics have been dealt with in the science and social sciences as part of population education that was integrated into the course contents in 1970s.

Before 1976, all the reports of curriculum committees included objectives and content for each subject. In my opinion, these were innovative for they also included teaching-learning methods, teaching aids to be used, and assessment for each topic along with objectives and content to be covered. In the science curriculum (with special reference to that of the lower secondary) of 1976, it was proposed that there had to be well integrated courses from the different branches of science at grades 6, 7, and 8 and that biology, physics, and chemistry should receive priority. But this course had to be devised to enable the pupils to learn the application of science in their daily lives and to develop the ability to think logically and encourage an active approach to learning. Much emphasis has been placed on learning by doing. This is a change in the direction from the ―process to product‖ in place of the traditional type of chalk and talk approach.

The new textbooks for science for grades 6 to 8 which was introduced in 1981-83 was an innovation in the area of science textbooks in Bangladesh which had the following features:

– Use of activity-based approach, with emphasis on low-cost improvised equipment made locally

– Inclusion of extra optional activities to extend the highly motivated and intelligent pupils

– A bigger variety of written exercises to include problem questions as well as recall questions

– A reduced number of technical names and terms.

In these books, each chapter contained some activities for the learners in the name of ―let us do ourselves.‖ Teachers' guides were introduced for the first time which contained:

– Suggestions on how to teach each part of the course and organize each lesson in terms of activities, time, and so on

– List of equipment and material required for each activity and how to make certain improvised items of equipment

– Answers to questions in text and additional background information on certain topics for the teacher.

2.4 Innovations in Teaching Methods and Assessment

No major change has been found up till now with regard to the teaching-learning methods of science in Bangladesh and the main problem is probably related to the teachers: They are inclined to teach the same things in the same way they were taught when they had been students. With the introduction of new textbooks at the lower secondary and secondary level in 1981-84, a teacher's guide was developed (I was one of the authors of textbooks and also for the guide) and many innovative teaching methods were suggested here. The teachers were very reluctant to use

those innovative methods due to lack of interest, motivation, and proper training. Even now, science is taught everywhere in Bangladesh using traditional teacher-centred methods with less importance paid to student participation. The teachers encourage the students in rote learning.

Similar to teaching methods, no major changes have occurred in the assessment system. With the introduction of new textbooks in 1981-84, assessment of student learning in science were proposed with both subjective (essay) and objective (Multiple Choice Questions [MCQ]) test items and these type of test were incorporated in the exercises in each chapter in the science textbooks. However, these were not reflected in the questions set during different examinations. In the Secondary School Certificate (SSC) examination of 1992, MCQ items were set for the first time with the essay items. But it was criticized by parents and some educationists for reasons that it would help rote learning. The MCQ format is now being used to assess student learning not only at the SSC examination but in other grades of primary and secondary levels. But due to lack of qualified and trained science teachers it is not yet possible to get good MCQ items for assessment of student learning in science. Although the curriculum has been updated, the evaluation system has not been changed to meet the expectation of new curricula.

2.5 Research in Science Education

At the postgraduate level, research in pure and applied science is conducted in different public universities in Bangladesh but research in science education is rare in Bangladesh. The students in the Science, Mathematics, and Technology Education department of the Institute of Education and Research (IER), University of Dhaka (DU) conduct research in science education for the partial fulfilment of their master‘s degrees. The students at the Educational Research and Evaluation department also conduct a few studies in science education. Besides, M.Ed. students of public teachers training colleges conduct one or two studies in science education every year. The total number of research in science education in Bangladesh is very low in comparison to other developing countries and more effort and emphases should be given. The research done in science education in IER can be divided into the following categories (Begum & Tapan, 1992):

– *Educational technology.* Research in educational technology was mainly on instructional material development and their validation and effectiveness. A good number of modules were developed on the content of science and pedagogy of science teaching and they were experimentally validated to examine their effectiveness.

– ***Science teaching-learning***. Research in this area are

mainly on identification of

teaching methods used by the teachers at different levels of education from primary to university level. Some studies were conducted to compare the effectiveness of different teaching methods. A few studies were on classroom culture of science teaching and identification of essential competencies for science teachers.

– ***Science curriculum***. Research in this area mainly focuses on development and implementation of curriculum and evaluation of impact of curriculum and instructional materials. Besides, some studies were done on identification and evaluation of objectives of teaching physics, chemistry, and biology at the secondary level.

– ***Achievement of science and its correlates***. A

few studies were done on development of achievement tests and their validation. Some research were done to identify the correlates of achievement in science. These correlates are mainly academic motivation, socio-economic status of students, and gender. **– *Environmental education.*** Several studies have been done on environmental studies. These include evaluation of teaching-learning materials and methods at the primary level, achievement of students, implementation and their impact, and identification of skills of primary teachers to teach environmental studies.

– *Assessment of science education*. A few projects were conducted on the development of assessment tools and to determine their reliability and

validity. One study was conducted on effects of formative evaluation on student achievement in science (Khanam, 1994).

– *Textbook evaluation.* A good number of studies have been done on evaluation of science textbooks at primary and secondary levels. The environmental science textbooks developed by NCTB and some NGOs were evaluated and compared to determine whether they are consistent with the national curriculum.

– *Physical facilities.* A few studies have been conducted on physical facilities available for science teaching in rural and urban secondary schools. These are mainly related to the science laboratory and science corner.

Descriptions of some research performed by masters‘ students in IER are given below.. Siddiq (1976) conducted a research study to determine the effectiveness of self-instructional modules as a strategy for teaching science at grade 6. From her study she reported that the module was effective for science teaching at this level and the students possessed positive attitudes towards the modular instruction. From his study, Haque (1976) reported that about 88% of science teachers in Dhaka city had general academic qualifications but 55% of them had no professional qualifications. Most of the schools had science laboratories but with very limited equipment, which is very low in comparison to international standards. The teachers had to teach about 27 classes every week and each section of class has 47 students. He recommended professional development for the science teachers and teaching loads of 18 classes a week for teachers with class sizes of 30 students. These recommendations have not been implemented yet and the teachers are still over-loaded.

Begum (1981) conducted a study to determine the attitudes of grade 5 students Towards environment studies. She reported that most of the students had positive attitudes towards the study of environmental studies. Parvin (1982) developed a curriculum on environmental education for grade 7 students and evaluated it with input from curriculum developers, subject specialists, and school teachers. She found that it was appropriate for the grade but recommended experimental verification using different teaching methods. Siddiqua (1982) found correlations between academic motivation and academic achievement of secondary science students. She selected 467 students from grade 9 and 10 as the sample for her study

and found significant positive relationship between the score of academic motivation and score in science subjects.

Khatun (1983) identified the teaching skills needed by the teachers to teach biology at the secondary level. She listed the skills related to biology teaching at the secondary schools and evaluated these on the basis of expert opinion. She found that secondary biology teachers should have the following skills: (1) using necessary apparatus and chemicals; (2) developing audiovisual equipment and their proper use, and, (3) collecting, storing and demonstrating the specimen for science teaching. Begum (1984) studied the present evaluation system of science faculty of Dhaka University (DU). From her study she reported that the students in the science faculty of DU are assessed through written and oral tests, which consist of tutorial, assignments, term papers, practical work, and regular attendance. The result was reported in terms of marks and alphabet grades. Further, there was no definite principle for distributing marks in written and oral tests and only 30% of marks were allotted for practical examinations. Khaleque (1984) and Chowdhury (1984) developed modules on grade 6 biology and grade 7 general science respectively and evaluated their effectiveness through comparison of mean achievement of experimental and control group students.

Banu (1984) conducted a study to determine students‘ knowledge of environmental science at the primary level. From her study with a sample of students from eight primary schools she reported that the students had deficiencies in knowledge on environmental science and their achievement differed from school to school, between urban and rural students, and girls and boys. Devi (1985) found significant positive relationship between socio-economic status of the students and their achievement in science. The relationship is similar for both urban and rural students but there was significant difference between mean achievement of urban and rural students and between girls and boys.

Rashid (2001) conducted a study on ―Assessment of Training Needs of Secondary School Physics Teachers.‖ She reported that secondary school physics teachers needed training in science content, practical work, teaching methods, and assessment. Mondal (2001) tried to identify the sources of physics teaching aids and found that most of the schools do not have adequate teaching aids and they

do not know from where they can collect/produce them. A few teachers said that they bought them from school budgets and sometimes the students and teachers produced improvised teaching aids. Some government projects rarely supply some teaching aids.

Roy (2003) tried to find out the ―Effect of Learners‖ page in daily newspapers on student learning in science and mathematics and found that these learning pages could not fulfill the needs of the students and recommended providing more materials on recent discoveries in science. Hassan (1985) studied the use of NCTB suggested teaching aids at the lower secondary level at Dhaka city schools. He found that most of the schools do not use NCTB suggested teaching aids. In most of the cases they do not use any teaching aids except the textbook.

Rana (2005) compared primary level science textbooks of NCTB with the

education program of Bangladesh Rural Advancement Committee (BRAC), a NGO in Bangladesh. From the evaluation of both the textbooks with the help of the experts, he found that both the textbooks did not fulfil the criteria of good science textbooks. Bari (2007) conducted a study on utility of teaching aids developed by the Directorate of Environment to teach environmental science at the primary level and found that in most of the schools these teaching-aids were not available and those schools where these were available were not usable due to absence of proper storage. The schools which are using it properly they found it very effective. Besides the above research, students at the IER have conducted some other studies such as causes of failure in examination in science subjects (Banu,

1993), suitability of primary science text materials (Bhuiya, 1990), determination of minimum continuum of biology at the secondary level (Das, 1984), problems of biology teaching at grades 9 and 10 (Khandakar, 1992) and comparison of achievement of girls in physical and biological science (Nahar, 1991)

2.6 National Education Policy (NEP) 2010

NEP 2010 is a milestone in educational development in Bangladesh. The policy acknowledges the need of education befitting the contemporary time. The aims and objectives of secondary education, according to NEP 2010, are to:

- help develop learners‘ latent intellect and inner faculties;
- equip learners with competencies necessary to compete in the job market and the economy;
- impart quality education to extend and consolidate the knowledge acquired during primary education to help students acquire a strong foundation for quality higher education;
- make efforts to mitigate disparities among various secondary educational institutions and among various socio-economic, ethnic and social groups; special steps have to be taken to support advancement of education in the backward regions and groups;
- design, develop and implement a uniform core curriculum and syllabus for selected areas of knowledge, irrespective of streams;

For all streams, a degree of uniformity will be maintained through stipulated compulsory subjects, such as Bangla, English, Bangladesh studies, Mathematics, science and ICT. Examinations of each of these subjects in all streams will be held with identical examination papers. The Education Policy requires initiatives to be taken to integrate conventional streams of education into a unified system based on core curricular contents and minimum common standards in operating schools. (MOE 2010)

2.7 National Curriculum 2012

Common Outlook

The national curriculum 2012 gave the opportunities to Madrasha students to study the same core subjects as general education students from class vi to class viii. Madrasha students of classes ix –x also have the scope to study the same core

subjects as general education students except religious and moral education. This will minimize the existing discrepancies and educational gap between the students of the two streams. It is expected that the common core study will help students to develop a common outlooks, attitudes and holistic personality.(NCTB 2012)

Integration of knowledge, skills and values

The national curriculum 2012 was designed to help students develop in a balanced way and holistically. Integration of the elements of knowledge, skills, values suitable for the 21st century and effective use of language have been incorporated into the curriculum and across the curriculum. The curriculum is expected to help students develop intellectually, spiritually, emotionally and physically in a balanced and harmonious manner. The curriculum has given appropriate emphasis to all significant aspects of growth of the human personality and intelligence. The values infused in the national curriculum in an integrated manner are discipline, patriotism, leadership, honesty, cooperation, active participation, tolerance, and punctuality. The national curriculum promotes national integrity and unity through the use of a single medium of instruction (the national language) and the provision of the same core subjects for all students in all Schools and Madrashas within the national education system

Incorporation of 21st century skills

The National curriculum 2012 gave the opportunities to students for achieving the 21st century skills and enable them to cope with the challenging global situation. The learnin outcomes include higher order cognitive skills, creative and critical thinking, problem solving and communication skills as well. To develop students‘ personal traits, social, cooperative and personal skills are built into the national curriculum.

The learning outcomes are so designed as to enable students to learn about state policies, the social system and a basic understanding of the requirements and needs of the local and national job market. They will understand the role of Bangladesh in a global and competitive world economy. Students will achieve basic practical skills needed in the workforce and know how to prepare for and apply for jobs. They will be able to assess their personal strengths and aptitudes and identify potential career

paths matched to their interests and abilities. Students, it is intended, will be able to act responsibly and morally in the workplace, society and family. They will be able to demonstrate positive attitudes towards family, society and situations with honesty and integrity. They will be socially responsible and contribute to the community.(NCTB 2012).

2.7.1 New learning Areas (NLA)

As mentioned in the partnership for 21st century‘s framework and NEP 2010, the national curriculum incorporated ICT as core subject from classes vi to xii to develop among students the information and communication literacy as basic tools in the knowledge economy and the information society of today‘s world. Bangladesh and global studies, core subject for classes vi to viii, was developed as an interdisciplinary subject comprising history, geography, civics and economics. It is expected to give students the opportunity to know the current global issues and be knowledgeable about environmental and climate issues and global citizenship in the 21st century. The other new subjects such as life and work oriented education, career education, Physical Education, Health Science and Sports; and Small Ethnic Group‘s language and culture also found room in the new curriculum structure. Business studies stream has been strengthened by incorporating Finance and Banking at grade ix-x and Finance, Banking and Insurance at grades xi-xii. In addition to new subjects, new contents were incorporated in the new curriculum. The new contents are climate change and our responsibilities, adolescence and reproductive health, life skills related contents, conservation of energy and energy security, use of instruments in medical diagnosis, and water resources and its multidimensional use.(NCYB 2012).

2.7.2 Activity based learning process and integration of ICT in class teaching

Students learn best when they are actively involved in their own learning rather than being passive recipients of knowledge and facts. The newly developed curriculum emphasizes the importance of students learning _how to learn‘ rather than simply _what to learn‘. To make learning more interesting, meaningful, stimulating and motivating for the students, the national curriculum recommended that student-centered classroom practices should be adopted as much as possible instead of the

conventional teacher centered classroom practices. The teachers are encouraged to use digital content and multimedia in their lessons.

In a participatory learning approach, students are expected to be engaged actively in projects, group discussions, and investigations to construct their own knowledge. Teachers are expected to relate classroom learning to real life and experiences of students outside of school. Teaching methods should help students to develop creative thinking, critical thinking, problem solving and decision making skills. Students should encourage using ideas and information from many sources and subjects in solving problems or researching issues in an interdisciplinary approach to learning. Interesting, stimulating, and attractive textbooks and learning aids are intended to be developed and used to support quality teaching and learning. The recommended pedagogic approaches include question and answer, inquiry-discovery, experiential learning, cooperative learning, group discussion, experimentation, constructivism, demonstration and investigation, (NCTB 2012).

Class period management

The school and madrasah calendar coincides with the Gregorian calendar year starting January 1 and ending December 31.The academic year will be divided into two semesters. First semester will start in January and end in June and the second semester will start in July and end in December. Students have to sit for a terminal examination at the end of each semester in place of existing three examinations in a year. According to the new curriculum, school working days increase by twelve percent.

The national curriculum 2012 recommended to reduce the number of holidays and increase the duration of existing contact periods. The curriculum framework suggested 50 minutes class periods in place of existing 40 minutes with the exception of 1st period. The duration of 1st period is 60 minutes. School remains open 220 days in a year and six days a week. Students of grades vi-viii will get 34 periods, first five days six periods, in a week. Students of grades ix-x will get 36 periods, six periods a day, in a week. Every working day, single shift schools will open at 9:30 am and close at 4:30 pm with 50 minutes break after 4th period. In double shift schools, morning shift will open at

7:00 am and close at 12:30 with 25 minutes break after 4th period. The day shift schools will open at 12:30 pm and close at 6:00 pm with25 minutes break after the 4th period. The daily school assembly is mandatory for all schools and madrashas.(NCTB 2012).

2.7.3 Junior, Secondary and Higher Secondary Education:

According to Banbeis (2015) total institutions offering Junior and Secondary education were 20297 in 2015 including 471 government primary schools having student from grade VI to VIII. The number of institutions in this subsector was 12012 in 1995, has been smoothly increasing. Side by Side the enrolment and teachers also increased. In 2015, the total enrolment was 9.74 million among them 5.91 million (53%) were girls giving gender parity index near 114%. Number of students per institution was 480 in 2015. Total teachers were 2.43 lac with 61701 female teachers. The percentage of female teachers was 25.6% in 2015 and 20% in 2005. In 2015, teacher-student ratio (TSR) was 1:40 and average number of teachers per institution was only 12 Among all teachers 67.88% were trained. This percentage was 29.42% in junior schools 71.62% in Secondary and 63% in higher secondary institutions.

In the total institution in 2015 the share of Junior Secondary institutions was 12%, Secondary institutions 83%, School and Colleges offering Higher Secondary 5%. Among all institutions (19826), more than 98% (98.4%) were privately managed and only 1.6% was publicly managed. Rural-Urban distribution reveals that in 2015, 77% institutions were located in rural areas, 68% teachers were working in the rural institutions, and 71% student was studying in rural institution.

The distribution by division reveals unequal distribution. As regards number of institutions, Sylhet had only 5% while Dhaka had 27% of all institutions. As regards enrolment the share of Sylhet was 6.3% while Dhaka had 31.17% (Table 3.1.3/b).

The 2015 Education Survey reveals that 85.38% of all institutions had electricity facility; the percentage was 52.8% in junior secondary schools, 89.79% in secondary schools and 98% in higher secondary institutions. Number of

institutions having multimedia was 71.9%. This percentage was 13.32% in Junior Schools, 80.86% of secondary and 94.76% of higher secondary institution. Relatively more institutions had computer facility; 36% of junior secondary, 89.33% of secondary, 99% of higher secondary, 87.29% of all institutions. Table 3.5.4 gives an account for the use of teaching materials. It is seen that nearly 99% institutions reported use of teaching materials.

The number and percentage of institutions receiving MPO is shown in Table 3.5.5. It is seen that 23.14% of Junior Schools, 90.68% of Secondary Schools and 83.05% of HSE institutions received MPO support. It is reported that 60% of all institutions offered computer education. This percentage was 19% for junior schools, 64% for secondary schools and 96% for higher secondary institutions. It is found that only 59% institution had computer teacher in 2013. It is found that some institutions offered computer education even without computer teacher.

summary Statistics and Key Performance Indicators (KPI)

Part 1: Summaries

Table 01: Number of Institution, Student and Teacher by Type of Education, 2015

Type of	Manag	No.	No. of Teacher			No. of Student			Indicators		
					% of			% of			
Primary	Public	63546	32248	1992	62	1379365	712805	52	43	217	5
	Private	58630	20531	1150	56	527410	257062	49	26	90	3.5
	Total	122176	52779	3142	60	1906776	969868	51	36	156	4
School	Public	80	8177	2593	32	335320	165152	49	41	417	10
	Private	19493	23494	5910	25	940775	502881	53	40	483	12
	Total	20297	24311	6170	26	974307	519396	53	40	480	12
College	Public	30	1292	3512	27	135696	581298	43	105	4493	43
	Private	3811	9868	2229	23	232190	112787	49	24	609	26
	Total	4113	11161	2580	23	367886	170917	46	33	894	27
Madrasah	Public	3	75	0	0	6289	37	6	84	2096	25
	Private	9316	11395	1445	13	240308	129091	54	21	258	12
	Total	9319	11403	1445	13	240937	129128	54	21	259	12
	Public	11	3961	890	22	31867	13789	43	8	287	36
	Private	36	4281	667	16	90962	34201	38	21	247	12
	Total	48	8242	1557	19	122829	47990	39	15	256	17

	Public	83	1205	320	27	19230	6415	33	16	232	15
	Private	13	1474	238	16	15504	5351	35	11	117	11
Teacher	Total	21	2679	558	21	34734	11766	34	13	162	12
	Public	25	4957	687	14	178085	29674	17	36	707	20
	Private	5538	2594	5557	21	694573	179200	26	27	125	5
Techni	Total	5790	30903	6244	20	872658	208874	24	28	150	5
	Public	37	1241	2721	22	493110	181450	37	40	1332	336
	Private	85	1390	3983	29	379781	105275	28	27	4468	164
	Total	12	2631	6704	25	872891	286725	33	33	7155	216
	Public	1592	4371	1072	25	242086	978148	40	55	1521	27
	Private	38744	49322	1062	22	1531338	777162	51	31	395	13
Total	Total	40336	53690	1170	22	1773424	874977	49	33	440	14
Country	Public	65138	36620	2100	57	1621451	810620	50	44	249	6
	Private	97374	69850	2212	32	2058767	1034225	50	29	213	7
(Primary	Total	162512	10647	4313	41	3680218	1844845	50	34	228	7

TSR-Teacher Student Ratio, SPI- Students per Institution, TPI-Teacher per Institution

Part 3: Secondary, Higher secondary & Tertiary Education

Table 02. Number of School, student and teacher by type and management, 2015

		Number of										
	Mana		Girls			% of			% of			
Junior	Private	2394	533	1934	5342	27.62	39521	22066	55.84	20	165	8
	Total	2394	533	1934	5342	27.62	39521	22066	55.84	20	165	8
	Private	1610	2432	19472	4657	23.92	81901	43787	53.46	42	509	12
	Public	322	147	7646	2336	30.55	26591	13049	49.07	35	826	24
Seconda	Total	1642	2579	20237	4890	54.47	84560	45092	102.5	42	515	12
	Private	997	153	2087	7195	34.47	82237	42938	52.21	39	825	21
	Public	11	3	531	257	48.4	16494	4723	28.63	31	1499	48
School	Total	1008	156	2140	7452	82.87	83887	43410	80.84	39	832	21
Govt.	Public	471	0				52907	29930	56.57		112	
Prima	Total	471	0				52907	29930	56.57		112	
	Private	1949	3118	23494	5910	25.16	94077	50288	53.45	40	483	12
	Public	804	150	8177	2593	35.32	33532	16515	49.25	41	417	10
All	Total	2029	3268	24311	6170	25.60	97430	51939	53.31	40	480	12
School		7		7	1		72	62				

Table 3: Gross and Net Enrolment Rate by gender in Secondary Education 2015

Sl. No	Indicators	Secondary level (Cycle-School+ Madrasah+Vocational)		
		Both	Boys	Girls
1.	Gross Enrolment Rate	72.78	67.75	77.84
2.	Net Enrolment Rate	67.00	62.16	71.85
3.	Adjusted Net Enrolment Rate	68.76	63.92	73.62

2.7.4 Madrasah Education:

Madrasah education is a subsector of education sector of Bangladesh. This subsector is also

large, catering to over 3.78 million students including Ebtedayee. This is popularly known as religious stream quite distinct from general stream. This subsector has been continuously growing. The total institutions offering post-primary (Ebtedayee) madrasah education was 7279 in 2000 rose to 9319 in 2015. Ebtedayee madrasah offers primary equivalent while post-primary madrasah covers Dhakhil, Alim, Fazil and Kamil; Which are equivalent to secondary, Higher Secondary, Degree and Masters Education of general stream.

In 2015 a total of 9319 madrasah offered Dhakhil to kamil education. Madrasahs are absolutely privately managed. Dhakil, Alim and Fazil are privately managed. Out of 221 kamil madrasah only 3 were Government madrasahs . Among 9319 madrasahs 9316 (99.97%) were privately managed. Among 9319 madrasahs 70% were dakhil, 16% were Alim, 11% were Fazil and 2% were kamil. In 6565 Dakhil Madrasahs, total students were 1293194; more than 59% were girls. Average students per institution are 197. Total teachers were 66801; the average teacher per institution was 10. Teacher-student ration was 1:19.

There were 1480 Alim Madrasah with 458197 students and 22884 teachers. Girls students were 54.59%. Female teachers were 12.44 percent. Average students per institution was 310 and average teacher per institution is 15 persons. Teacher student ratio was 1:25. In 2015 total Fazil madrasah was 1053 with 463817 students and 19376 teachers, Girls students were 46.89%. Female teachers were 11.48%. Average student per institutions was 440 and average teacher

was 18, giving teacher-student ratio 1:24. There were 221 kamil madrasah in 2015 with 194165 students and 4972 teachers. Girls constituted 29.30% of total enrolment. Female teachers were

10% of total. Average students per institution was 879 and average teachers was 22, yielding teacher-student ratio 1:39.

The distribution of madrasahs by division reveals that 21.27% madrasahs were located in Dhaka, 17.75% in chittagong 16.47% in Rajshahi, 15.09% in Rangpur, 12.77% in Khulna, 12.54% in Barisal and 4.22% in Sylhet. Rural–Urban distribution shows that 87% of all madrasahs were located in rural areas. Variation between types of madrasahs and the rural share was as follows: Dhakil 88.91% Alim 78.46%, Fazil 78.63%, Kamil 23.08%.Most of the madrasahs (98%) prepare annual development plan, conduct co-curriculur activities, Madrasah (99%) run in one shift only, about 60% madrasahs use computer for academic purposes, 46% madrasahs have separate library. Only 24.53% madrasahs have science laboratories and 7.48% madrasahs have Ramp for special needs student.

Among all teachers only 20% teachers were trained. This percentage varies between 15% in kamil and 21% in Dakhil. Percentage of female trained teacher is 19% which is lower than percentage of male trained teacher Nearly 95% Heads of madrasahs are appointed while 4.93% are acting heads variation between types of madrasahs was observed. Among all teachers 78.81% were receiving MPO in

2015. This percentage was 70% in case of female teachers. Number of teachers having NTRC was few. Among 114033 teachers only 20042 (17.58%) have NTRC (BANBEIS-2015).

2.7.5 Secondary Education

Secondary education is divided into three categories: Junior level (Grade VI, VII, and VIII), Secondary level (Grade IX and X) and Higher Secondary level (Grade XI and XII). In total secondary education is for seven years. Secondary educational institute

are the same as primary educational institute (Government, Semi-government, Private and Religious school)

There are two public examinations at this level: Secondary School Certificate (SSC) after the completion of 10^{th} year schooling education and Higher Secondary Certificate (HSC) after the completion of Grade XI and XII All the religious school also held the public examination according to their educational board rules.

In the secondary level student enrollment also increased over the years but once again the quality of education was not up to the same standard all over the country. Most of the schools at this level provide very poor educational facilities (library, laboratory, etc.) and the Teacher of those schools has lack of teaching skills.

Higher Education:

There are many government and private colleges and universities for higher education in Bangladesh. Generally a student requires 3 years to obtain the Bachelor degree and another

2 years for Master degree. All the University also offers M.Phil and Ph.D courses. There are many student doing their research over there.

Science Education:

Science education starts from primary school (Grade III) in Bangladesh. In the beginning, student studies basics on natural sciences, such as life of trees, flowers, etc. From Grade III to Junior high school (Grade VIII) student studies the basic composite science subject (Physics, Chemistry, Biology) and general Mathematics. From Grade IX students are divided into the following groups on the basis of their interest: Biological science group, Physical science group, Arts group, and Commerce group. All the religious school also teaches science subjects but in very general. They teach basic Physics, Chemistry, Biology and Mathematics.

There are around 14,069 secondary schools at present in Bangladesh. Those schools are divided into 3 categories on the basis of availability of science facilities. Following table describes the detail of those categories

A Category (900~1000)	**B Category** (7800~8200)	**C category** (4500-5000)
Schools: generally in Big	Schools: in the developing	Schools: mostly in the rural
Laboratory	One multi-purpose room	Very small laboratory
Equipment and chemicals	(laboratory, recreation, etc) Few equipment and chemicals	Almost no equipment and chemicals
5~7 Science Teacher per school	2~4 Science Teacher per school	1~2 Science Teacher per school Very few books available

Table: Different categories of Secondary schools

Although there are laboratories in some of the secondary schools, but there is no laboratory assistant, which is very necessary. Laboratory assistant could help the students by showing the technique of using the equipment‘s of the laboratory. Therefore, in spite of having equipment and chemicals, there is no use of scientific experiment. Generally the Science teacher takes the laboratory classes. In general, a Science teacher takes 5~6 classes per day, which effects their ability to teach efficiently. That‘s why all the science courses are being taught only in the class room at this level.

However, after completion of the SSC examination, there is a compulsory practical class (one per week) at the laboratory for all the science subjects. Although it is compulsory, but there is still very little use of all the scientific equipment and chemicals due to lack of skilled laboratory assistant. In this way, most of the equipment and chemicals are wasted.

To have better knowledge on science subjects, it is understood that laboratory assistant is necessary in all the schools. And academic supervision is also required to get better result from the teacher As we see that in the B and C category secondary schools there is almost no scientific equipment and chemicals are available. Therefore, it is suggested that equipment and chemicals need to be supplied to those school to have better scientific education.

2.7.6 Pre-service and In-service:

There are 54 Primary Training Institute (P.T courses) and 12 Teachers Training College (B.Ed and M.Ed courses) all over the Bangladesh. Pre-service and In-service courses are held in those training institute. The duration of each course is 10 months. There is an Open University in Bangladesh, which also offers the same courses through the long distance education.

All the courses at these training institutes are taught only in the class room. There is no course on practical, such as on how to use the equipment and chemicals effectively at the laboratory. Class room courses really does not improve the quality of the Teachers. Therefore, it is suggested that courses at those institute should be redesigned in such a way that there is scope of class room lecture as well as laboratory class.

On top of the above institutions, there are another 9 Secondary Education and Science Development Center (SESDC) and 5 Higher Secondary Teachers Training Institute (HSTTI), who offers In-service training courses only.

SESDC: In this institute the In-service courses are designed for secondary school Teachers. Bangla, English, Mathematics, Physical science and Biological science courses are there in this institute. The duration of this course is normally for 2~3 weeks. The courses at this institute offers class room lecture as well as laboratory class with scientific experiment.

However, these courses at this institute stopped operation due to shortage of fund since

1998. Therefore, it has directly affected the quality of the education at the secondary level. It is suggested that these courses should be restarted for the benefit of the student.

HSTTI: At this institute the In-service courses are designed for the higher secondary school and college Teachers. There are different types of courses offered at this institute. The duration of each courses is between 2~3 months. Most of the courses follow the class room lecture method only. There is almost no laboratory class for these courses. Academic supervision is fully absent for this program.

Therefore, we don‘t get the feedback on the benefit of such courses. These courses are also facing the problem due to shortage of fund.

2.7.7 Subject Structures

Subject structures and time allocations for grades vi-viii, ix-x and xi-xii recommended and incorporated into the national curriculum are shown in Table (NCTB 2012)

Table 4: Subject structures and time allocations for grades vi-viii, ix-x and xi-xii.

Division of Subject	Subject	Exam Marks	Periods in a week	Periods in a	Periods in a Year
Core subject	Bangla	200	5	8	160
	English	200	5	8	160
	Mathematics	100	4	6	128
	Religious and Moral Education (Islam and Moral education/Hindu religion and moral education/ Christian religion and moral education/Buddhist	100	2	32	64
	Information and Communication Technology	50	2	32	64
	Career education	50	1	1	32
	Physical education, Health science and Sports	100	2	32	64
Groupwise core subject					
Science	Physics	100	48	96	
	Chemistry	100	48	96	
	Biology/Higher Mathematics	100	48	96	
	Bangladesh and Global studies	100	48	96	
Humanities	History of Bangladesh and World Civilization	100	48	96	
	Geography and Environment	100	48	96	
	Economics/Civics and citizenship	100	48	96	
	Science	100	48	96	
Business Studies	Business Entrepreneurship	100	48	96	
	Accounting	100	48	96	
	Finance and Banking	100	48	96	
	Science	100	48	96	
Groupwise additional subject(One or none)					
Science	Biology/Higher Mathematics/ Agriculture education / Home Science/ Geography and Environment/ Arts and	100	48	96	
Humanities	Economics/Civics and Citizenship /Arts and Crafts/Agriculture Education / Home Science/ Small ethnic group‘s language and culture/ Arabic/ Sanskrit/Pali	100	48	96	

Business Studies	Geography and Environment/Music Bangladesh and Global Studies/Agriculture Education/ Home Science/ Small Ethnic Group's Language and Culture/Arts and Crafts/	100		48	96
Total		**1300**		**576**	**1152**

2.7.8 Present scenario of Science Group:

SSC results of BISEs also show similar down fall of science group students. For increasing the science enrollment vis-à-vis developing pupil's interest in Science a good number of projects were taken by the Ministry of Education. Out of those SESDP, SEDP, FSSAP, TQI etc are trying to develop science curriculum, text materials, teaching materials, Science teachers and developing the physical facilities of science learning by supplying chemical, equipments even erecting well equipped science buildings. But why this down fall still persisting? What are the real situation of teaching science, what are the weakness and threat? Has not been created there any strength and opportunities in favour of learning science due to the effort of last decades? A special type of SWOT analysis is to days demand for finding the way for developing the present situation of Science education of the school level of Bangladesh. In 2009 students appeared in science group were 182744 (22.9%) out of total students 797891 in SSC examination of eight boards. Similarly these percentages were 22.4%, 21.9%, 22.6%, and 22.9% in 2010, 2011, 2012 and

2013 respectively (Banbeis, 2014).

2.8 Technology Education

2.8.1 National ICT Policy 2009:

In today's world, Information and Communication Technology (ICT) is considered as the most effective constituent for the development of a nation. In order to decide on the ways to deliver the benefits of ICT to the greater mass of the country, the present Government, in its previous tenure, felt the necessity

of an Information and Communication Technology policy. The intention was reflected in measures such as tax waiver from import of computers, connecting Bangladesh with the Information Superhighway and allocation of fund 400 million Taka for promotion of IT sector. Digital Telephony was also

introduced during that period. Especially mobile phone business was opened up through removal of monopoly with a view to keep the mobile communication within the reach of the common people. For the development of Information & Communication Technology in the country, the Government formed a committee for formulating a national policy on ICT (vide Circular No: MOST/Sec-09/NCST-1/99/90 Dated: 10-05-1999). Though the policy was approved in 2002, the vision of developing a knowledge-based society in the country within 2006 could not be realized because of sluggishness of the next Government. Needless to say, that we have to go a long way to achieve that level of maturity in ICTs. In view of this, the ICT stakeholders felt the need to revise the current ICT Policy in line with the national goals, objectives and capabilities. Accordingly, the 'National ICT Policy Review Committee' was formed by the Ministry of Science and ICT (vide Circular No. MOSICT/Section-13/IT-7/1999/Part-2/108, Dated: 4-5-2008, published in Bangladesh Gazette in Vol.29: July 17, 2008). The ‗National ICT Policy 2009' is the outcome of the work of this committee.

It is expected that the successful implementation of the vision and objectives of the National ICT Policy 2009 will facilitate materialise Digital Bangladesh which the government pledged to build within 2021 by.

2.8.2. Rationale for a National ICT Policy

The constitution of the People's Republic of Bangladesh has edified social equity and ICTs are the best means to propagate that ethos within a framework optimizing the effective utilization of the nation's limited natural and abundant human resources. The article 19 of the constitution clearly mandates:

—19. **Equality of opportunity.-** (1) The State shall endeavor to ensure equality of opportunity to all citizens.

(2) The State shall adopt effective measures to remove social and economic inequality between man and man and to ensure the equitable distribution of wealth among citizens, and of opportunities in order to attain a uniform level of economic development throughout the Republic.‖

The policy is intended as a binding guide for all planners and executive officers of the state. It is also meant to be an investment guide for private enterprises, a social mobilization guide for NGOs/civil societies and a benchmark for electronic delivery of citizen services

2.8.3 ICT policies in Bangladesh

The Government of Bangladesh has given emphasis to the inclusion of ICT in the education system. For this purpose, different policies have been developed and are being implemented to integrate ICT in the education system. Here key elements in the National Information and Communication Technology Policy-2009 [NICTP-

2009], the National Education **Policy-2010 [NEP-2010**], and the Bachelor of Education Curriculum are identified.

The National Information and Communication Technology (ICT) Policy-2009

The National Information and Communication Technology (**ICT) Policy-2009** of Bangladesh considers ICT as an essential means for the country‟s economic and

social development (**Ministry of Science and Information and Communication Technology of Bangladesh [MOSICTBD], 2009**). The policy defines ICT as any kind of electronic technology that supports the creating, preserving, processing, transforming and disseminating of information. This policy addresses all public sectors of Bangladesh, such as business, social-welfare, and education, and it recommends strategies for integrating ICT into each sector. In regard to the education sector, this policy aims to develop citizens‟ computer literacy, and to encourage research and development work in ICT. It advocates ICT courses in primary, secondary, technical and vocational education and training programs.

Bangladesh's national ICT policy considers ICT as a fundamental skill of the 21st century, and suggests different strategies to develop ICT literacy for primary and secondary teachers and students. For this purpose, the policy recommends developing the ICT infrastructure in schools and teacher training institutions through the provision of computers, local area networks and Internet connections. The policy

also regards ICT as an effective tool for teaching and learning activities, and mandated the preparation of multimedia-based content and materials for the teacher training programs. In order to encourage teachers and teacher educators to use ICT in classrooms, the policy advises providing them with ICT loans and incentives so that they can buy ICT equipment and prepare resources for multimedia based classroom environments. It also recommends peer-learning methods and action research as key strategies for preparing teachers to use ICT in classrooms.

With a view to integrating ICT in education, the ICT policy suggests preparing digital learning content, such as e-books, in Bengali scripts and disseminating those in schools. The national ICT policy aims to introduce ICT-related subjects at all levels of education, and to progressively upgrade the curriculum. It also proposes to set up a central online database of digitally developed learning materials, e-books and lesson-plans so that teachers as well as students can gain easy access to resources and find essential information. The policy further recommends recruiting teachers in schools who have considerable ICT knowledge and skills. In addition,

2.8.4 ICT, change and the importance of teachers' perspectives.

ICT has been integrated in education with a belief that it is a catalyst of change that can encourage knowledge transformation, critical thinking and student-centred learning (Roblyer & Doering, 2010). Accordingly, governments are adopting different policies and strategies for integrating ICT into education systems (Kozma, 2008). However, the potential of ICT in education is not yet been clearly realised (Moonen,

2008). One reason for this is that teaching professionals are often not adequately prepared for teaching with ICT (McDougall, 2008). School teachers are trained in and prepared for implementing school curricula by a cadre of professionals or teacher trainers who themselves struggle with understanding the full potential of the technology (Swennen & Klink, 2009).

It is often reported that government initiatives regarding enhancing the quality of education around the world, in both developed and developing countries, mostly focus on primary and secondary education sectors and preparing the teachers of these schools. Little focus is given to teacher education programmes, and preparing teacher

educators. Consequently this remains an under-researched area (Koster, Brekelmans, Korthagen, & Wubbels , 2005; O‟Sullivan, 2010). This is also true in regard to research about integrating ICT in education. A considerable number of studies can be found that focus on school teachers‟ perspectives and classroom practice of using ICT in schools (Ertmer & Ottenbreit-Leftwich, 2010), but relatively few studies are found that focus on the teacher educators‟ perspectives of using ICT in teacher education programs (Peeraer & Petegem, 2011), particularly in the context of a developing country (Shohel & Power, 2010). This study endeavours to explore that gap and examine teacher educators‟ experiences and understandings of ICT in teacher education programmes in one such developing country: Bangladesh.

2.8.5 The Bangladesh Context

Bangladesh is a developing country with a density of 993 persons per square kilometer (Bangladesh Bureau of Statistics [BBS], 2009). The natural resources available in this country are not sufficient to provide economic emancipation to this huge population, so the Bangladeshi Government policies always emphasize the potential for transforming this large population into human resources (Hoque, 2002). Consequently, one of the major goals of the national education policy is to develop human resource through education and training for national and international markets, and, by doing so, to accelerate economic progress and to enhance the quality of life for the people of Bangladesh (Ministry of Education Bangladesh [MOEBD], 2010]).

One major source of earning for Bangladesh is the remittance from Bangladeshi people working overseas (Hoque, 2002). Bangladesh sees ICT as an important potential area for earning foreign currency, and consequently established the National Information and Communication Technology Policy-2009 [NICTP-2009] as a key initiative to develop competent ICT resource persons who will work for international ICT markets and contribute to the national economy. This policy is also reflected in the recent education policy in Bangladesh where particular emphasis is placed on the development of ICT competency among the students (MOEBD, 2010

It is noteworthy that the existing education system in Bangladesh was introduced by the British colonisers in the early 19th century, and its aim was to produce skilled people who could help the colonisers by assisting with clerical work (Salahuddin & Chowdhury, 2010). Consequently, the British schooling structure, including curriculum, syllabus, and textbooks, became part of the Bangladeshi education system, and to some extent there is still evidence of its influence. There has been a historic and continuing dependence on European countries to inform the curriculum and recently ICT is a new addition to this list.

It is often claimed that ICT is a western innovation, and it is being introduced into other countries by international commercial agencies such as the World Bank (Zembylas & Vrasidas, 2005). Similarly, in Bangladesh, ICT is being incorporated in education through support from international financial organisations, such as the Asian Development Bank (ADB) (Pouezevara & Khan, 2007) and the Department of International Development, UK (Shohel & Power, 2010). In addition, foreign consultants are being appointed to design ICT curricula and textbooks, and to train the educators so that the educators can then train the school teachers to implement ICT in education. For example, the Ministry of Education, Bangladesh, has been implementing a project called Teaching Quality Improvement in Secondary Education Project (TQI-SEP) since 2005 with an aim to enhance teaching quality of the secondary teachers. This project is supported by the Asian Development Bank, and one objective is to provide one multi-media supported computer laboratory with internet connection and local area network to all government teachers‟ training colleges (TTC), so that the educators and trainee teachers can develop their knowledge and skills in ICT. The project has also provided one multi-media equipped vehicle to each government TTC as a mobile resource unit; the educators use this vehicle to go to remote schools to train the school teachers in pedagogy and ICT skills.

There remains a need for research that explores the extent to which international funder goals and strategies are congruent with the needs of Bangladeshi teachers and teacher educators. This study draws on understandings of teacher educators as a contribution to such research

2.8.6 The National Education Policy-2010

The National Education Policy-2010 also emphasizes the integration of ICT in the education system suggesting that ICT is one of the most important elements to lever the quality of education (Ministry of Education of Bangladesh [MOEBD], 2010). The first chapter of the policy (the Goals and Objectives of Education) consists of 30 general objectives of education in Bangladesh and the twenty-first objective is "to increase the use of information and communication technology as a teaching-learning tool in all levels of education" (p. 2). accordingly, in chapter four,

'Secondary Education', the policy proposes to introduce ICT as a compulsory subject in the secondary curriculum, and recommends that the Government provide the necessary ICT infrastructure in schools. In order to prepare the teachers for teaching with and about ICT, in Chapter 24 'Teacher Training', it proposes to modernise the teacher education curriculum and syllabus with ICT knowledge and skills.

Moreover, there is a separate chapter on ICT education. Chapter 12, „Information Technology Education", states that ICT education can contribute to reducing the poverty of the country by preparing the pupils with effective skills to work abroad in ICT sectors and consequently to send remittance back to Bangladesh. It states two specific objectives of ICT education: firstly, preparation of international standard ICT-experts, and secondly, the prioritization of knowledge pertaining to not only computer science, but also a wide range of communication technologies, such as mobile and telecommunication technologies, radio, and television. In order to introduce ICT to children, the policy recommends including ICT as a teaching-learning tool within primary schools, and it proposes the inclusion of 'computer science' as a subject in the secondary curriculum for those students who want to further their study of ICT within the science discipline.

2.8.7 Lack of ICT resources and infrastructure

The participants reported that there is a lack of computers, multimedia facilities and internet connections in most teacher training institutions. Two or more trainee teachers share one computer in the classroom. Teacher educators often cannot teach trainees about email and online search skills due to insufficient or unreliable internet connections. Besides, the computers often go out of order, and the lack of a computer

maintenance budget is a reason that broken computers are not repaired. This view is supported by Ertmer and Ottenbreit-Leftwich (2010) who report that technical problems often contribute to a lack of confidence amongst teachers. Hew and Brush (2007) also demonstrated that lack of resources can be a barrier to teachers' technology use. Therefore, when building a supportive infrastructure, it is also important that schools be well equipped, not only with ICT resources, but with the pedagogical expertise to facilitate meaningful use and maintenance. Since Bangladesh neither produces ICT devices nor can afford to buy expensive equipments, it depends on international financial agencies for support in bringing ICT technologies into educational settings. However, the support from international financial agencies is imbalanced because they mostly provide money for purchasing ICT devices and rarely for developing context appropriate pedagogical uses of ICT in the grounded educational settings that exist in Bangladesh.

2.8.8 Teacher educators' suggestions to improve the ICT course

The teacher educators interviewed strongly advocate the inclusion of pedagogical knowledge of ICT in the curriculum so that trainee teachers can understand the practical applications of ICT while learning about ICT skills. As teacher educators‟ lack of ICT knowledge is found as a barrier for teaching trainees, it is important to train educators before they teach ICT. In order to increase the educators‟ confidence in using ICT and to encourage them to use ICT, one recommendation is the implementation of yearly awards or incentives for those educators who will show examples of best practice.

Some of the teacher educators also stressed the need to increase all educators positive attitudes towards ICT in education. As noted earlier, positive belief in the importance of ICT in education has a direct bearing on its success in the classroom. Wozney, Venkatesh and Abrami (2006) argue that a sound knowledge base and strong self-efficacy cannot ensure meaningful technology use. It is also important to investigate teachers‟ attitudes towards ICT, because attitude acts as a lens when people work with new knowledge and skills. Therefore, this study recommends working towards developing positive attitudes towards ICT not only in those educators who teach ICT, but in all other educators in the Teachers Training College.

Teacher educators professional culture, including the principal‟s leadership and government-level supports, are also recognised by the participants as important. Ertmer and Ottenbreit-Leftwich (2010) note that professional culture makes an impact on the development of teachers' knowledge and beliefs, and it is important to take account of both the context in which they are prepared, and the context in which they will teach. Therefore, this study suggests that the College principal as a leader should encourage the development of a community of practice among the educators with a view to developing their positive attitudes towards ICT, and increasing their ICT knowledge and skills.

Implications for practice

This study has implications for various levels of what Davis (2010) calls the ―educational ecosystem‖ and for those responsible for planning and implementing ICT in education. School teachers and teacher educators are offered critical insights about the need to not be a passive consumer of ICT (Davis, 2010), but rather be a ―critical consumer‖ (Roblyer & Doering, 2010, p. 51) and so initiate ways to integrate it into their own practice. Teacher educators and teachers are encouraged to explore the opportunities and tensions in implementing ICT in teacher education programs. Critical examination of ICT policy documents invites policy makers to further consider the potential of ICT so that they, and those in other developing countries, can better integrate ICT in education.

A lack of pedagogical knowledge of ICT is identified in the study, and curriculum developers need to address this shortage in future planning. The shortage of ICT-knowledgeable educators in teacher training institutions indicates that educators must be better trained in ICT, with technological, pedagogical and content knowledge (Mishra & Koehler, 2006), before they are given responsibilities to prepare school teachers.

The scarcity of ICT equipment and of necessary infrastructures are barriers to be addressed. The English script embedded in computers and on the web is also a perceived barrier that can be partly minimised by introducing Bengali scripts in computers. Awarding some sort of incentives to the exemplary teachers may encourage others to implement best-practices in using ICT in education. Finally, strengthening the community of practice among the teachers and educators may influence a faster integration of ICT in education.

This study shows that there is a gap between how policies envisage the ways ICT can reform education, and what teacher educators understand about teaching about and with ICT. It also suggests that policies approach ICT in more mechanistic and less pedagogical terms than do those teacher educators who have developed confidence in ICT and have begun to explore it as a way to transform approaches to learning. It is critical to bridge this gap to enable successful implementation of ICT in education in Bangladesh.

Although it has only begun to explore the complexity in the issues, this study also acknowledges that the development of ICT in education is not just a pedagogical issue. The broader social commitment to ICT development in Bangladesh on the one hand involves increasing dependency on the global monetarist market and on the other hand offers a perceived way of developing greater economic capability within that market. The duality of the impact – present and potential - of ICT on well-being in Bangladesh, as in other countries that face such a twofold challenge, is a field that requires much further examination. This study simply presents it for such consideration. However, because of the complexity of the economic and power issues involved, it is all the more important that the full potentials of ICT as an educational tool are explored, and that teacher educators with experience of ICT as a pedagogical tool are consulted in the development and implementation of policy.

(Teacher Educators‘ Perspectives of the Introduction of ICT in Education in Bangladesh)

2.8.9 Conclusion:

In conclusion, this Chapter reviews the historical background of science education in Bangladesh and considers the curriculum documents, national and international reports and science education research literature in regards to quality teaching and learning of science in schools. The review of literature identifies key theories, constructs and variables impacting on the quality and status of science education which are summarised as a conceptual framework diagram in Figure 2.1. The conceptual framework outlines the relationships of teachers’ professional learning opportunities on their knowledge and beliefs and how these influence the implementation of intended core curriculum in junior secondary science for student-centered inquiry teaching. Also, the contextual factors that are limiting the implemented science curriculum and act as barriers to students’ learning for developing scientific literacy are presented.

2.9.1 The Conceptual Framework

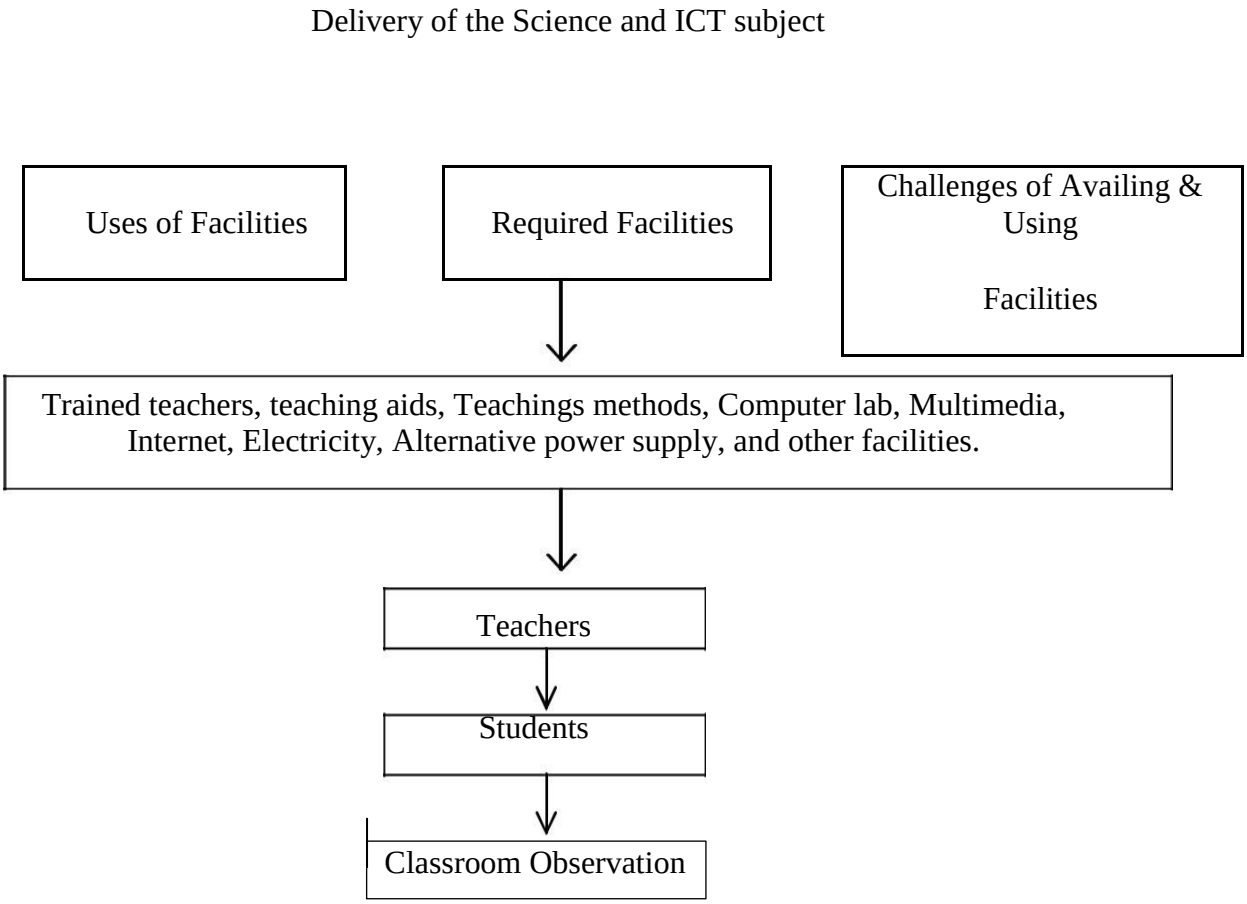


Figure l .1: Conceptual framework of the study

Chapter Three
Methodology

3.1 Introduction

This chapter shows the detailed methodology of the study. This means that how I have done this study has been presented in this chapter. The methodology chapter includes introduction, nature of the study, study area, population of the study, sample and sampling techniques, data collection tools, procedures of data collection, triangulation of data and the ethical consideration.

3.2 .Research Question

The main goal of this research is to explore how science and technology education is promoted through secondary science education in Bangladesh as well as in Munshigonj District.

To achieve the said objective, the following five main research questions have been formulated:

This study was conducted to explore answer to the following research questions:

1. What is the present Scenario of class Ten Science Students in Munshigonj District?

2. What are the teaching methods and strategies practiced in the secondary science classrooms at present?

3. What challenges do science teachers usually face in science classes?

4.what is the impact of Introducing ICT in Classrooms ?

5.What challenges do science Teachers face during ICT class?

Research Design

This study was designed to describe the actual picture of secondary science teaching and learning to formulate a realistic picture for science and technology education in Munshigonj District. Data for the actual picture were generated through surveys of science teachers and students.

Data for the real picture of science teaching and learning were generated through analysis of the research literature, national curriculum documents and by survey of science teachers, and interviews with key stakeholders.

The purpose of collecting data related to actual pictures of trends and problem of science and technology education at the secondary level .Importantly, the study involved both quantitative and qualitative approaches. The quantitative approach involves the use of questionnaires to survey both teachers and students. The teachers' survey helps to identify typical practice in curriculum delivery, teaching and assessment in secondary science, and factors limiting quality and acting as barriers to change. The students' survey further helped to gather students' views about their interest in science, their perceptions of the relevance of science, their own competence and work attitude to science.

Also, interviews were conducted with other stakeholders that have an influence on science education in Munshigonj District. These groups of people included a Senior science teacher, a representative of Teachers Association of Munshigonj, District Education officer, and Head Teacher. The data from the interviews consist of information provided directly by the stakeholders about their experiences, knowledge and opinions about science teaching and learning in secondary schools.

A mixed method approach involving a combination of qualitative and quantitative data from different sources was used to corroborate findings in this study. Qualitative methods help to provide answers to questions by examining various social settings and individuals who inhabit the settings, allow the researchers to share in the understandings and perceptions of others, and to explore how people structure and give meaning to their

daily lives (Berg,1989). Giddens (1984) notes, qualitative methods help elucidate the frames of meaning of the actors and investigate the context of action**.** Miles and Huberman (1984) further argue that findings of qualitative methods have a quality of undeniability, because they help create concrete, vivid and meaningful flavour descriptions of incidents and events.

Patton (1990) and Thomas and Nelson (1996) also corroborate that using the interviews can help researchers to gather information about several people's views, perceptions and opinions in one session and for the participants to provide checks and balances on each other's views, which can curb extreme views. Thus, qualitative methods is necessary for generalizing plausible alternative explanations, describing the program, constructing a narrative history, presenting data collection procedures, and summarizing (Campbell, 1974) and to help allow the researcher to have more continuous reflection on the research in progress, more interaction with the participants in the research, and more room for ongoing alteration as the research proceeds (Bouma, 2000).

Qualitative methods major setbacks include that they tend to produce large amounts of information that can only be focused after data collection, less focused at the outset that is, assume less in advance which variables are relevant, more open-ended, and are sensitive to context that are likely to be focused on in the intentions, explanations, and judgements of the participants, since it aims at providing the maximum opportunity for the researcher to learn from the subjects, or participants in the research (Bouma, 2000; Howe, 1985).

Quantitative methods essentially help to identify and assess the bounds of knowledgeability of the respondents and to assess the respondent's attitudes, values, beliefs or opinions (Berg,

1989; Bouma, 2000). House (1994) indicates that questionnaires in quantitative research give more precise, explicit, and predetermined measure and identification of relevant variables in advance. Lokan, Hollingsworth & Hackling (in press) further claim that questionnaires are economical and very simple to administer to sample large groups of respondents; give better potential to generalize findings because samples are larger; ensure efficient gathering of large quantities of baseline data; and also the responses

gathered can usually be transformed easily by coding into data files that are ready for statistical analysis. However, questionnaires are very complex to construct and the success of using questionnaires depends on the honesty of the respondents (Bouma, 2000).

Despite the complex nature of the quantitative methods, they are more quickly accomplished, produce more reliable conclusions and help provide reportable findings involving percentages of variable occurrences (Berg, 1989). Therefore, quantitative methods are essential in educational research (Patton, 1980).

While quantitative and qualitative methods each gather valuable information on their own, findings from qualitative and quantitative methods are distinct and they complement one another in the content (Berg, 1998; Giddens, 1984).

3.3 Nature of the Study

This study has been conducted by following the mixed method approach because both quantitative and qualitative data have been collected from the selected samples. The mixed method approach is a process of collecting, analyzing and mixing data to create understandable design out of complex data and to clarify the intent of mixing of quantitative and qualitative data in a single study (Creswell, 2010). Data has been collected by questionnaire from the students, the interview schedule from the teachers and by the observation checklist observed by me.

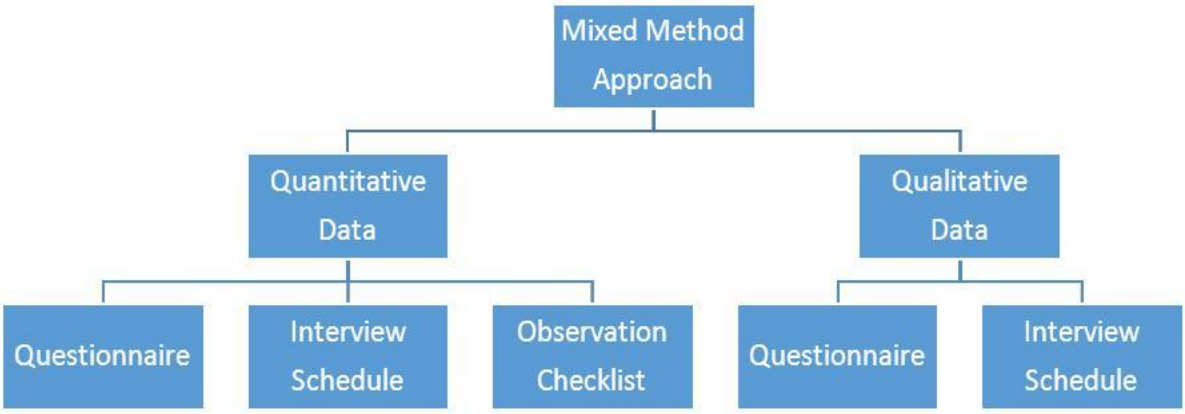


Figure 3.1: Nature of the study

3.4 Justification for choosing this area for this study:

The choice of study area aligned with my research question and methodology. To know the scenario of science and technology education in Bangladesh .it could not be suitable to study where schooling had started in the recent time (i.e . late colonial to Pakistan region). In this connection munshigonj seemed the better choice because education has rooted in the very earlier time. Once bikrampur was called the knowledge of region. About 25 school had already been celebrated 100 years. This is very rare in most of the district in Bangladesh.

Due to this rich history and developed education from very ancient time, Munshigonj (bikrampur) has been chosen for this study. Although the teacher follow the same curriculum of Bangladesh. Prominent scientist sir jagadish Chandra basu and sreegaan atish dipankar is the man of bikrampur.

This study has been conducted on the basis of the area of Munshogonj District. Therefore, the study has covered the area of the government and non-government secondary schools in Munshogonj District the schools have been selected conveniently.

The researcher chose grade Ten because it is considered as the vital class before grade eleven which is the terminal grade of the Secondary cycle. This is why this level is expected to provide a more authentic picture of Science and technology education.

In this way, the study was carried out in Munshigonj district located on the bank of *Padma and Dloleshary River*. The area is densely Populated . The locale was chosen for the advantage of study in order to gather data from eye witnesses and it was very close to my residence as well.

The site is geographically located at the center of Bangladesh, approximately 40 kilometers form the capital city of Dhaka. The locale was selected purposefully in a convenient way.

Apart from, it was my home District where I grew up. As such, I was acquainted beforehand with the high school and its environment. I had also met some of the stakeholders before starting my data collection. In this way, I established rapport with stakeholders and the school environment within a very short time. They facilitated my

observing the class in a cooperative way. Besides, teacher warmed towards me quietly and were pleased to get me at the center of Bangladesh, approximately 40 kilometers form the capital city of Dhaka.

The locale was selected among them which helped me to collect data smoothly. Furthermore, the locale was close to the capital city Dhaka which facilitated to save time and money. Therefore, I could easily manage to get access to the field among them which helped me to collect data smoothly.

3.5 Population of the study

The target population was secondary schools science teachers and their lessons in Bangladesh. Science teachers from co-education and easy access secondary schools of Munshigonj District were purposively selected. In addition to that political unrest of the country, time and money constraint, and the nature of research limit probability sampling. Therefore purposive sampling was adopted. The purposive sampling technique is a type of non-probability sampling that is most effective when one needs to study a certain cultural domain with a specific type of knowledge or skill (Vargas & van Andel, 2005).

3.6 Sample and Sampling Techniques

I had collected the school list from Disrtict Education Officer. There were 126 high school in Munshigonj District . Data were collected from 58 high schools of six upzila of Munshigonj District purposively . A total 58 high school were surveyed. 58 Secondary schools have been selected conveniently from Munshogonj District to collect quantitative and qualitative data for exploring the uses of the available facilities and the challenges of availing and using those facilities. Among them government schools and non-government schools have been taken for data collection. The students have been selected randomly, the teachers have been chosen purposively and the classrooms have been taken purposively. A table of the sample and sampling techniques is given below.

Secondary Institution Of Munshigonj District (126)
Table:

	Secondary Institution											
	Munshigonj Sadar		Tongibari		Serajdikhan		Sreenagar		Gazaria		Louhajang	
British Period (1854-1947)	Girls-1 Boys-2 Co-education-3	6	Girls-00 Boys-00 Co-education-10	10	Girls-0 Boys-0 Co-education-05	5	Girls-00 Boys-00 Co-education-09	9	Girls-00 Boys-00 Co-education-02	2	Girls-01 Boys-00 Co-education--06	7
Pakistan period (1947-1971)	Girls-2 Boys-0 C0-education-05	7	Girls-01 Boys-00 C0-education-00	1	Girls-00 Boys-00 C0-education-05	5	Girls-01 Boys-00 C0-education-04	5	Girls-00 Boys-00 C0-education-01	1	Girls-00 Boys-00 C0-education-02	2
Bangladesh period (1972-Till date)	Girls-02 Boys-00 C0-education-13	15	Girls-00 Boys-00 C0-education-07	7	Girls-02 Boys-00 C0-education-15	17	Girls-01 Boys-00 C0-education-08	9	Girls-02 Boys-00 C0-education-13	15	Girls-00 Boys-00 C0-education-03	3
Sub-Total	28		18		27		23		18		12	
Total	126											

Table: Secondary Institution Of Munshigonj, British Period to till date

British Period (1854-1947)	Pakistan period (1947-1971)	Bangladesh period (1972-Till date)
39	21	66
Total = 126		

Table: Secondary Institution Of Munshigonj, British Period to till date

Girls	Boys	Co-Education
13	02	111
Total = 126		

Table: 3.1 Selected 58 High School (14 Girls, 2 Boys and 42 Co-Education) by upzila and types

District	upzila	institutions		Urban	rural	Govt.	Non Gov.	Govt.		Non.Govt.		
		Type	Number					Boys	Girls	Boys	Girls	Co.Edu
MUNSHIGONJ	Munshigonj	SCHOOL	10	3	7	2	8	1	1	1	2	7
	Tongibari		10	3	7	0	10	0	0	0	2	7
	Louhajang		10	3	7	0	10	0	0	0	2	7
	Serajdikhan		10	3	7	0	10	0	0	0	2	7
	Sreenagar		10	3	7	1	9	0	1	0	2	7
	Gazaria		8	3	5	0	8	0	0	0	2	7
	Total		58	18	40	3	55	1	2	1	12	42

3.7 Survey participants of the study

This study purposively selected one hundred and sixteen (116) science teachers from Secondary schools at Munshigonj District (Table) to gather information regarding Science teaching- learning aspects. Among them 16 was female. The age of the participating teachers ranged between under 25 up to 50 years old with teaching experiences ranged between one (1) year to more than 30 years. Academic education of the participant teachers lay in between bachelor and master; all of them have Bachelor degree in Education (B.Ed.); 95 of them received training on Subject Based Cluster (SBC); Continuous Professional Development (CPD) training received by 90; Teaching Quality Improvement (TQI) training received by 110 teacher participants. TQI training, which was started in 2006, mainly focuses on the participatory teaching approach to develop students' understanding and thinking skills of science.

Table:3.2 **Demography of the Survey Participants**

Characteristics of Participants	**Number of Participants (N=116)**
Male	100
Female	16
Academic background Bachelor Of Science Master Of Science	 110 06
Inservice Training B.ED SBC CPD TQI	 116 95 90 110
Year of Teaching 1-5 Years 5-10 10-15 15-20 20-25 25-30 More than 30 years	 10 50 30 10 09 07
Age Below 30 30-35 35-40 40-45 More than 45 Years	 06 30 40 30 10
	Total = 116

Table: 3.3 shows the sample and sample size

High Schools (58)	Science Teachers	Students
Co-education (42)	422= 84 2 teacher fom each school	42□1□̃ı= 420 10 students from each school
Girls (14)	14×2= 28 2 teacher fom each school	14×1×ı́= 140 10 students from each school
Boys (2)	2×2= 4 2 teacher fom each school	2×1×ı́= 20 10 students from each school
Total	116 science Teacher	580 students

3.8 Interview participants of the study

By using maximum variation sampling technique (Glaser & Strauss, 1967) fifteen of the participant teachers from same pool of survey respondents were selected and interviewed. In this case, teaching experience, in-service trainings, gender, and subject taught at graduation level were considered. Among the participants four of them were females. The teaching experiences of the participants ranged between two to seventeen years, held Bachelor degree in Education (B.Ed.), have studied separate subjects of Physics and Chemistry along with either Mathematics or Biology at graduating level,

received Teaching Quality Improvement training (TQI), Subject Based Cluster training (SBC), Continuing Professional Development (CPD) training, and short term Overseas Training (OT).

Table: 3.4 Interview participants of the study

Teacher	Gender	Age	Teaching Subject	Years of Teaching Experience	Academic Background	Inservice Training
CT 1	Male	40	Biology	15	M.SC	B.ED ,TQI , SBC,CPD
CT 2	Male	38	Biology Chemistry Math	14	B.SC	B.ED ,TQI ,
CT 3	Male	42	Physcics	11	M.SC	B.ED,CPD
CT 4	Male	50	Biology,Chemistry	25	B.SC	B.ED ,TQI ,
CT 5	Female	40	Biology Chemistry Math	16	B.SC	B.ED,CPD
CT 6	Male	50	Biology Chemistry Physcics	25	B.SC	B.ED ,TQI ,
CT 7	Female	43	Chemistry	20	M.SC	B.ED,CPD
CT 8	Male	40	Biology,Chemistry	10	B.SC	B.ED ,TQI ,
CT 9	Female	45	Math	15	M.SC	B.ED,CPD
CT 10	Male	46	Biology ,Chemistry	16	B.SC	B.ED ,TQI ,
CT 11	Female	36	Biology Chemistry Math	08	B.SC	B.ED,CPD

CT 12	Male	48	Biology ,Chemistry Math	18	B.SC	B.ED ,TQI ,
CT 13	Male	39	Biology	17	M.SC	B.ED,CPD
CT 14	Female	37	Biology Chemistry	05	B.SC	B.ED ,TQI ,
CT 15	Male	45	Biology Chemistry Math	20	B.SC	B.ED,CPD

B.Ed., Bachelor of Education, TQI, Teaching Quality Improvement; SBC, Subject Based Cluster, CPD, Continuing Professional Development;

3.9 Data collection tools:

Pilot testing of the research instruments

For pilot testing, the researcher randomly selected six schools from munshigonj district. From each school, the headmaster, 15 science students and three science teachers were selected for the collection of data. The total respondents for pilot test were six headmasters, 90 science students, 18 science teachers and five science experts. The questionnaires, check list and Opinionnaires were administered to the relevant respondents. They were asked to fill the questionnaire and mark any word or sentence structure that they find ambiguous, confusing or incomprehensible. The researcher also discussed the items with the respondents in a very cordial and informal manner. The respondents were asked to express their views and their thoughts when they read an item. The purpose was to observe that the respondents understand an item in the same way as intended. From the responses of these respondents and the difficulty faced in understanding the items, the language of some of the items were modified and improved accordingly.

3.9.1 Questionnaire for Science Teachers

The teacher questionnaire comprised five sections. The first section elicited information on demographic data regarding the teacher's age, qualifications and years of teaching experience, area of teaching specialization, class size and school location. The second section focused on the teacher's views of science teaching and learning. Section three examined what is actually happening in the teaching and learning of science. Section four focused on the constraints to quality teaching and learning of science in schools.

3.9.2 Opinionnaire for Science Teachers

Rating Scale is the tool through which data can be collected easily. A researcher can collect quantitative data in a short time by the help of questionnaire . As a result a Rating Scale has been used for collecting data from the Science Teachers of the selected class. The Rating Scale has been prepared to collect data about availability and use of teaching aids, use of teaching methods, components and use of computer lab, multimedia and it's uses, use of internet, supply of electricity, alternative power supply etc.

3.9.3 Questionnaire for the Students

Questionnaire is the tool through which data can be collected easily. A researcher can collect quantitative and qualitative data in a short time by the help of questionnaire (Hossain, 2009). As a result a questionnaire has been used for collecting data from the students of the selected class. The questionnaire has been prepared to collect data about availability and use of teaching aids, use of teaching methods, components and use of computer lab, multimedia and it's uses, use of internet, supply of electricity, alternative power supply etc.

3.9.4 Interview Schedule for the Science Teachers

Interview schedule is such type of a collection tool by which a research can collect necessary data from the respondent through a conversation. It is an effective tool for gathering data (Samad, 2010). Therefore, a semi-structured interview schedule has been used to collect data from the teachers of selected class. The interview schedule has been made to collect data about teachers' training, available teaching aids and their uses in the

schools, teaching methods they used in teaching ICT, instruments and use of computer lab, multimedia and its uses, use of internet, supply of electricity, alternative power supply, other facilities as well as the challenges of availing and using the facilities.

3.9.5 Observation Checklist

Observation checklist is another data collection tool to collect data by observing the real situation. The data collected through observation checklist is more authentic (Samad, 2010). So, for the collection of data, an observation checklist has been used. The observation checklist has been prepared to collect data about teaching-learning method , science laboratory , availability of teaching aids and their uses, number of computers in the computer lab, multimedia and its uses, use of internet, supply of electricity, alternative power supply etc.

3.9.6 Procedures of data collection

Data collection for this research study involved Five phases. These are enumerated as follows:

Phase 1- Seeking approval to access schools and requesting teachers' consent for their participation: A letter was sent to the DEO in Munshigonj to inform them of the research and also to seek their consent and approval to nominate a contact person within the education department so that the study could be conducted in the secondary schools (see Appendix). Thereafter, a letter of introduction was obtained from the varsity to secondary education officer in the six upzila for access to the schools involved in the study.

Head Teacher, science teachers and other key stakeholders from each upzila were approached by the Researcher to discuss the purpose of the study and to seek their consent for completing the questionnaires and also to participate in the focus group meetings, classroom observation and interviews. Participants who indicated interest in participating

in the focus group meetings, classroom observation and interviews and returned consent forms were involved in the study.

Phase 2- Distribution and administration of questionnaires and opinionnaires : Teacher survey questionnaires and opinionnaires were distributed to science teachers in the secondary schools in each of the upzila that were involved in the study. Also, the student survey questionnaires were distributed to teachers at the sample schools. To ensure a high return rate of the questionnaires, the Researcher personally supervised the distribution and collection from teachers and students. Most of the teachers preferred completing the questionnaires from home and so some failed to return the questionnaires for analysis. The return rate was 82% for the teacher survey. A 100% return rate was achieved for the student survey, since the students were asked to respond to the questionnaires during class time. The administration of the student questionnaires was personally supervised by the Researcher.

Phase 3- Collection of curriculum and related documents from schools: In this phase, the Researcher obtained national curriculum documents from the Districts, School Head teacher and teachers both from rural and urban secondary schools . Curriculum documents obtained include: school diaries which record teachers' planning, schemes of work, records of students' performance, National Policy on Education document, National curriculum in Integrated Science, science inventory records, continuous assessment records and students' performance record in order to obtain information about curriculum delivery, resources, time allocation, curriculum and pedagogy in science teaching and learning.

Phase-4-Classroom Observation: Classroom observed by the researcher through check list in a passive mood. After collecting both quantitative and qualitative data from the teachers I have collected the quantitative data from government secondary schools and then from non-government secondary schools. Here to say that, after taking the permission, I have observed (with the help of the teacher) some of the classrooms , science laboratory and the Computer‘s laboratory (where available) properly and taken necessary data concerned with my study. At the same time, I have collected data about the teachers related

to ICT. While running the teaching-learning activities in the classroom, I have observed the class and collected essential data fromfifteen Schools which I have selected purposively.

Phase 5- Interviews: The final phase of this research data collection involved interviews with a Science Teacher in munshigonj, DEO, secondary education officer of six upzila. Consent forms and letters of invitation stating the purpose of the study were sent to individual key stakeholders to seek for their consent to participate in the interviews. Interviews were conducted between 14th July to 5th August, 2014 with participants who indicated their willingness to participate in the study and returned the consent forms. Interviews were audio recorded by the Researcher and lasted for about an hour.

3.9.7 Summary of Data Sources

In order to generate data to address each of the research questions for the study, various data sources were employed and these are presented in Table :

Table : 3.5 Data sources related to the research questions

Data Sources	RQ 1	RQ 2	RQ 3	RQ 4	RQ 5
Teacher survey		√	√	√	√
Student Survey				√	√
Interview	√	√	√	√	√
Observation Check list	√	√	√		
Document Analysis	√				
Opinionnaire				√	√

Note: *RQ indicates the research question.*

3.9.8 Data Analysis

The research data collected were extensive and as such were analyzed using both quantitative and qualitative methods. Patton (1990) notes, "the analysis of the empirical data aims to make sense of massive amounts of data, reduce the volume of information, identify significant patterns, and construct a framework for communicating the essence of what the data reveal" .

Questionn aires

Data from the teacher and student questionnaires were analysed using descriptive statistical methods . Responses to the open-ended questions were coded into categories and the frequency of teachers' and students' responses in each category was determined. Responses on the scale item were also coded in relation to the items so that the number and percentage that responded 'some time', ' often' and 'never' were calculated using the statistical package.

Interviews

The audio recordings from the interviews were listened to several times by the Researcher and transcribed verbatim. Transcripts were analyzed by reading through several times by the Researcher to identify emerging themes that are relevant to the study for interpretation and analysis. Data that occurred most frequently were emphasized in the reporting of findings.

Observation check list

Data from the Observation check list were analysed using descriptive statistical methods . Responses to the open-ended questions were coded into categories and the frequency of teachers' and students' responses in each category was determined. Responses on the scale item were also coded in relation to the items so that the number and percentage that responded 'some time', ' always' and 'never' were calculated using the statistical package.

Opinionn aires

Data from the teacher and student opinionnaires were analyzed using descriptive statistical methods . Responses to the open-ended questions were coded into categories and the frequency of teachers' responses in each category was determined. Responses on the scale item were also coded in relation to the items so that the number and percentage that responded 'agree', ' disagree' and 'neutral' were calculated using the statistical package

3.9.9 Data coding

After collecting data, the interview of school teacher were coded for easy analysis of data. The interview of school teacher was coded as CT. The number of interview also had been indicated through numbering such as CT 1, CT 2, CT 3…..

Participants	Used Codes
School Teacher	CT1 to CT15

Table: Used code in the study

Participants	Used Codes
Student	st1 to st15….

Table: Used code in the study

3.10 Triangulation of data

After collecting data by using different data collection tools, triangulation was used as a system of increasing the validity of collected data through cross-checking. As there have been used three types of data collection tools in this study, triangulation of data has been used here for the authenticity of gathered data. The collected data through the observation checklist have been cross-checked by the questionnaires and the interview schedule according to the triangulation system. At the same time, the collected data through the questionnaires and the interview schedule have also been cross-checked by the observation checklist. As a result of using triangulation validity and reliability of data collected from different sources has been improved a lot.

3.10.1 Ethical consideration

Ethical consideration is a pivotal issue for conducting any kinds of research work. At the time of accomplishing this study, I have always tried to ensure the ethical issues in each and every stage. Some of the ethical issues have been given below.

- From the first to last of the thesis work, I had done with the consultation of my supervisor. When I had gone to her with any kinds of problem of the study, she consulted me sincerely. At the every step, she has always helped me cordially.

- At the time of review of the related literature, I had always tried keep away from plagiarism. I had used mainly paraphrasing and sometimes quotations while reviewing the literature and provided the actual references of all the literatures.

- At the time of collecting data, I was always present in the field. I had filled up the observation checklist going to the schools. I had tried to take one of my friends (as an assistant) to the schools when gathering data through questionnaires. I had collected data by conducting the interview myself with the teachers as their approbation. There was not used any false information in the study.

- When the respondents were providing data, I have assured that their identity would not be disclosed at all.
- In this study, I had provided the recommendations according to the analysis of only the collected data. I always tried to avoid providing my opinion in this study.

- A consent letter was used to get permission for collecting data from the teachers and the students of that school.

- There was no biasness towards this

CHAPTER: FOUR
Data Analysis And Findings

Section: 1 Quantitative Data Analysis

Introduction

This chapter presents the analysis of data collected by the teacher‘s questionnaires and observation check list. The chapter also presents the major findings of quantitative data by analyzing. First of all, What is the Scenario of class Ten Science students in Munshigonj District and the facilities available to deliver ICT subject in secondary school in Munshigonj District have been analyzed and presented. Then it has been analyzed that to what extent teachers are using the available facilities for the effectiveness of teaching learning activities. At last, the challenges that the teachers and school authority are facing for availing and using facilities in conducting ICT classes are presented.

This study was conducted to explore answer to the following research questions:

RQ 1.What is the present Scenario of class Ten Science Students in Munshigonj District?

RQ 2.What are the teaching methods and strategies practiced in the secondary science classrooms at present?

RQ 3.What challenges do science teachers usually face in science classes?

RQ 4. What is the impact of Introducing ICT in Classrooms ?

RQ 5.What challenges do science Teachers face during ICT class?

Data analysis from RQ 1.What is the present Scenario of class Ten Science Students in **Munshigonj** District?

4.1 At a glance science Students of 58 High school of Munshigonj District (Six Upzila)

4.1.1 Munshigonj Sadar

Table : 5 Stream wise Students At a glance (Munshigonj Sadar)

2015					2016			
Total School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
10	392	1154	921	2467	371	982	1207	2560
	15.90 %	46.80 %	37.30 %		14.50 %	38.40 %	47.10 %	

Above data shows (Table: 5) that Science students at grade ten in 2015 were 15.90 % out of students 2467(All Group) , on the contray in the year of 2016, Science students at grade ten are 14.50 % out of students 2560(All Group), That Means Science students Decrease all most 1% in 2016.

Fig: 1- Comparative Science Students At a glance- MUNSHIGONJ sadar-2016

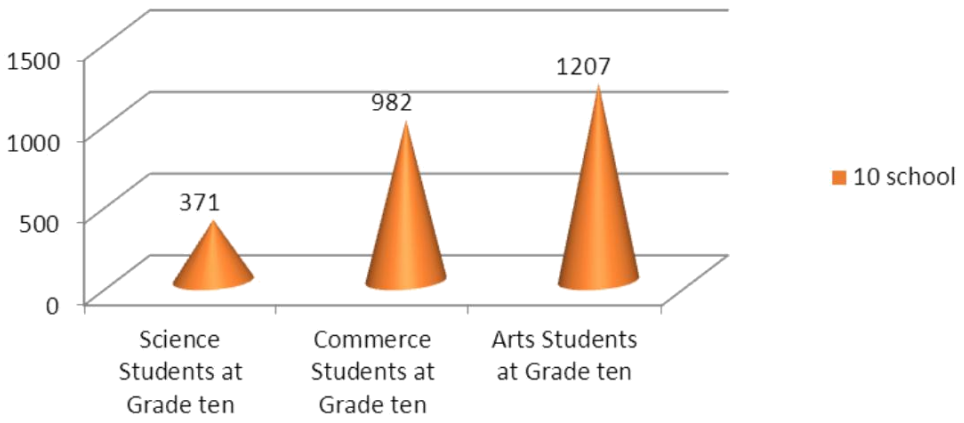
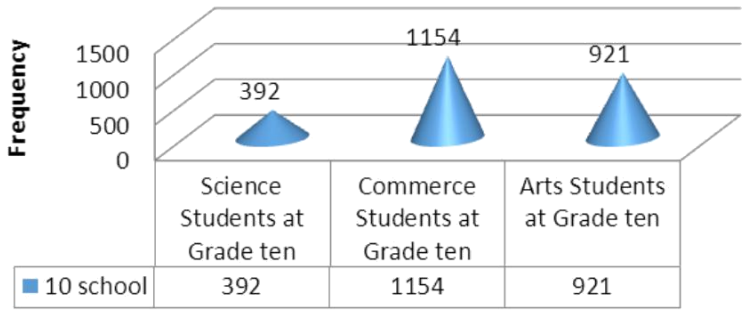


Fig: 2- Comparative Science Students At a glance- MUNSHIGONJ sadar-2015



4.1.2 Tongibari

Table: 6 Stream wise Science Students At a glance (Tongibari)

2015					2016			
Total School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
10	323	868	830	2021	440	963	1053	2456
	16.o %	43 %	41.00 %		18.00 %	39.10 %	42.90 %	

Above data shows (Table: 6) that Science students at grade ten in 2015 were 16.00 % out of students 2021(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 18.00 % out of students 2456 (All Group), That Means Science students Decrease all most 1% in 2016|

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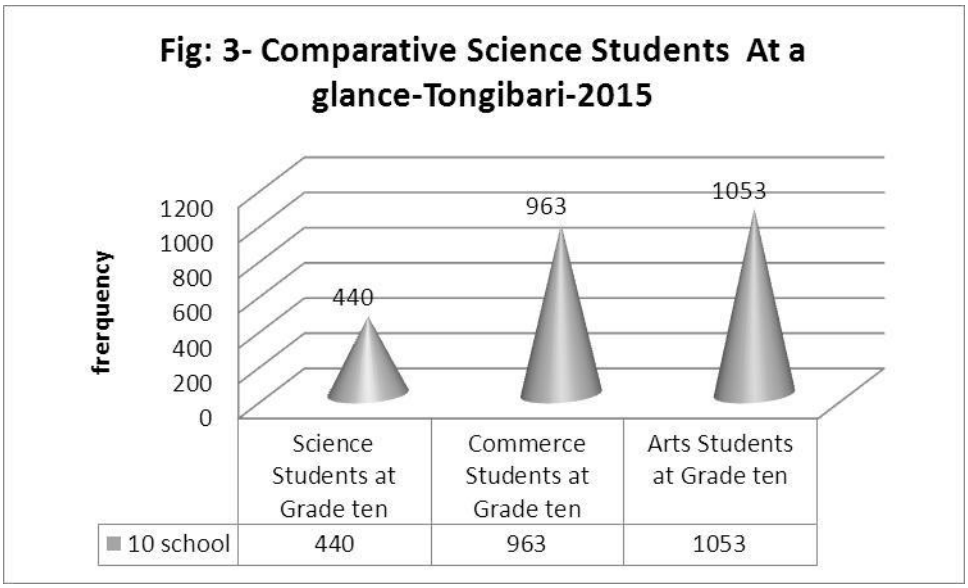
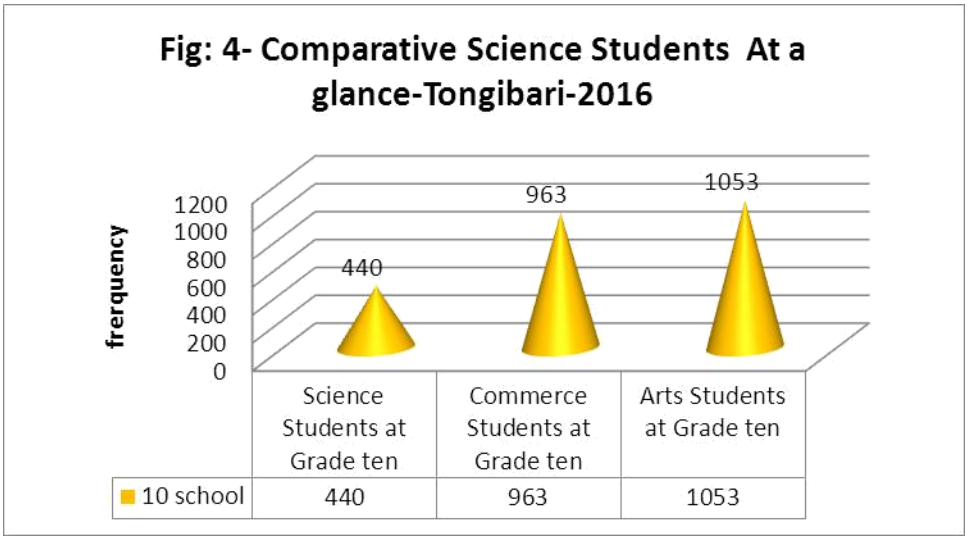


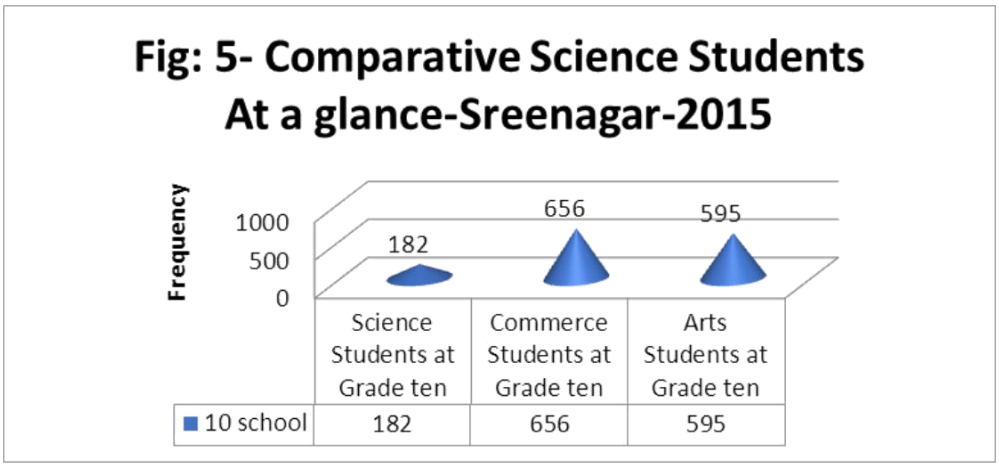


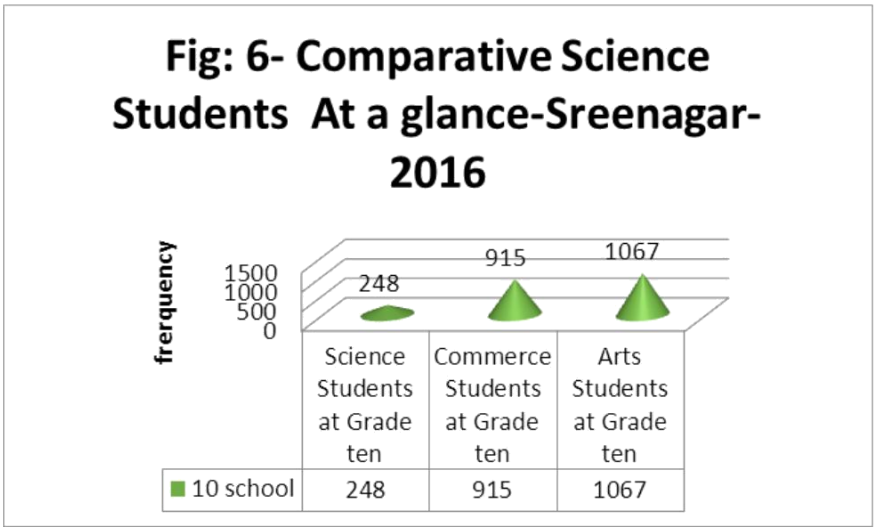
4.1.3 Sreenagar

Table 7: Stream wise Science Students At a glance (Sreenagar)

2015					2016			
Total School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
10	182	656	595	1433	248	915	1067	2230
	12.71 %	45.78 %	41.43 %		11.13 %	41.12 %	47.80 %	

Above data shows (Table: 7) that Science students at grade ten in 2015 were 12.71 % out of students 1433(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 11.13 % out of students 2230 (All Group), That Means Science students Decrease all most 1% in 2016|





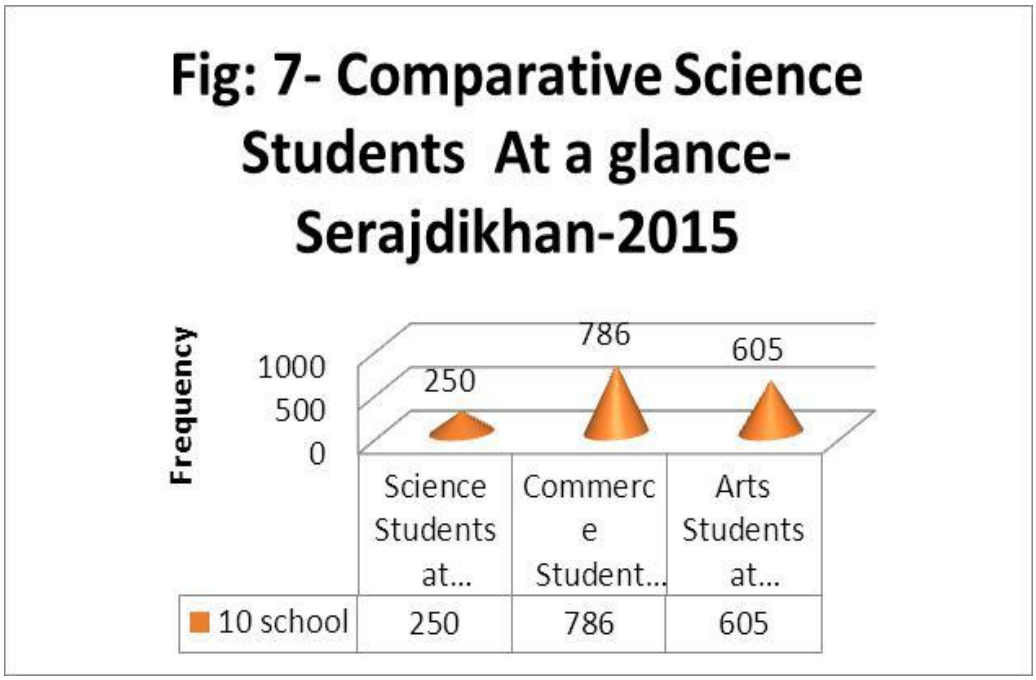
4.1.4 Serajdikhan

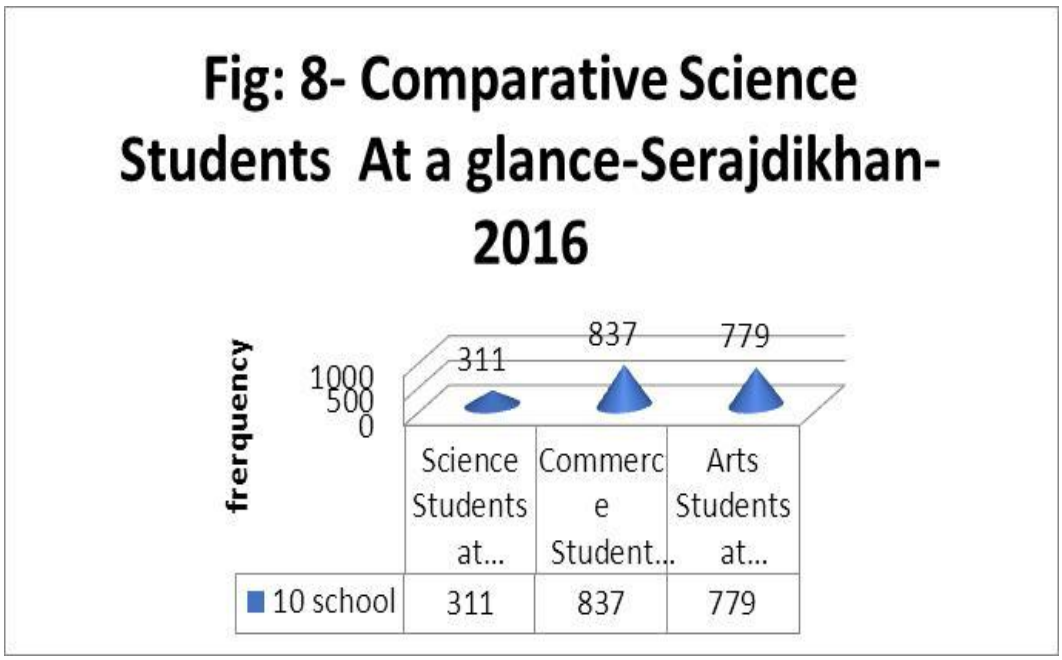
Table: 8 Comparative Science Students At a glance (Serajdikhan)

2015					2016			
Tolal School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
10	250	786	605	1641	311	837	779	1927
	15.24 %	47.90 %	36.87 %		16.14 %	43.44 %	40.43 %	

Above data shows (Table: 8) that Science students at grade ten in 2015 were 15.24 % out of students 1641(All Group) , on the contray in the year of 2016, Now Science

students at grade ten are 16.14 % out of students 1927 (All Group), That Means Science students Increase all most 1% in 2016|



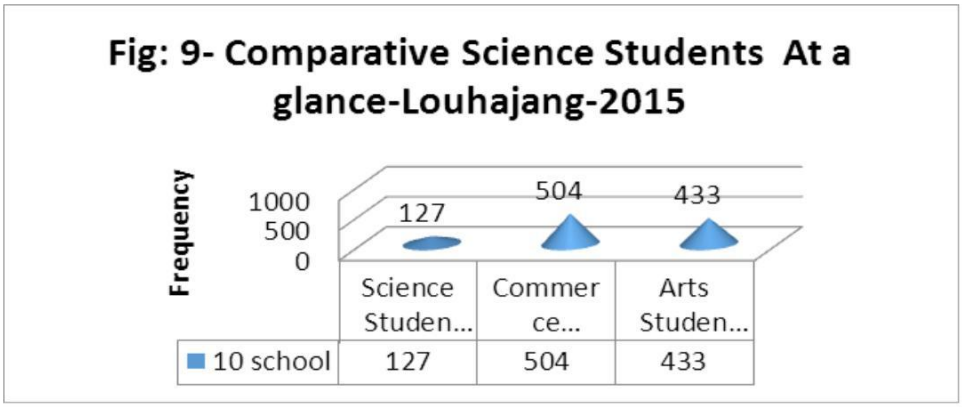


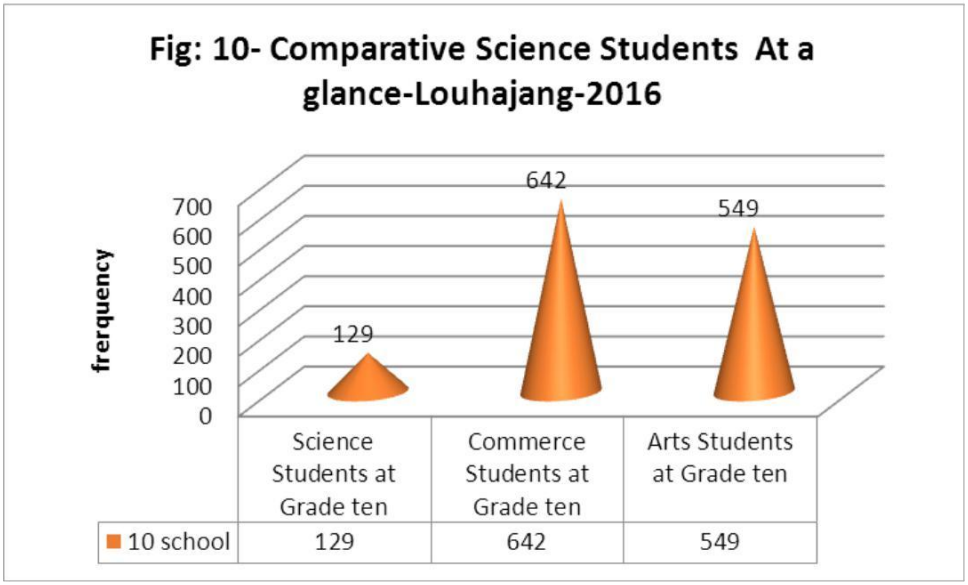
4.1.5 Louhajang

Table: 9 Comparative Science Students At a glance (Louhajang)

2015					2016			
Total School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
10	127	504	433	1064	129	642	549	1320
	12.0 %	47.4 %	40.70 %		9.o %	48 .7%	41.5 %	

Above data shows (Table: 9) that Science students at grade ten in 2015 were 12.00 % out of students 1064(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 9.00 % out of students 1320 (All Group), That Means Science students Decrease all most 3% in 2016|



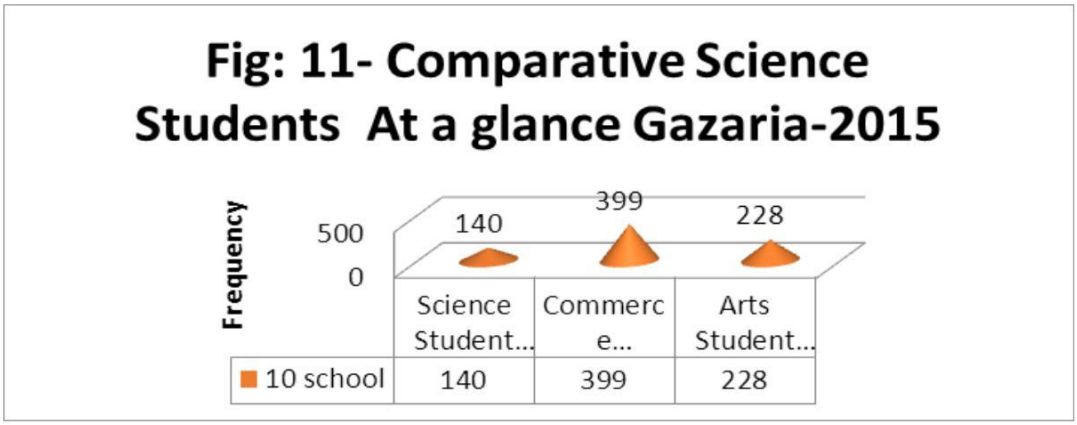


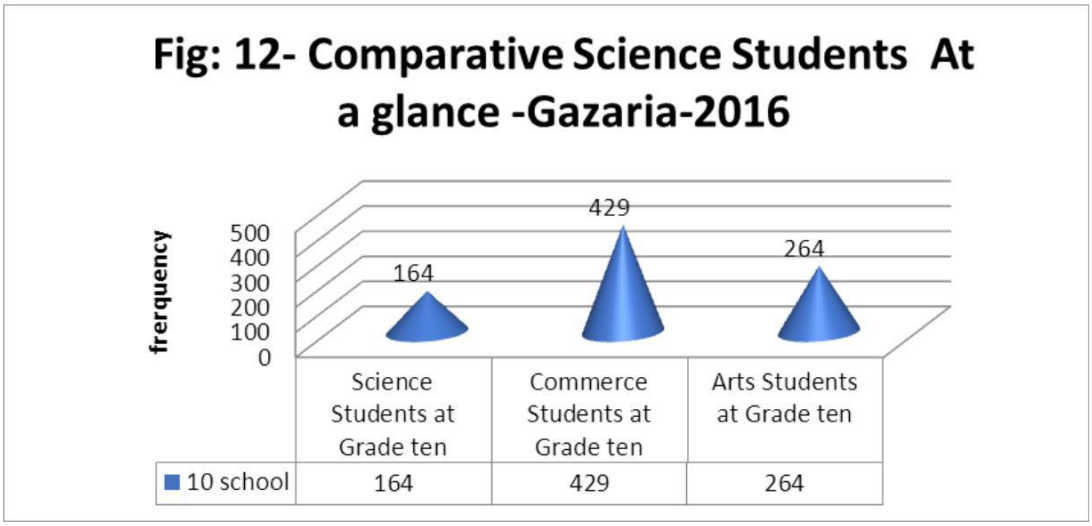
4.1.6 Gazaria

Table: 10 Comparative Science Students At a glance (Gazaria)

2015					2016			
Tolal School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
08	140	399	228	767	164	429	264	857
	18.26 %	52.10	29.80 %		19.14 %	50.10	30.90 %	

Above data shows (Table: 9) that Science students at grade ten in 2015 were 18.26 % out of students 767(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 19.4 % out of students 857 (All Group), That Means Science students Decrease all most 1% in 2016|





Comparative Study in stream wise total students in Munshigonj District

Table : 11 Stream wise total Students At a glance in Munshigonj District (six upzila)

2015					2016			
Total School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total
58	1414	4367	3612		1663	4768	4921	
	16%	46%	38%	9393	15%	42%	43%	11352

Above comparative data shows (**Table: 11**) that Science students at grade ten in 2015 were 16% out of students 9393(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 15 % out of students 11352. (All Group), That Means Science students Decrease all most 1% in 2016.

Findings: 4.1 Munshigonj Sadar, Science students Decrease all most 1% in 2016. Tongibari , Science students Decrease all most 1% in 2016.Sreenagar, Science students Decrease all most 1% in 2016.Serajdikhan, Science students Increase all most 1% in 2016.Louhajag, Science students Decrease all most 3% in 2016.Gazaria, Science students Decrease all most 1% in 2016.

Opinion on probable cause of decreasing the student enrollment in science group at Ten level by the opinion of respondent Science Teachers .

Table: 12 Opinion on cause of decreasing the student enrollment in science group by the respondent Science Teachers (116).

Cause of decreasing Science students	Agree	S.Agree	Undecided	Disagree
1. Curriculum of science comparatively rigid	20%	30%	0%	50%
2. Shortage of competent and skilled science Teachers	10%	70%	0%	20%
3. Inadequacy of teaching and learning	50%	30%	0%	20%

	materials for science students				
4.	Science study is comparatively laborious	60%	30%	0%	10%
5.	Science study is comparatively expensive	50%	30%	0%	20%
6.	Science study is comparatively time consuming	30%	30%	0%	40%
7.	Students compelled to go to private tution to the science teachers	20%	40%	0%	40%
8.	Difficult to get projected marks in practical exam, so phobia to practical exam	40%	30%	0%	30%
9 .	Science study is comparatively expensive	20%	30%	0%	50%
9.	Inadequate scope of joining the suitable job after completion of Education	60%	20%	0%	20%
10.	Employment scope is more for the candidates from other groups rather than science	50%	30%	0%	20%
12.	Lack of suitable lab in school level institutions	40%	30%	0%	30%

Table 12 shows that 30% and 20% participants Strongly Agreed and Agreed that **Curriculum of science comparatively rigid**, 50% Participants Disagreed to the statements. In response to" **Shortage of competent and skilled science Teachers**" there is big differences in data is found, 10% and 70% participants Strongly Agreed and Agreed , 20% Participants Disagreed to the statements. **Inadequacy of teaching and learning materials for science students**, 20% participants Disagreed to the statement. 50% and 30% participants Strongly Agreed and Agreed. Science **study is comparatively laborious**, 60% and 30% participants Strongly Agreed and Agreed , 10% Participants Disagreed to the statements. **Science study is comparatively expensive**, 20% participants Disagreed to the statements.The data shows that 30% and 30% participants Strongly Agreed and Agreed that **Science study is comparatively time consuming**, 40% participants Disagreed to the statement.

In response to "**Students compelled to go to private tution to the science teachers**" there is big difference in data is found, . 40% and 20% participants Strongly Agreed and Agreed, 40% participants Disagreed to the statements.

In response to "**Difficult to get projected marks in practical exam** so phobia to practical exam" there is no big difference in data is found, . 40% and 30% participants Strongly Agreed and Agreed, 30% participants Disagreed to the statements.

Data reflect that 30% and 20% participants Strongly Agreed and Agreed that Science study is **comparatively expensive** , 50% participants Disagreed to the statements.

In response to "**Inadequate scope of joining the suitable job after completion of Education**" there is big difference in data is found, . 50% and 30% participants Strongly Agreed and Agreed, 20% participants Disagreed to the statements.

Lack of suitable lab in school level institutions, 30% participants Disagreed to the statement. 40% and 30% participants Strongly Agreed and Agreed

Findings : 4.2 Science students cause of decreasing from another stream because Shortage of competent and skilled science Teachers. Insufficient trained teacher on the changed syllabus and curriculum. Less scope to get admission in higher education.. Science study is comparatively expensive.. Shortage of competent and skilled science Teachers . Inadequacy of teaching and learning materials for science students. Science study is comparatively laborious.. Science study is comparatively time consuming.

Analysis of Data
TEACHER SURVEY RESULTS

Introduction

The role of teachers in achieving teaching and learning of science and the scientific literacy of students is of significant importance to science education. This Chapter therefore examines the results from the teachers' questionnaires, which were used to gather information regarding teachers' beliefs about the method and quality of science teaching and learning in Secondary schools.

This Chapter is divided into 10 sections. The first section provides **demographic** information about the schools and teachers who participated in the study. The second section describes the teachers' beliefs about **the purpose for teaching science.** Teachers' beliefs about **the characteristics of science teaching and learning** are examined in section three. **Teaching-learning and assessment strategies** are considered in sections five and six. Section seven examines the **resources for science teaching and learning.** Teachers' perceptions about the **factors inhibiting teaching and learning** of science are described in section eight while section nine provides teachers **views about improving teaching and learning** of science. The final section provides a **summary** of the Chapter.

Demographic Data

Munshigonj district comprises 06 upzila. The (06) six upzila involved in this study support a total of 126 Secondary Schools. The entire population of 126 science teachers was surveyed, and of these, 116 completed and returned questionnaires giving an 82% return rate. The distribution of teachers according to school type is presented in Table12.

Table :12
Percentage of teachers from boys, girls and coeducational schools (n=116)

Category	N	Per cent
Boys only	2	2.0
Girls only	14	12.0
Coeducational	100	86.0
Total	116	100.0

Data in Table 12 reveal that the majority of science teachers were from coeducational schools (86%) with 2% each from boys only and girls only schools respectively. The sample of 116 science teachers comprised 100 males (86%) and 16 females (14%). The age distribution of teachers is summarised in Table 13

Table
4:13
Percentage age distribution of teachers (n=116)

Category	N	Per cent
20 years and below	2	2.6
21-30 years	32	27.5
31-40 years	51	43.3
41-50 years	29	25.0
Above 50 years	2	2.6
Total	116	100

Almost 95% of the teachers were aged between 21 and 50 years, and only 5% were either below 21 years or over 50 years.

Finding 4.3

The majority of science teachers in the sample was female from coeducational schools with ages between 21 and 50 years.

The summary of teachers' teaching qualifications is presented in Table 14

Table :14
Percentage of teachers with various science teaching qualifications (n=116)

Category	N	Per cent
B.Sc (Hons.)	10	8.7
B.Sc (Pass)	20	17.4
M.SC	16	14.0
B.SC +B.ED	60	52.2
B.SC+M.Ed	10	8.7
Total	116	100

Note. ***M.ED–Masters of Education; BED-Bachelor of Education; B.SC (PASS)- B.SC Pass course***

The data in Table 14 indicate that almost all of the teachers (69%) had a BSC degrer and Bachelor of education; however, 8.7% were BSc honours in science , (14%) had a MSC degree . The summary of teachers with higher degrees is presented in Table 15

Table :15
Percentage of teachers with higher degrees (n=116)

Category	N	Per cent
None	90	78.0
M. Ed	10	8.0
M. Sc	16	14.0
PhD	0	0
Total	116	100

The majority of teachers had no higher degree in either science or education (90%). Only five teachers had a master degree in education and three had a master degree in science. The major subject areas of science teachers' qualifications are presented in Table 16.

Table :16
Major subject areas of science teachers (n=116)

Category	N	Per cent
Integrated Science	67	58.0
Chemistry	10	8.6
Biology	18	15.5
Physics	12	10.3
Agricultural Science	3	2.5
Mathematics	6	5.1
Total	116	100

Of the 116 science teachers, more than two third majored in integrated science (58%), 15% in biological sciences,10% in chemical sciences and (10%) had a major in physics. Other teachers majored in agricultural science (2.5%) and mathematics (5%). The summary of teachers' years of teaching experience is presented in Table 17

Table :17
Teachers' years of teaching experience (n=116)

Category	N	Per cent
5 years and below	29	37.2
6-10 years	20	25.6
11-15 years	17	21.8
16-20 years	10	12.8
Above 20 years	2	2.6
Total	78	100

Data in Table 17 indicate that nearly two-thirds of teachers (60%) had between 6-20 years of teaching experience. Thirty-seven per cent had less than six years teaching experience and only 3% had been teaching for more than 20 years.

Finding 4.4

All of the teachers in the sample had at least two years of bachelor Degree (B.SC) . Most teachers were trained in B.ED education and had teaching qualifications in integrated science, chemistry sciences and biological sciences. Only a few teachers had master

degrees in education or science. Almost two-thirds of teachers had 6-20 years teaching experience and more than one-third had less than six years of experience.

The sample of schools was drawn from urban and rural areas. Class sizes in urban and rural schools are summarised in Table 18

Table :18
Class sizes in urban and rural schools (n=116)

Class size	Rural	Urban	Total
	9	16	25
31-40	9	6	15
41-50	8	25	33
51-60	9	9	18
61-70	6	3	9
71-80	0	6	6
81-90	5	0	5
91-100	2	2	4
101-110	0	0	0
111-120	1	0	1
Total	49	67	16

The data in Table 18 indicate that the most common class sizes were between 20 and 60 students. Class sizes in rural schools ranged from 20 to 120 students with a modal class of 30 students and a mean of 53.5 students. In rural schools, the class sizes ranged from 20 to 100 students also with a modal class of 30 students and a mean of 45.8 students.

Finding 4.5

Class sizes ranged from 20 to 120 students. The mean class size in both rural and urban schools is almost 50 students per class with a modal class size of 30 students per class.

Infrastructural facilities for Science teaching

Science infrastructure includes furnished laboratory, scientific equipment's apparatus, chemicals, class room, seating arrangement, open space etc., this study selected 58 sample Institutes, schools (58) proportionately according to their population.. Table 4.8 shows the scenario of the laboratories of our institutes.

Table 4.8 Status of science Laboratories in secondary level Institutions

Institutes have:	No of School (58)		
	Rural (32)	Urban (42)	Total
Separate science building	0.0	6.8	
No laboratory	21.6	9.5	14.86%
Headmasters/teachers room used as lab.	13.5	4.1	
1 Lab in main school building	18.9	29.7	
2 Lab in main school building	5.4	6.8	
More than 2 labs in main building	0.0	6.8	
Purchase equipment Regularly	13.5	20.3	
Annual budget for lab	45.9	54.1	
Purchase equipment occasionally	35.1	33.8	
Own fund for purchasing equipment's	25.7	27.0	
Depends on Govt. Grant for equipment's	21.6	21.6	
Proper lab maintaining	28.4	43.2	
Lab bearer	0.0	0.0	
Lab assistant	0.0	0.0	
No Lab. Stock resister	35.1	36.5	

From table 4.8 it is evident that only 6.8% urban schools have separate science building, 21.6% rural, 9.5% urban total 15% high schools , have on laboratory. 17.6% of Schools use Head's room/teachers room as laboratory store. 48.3% urban schools, 15.3% urban have science laboratory. The table also reveals that 71.6% and 26.9% laboratory of school have proper maintenance system. 71.6% and 57.1% laboratories have stock registrar. No school has any post of laboratory bearer or laboratory assistant. 33.8% schools purchase equipment and chemicals regularly.

Table 4.9 shows condition of existing in laboratories as viewed by the researchers in term of its size, number of doors-windows, cupboards-selves sitting arrangement, table, tools, bench, number of chemicals items, number of apparatus and equipment's items, gas, water, electricity supply etc.

Table 4.9 Physical condition inside the existing laboratories

Index	Quantity/quality		
	Sufficient	Insufficient	Not at all
1. Length and width of Laboratory	32.9	42.9	24.3
2. Number of Windows	48.6	32.9	18.6
3. Number of doors (2)	0.0	0.0	0.0
4. Cupboards, Selves and Racks	27.5	30.4	42.0
5. No. of Chemicals Items	22.9	38.6	38.6
6. No. of Apparatus and Equipment's Items	22.9	32.9	44.3
7. Sitting arrangement Tools, Bench	32.8	28.4	38.8
8. Gas supply	12.2	4.9	82.9
9. Water Supply	34.9	28.6	36.5
10. Electricity supply	58.5	30.8	10.8
11. First aid box	28.6	31.7	39.7

Table 4.9 shows 32.9%, 48.6%, 27.5%, 22.9%, 32.8%, 12.2%, and 34.9% secondary level institution's laboratory has sufficient length and width, number of windows, cupboards, selves and racks, chemicals Items, apparatus and equipment's, sitting arrangement, gas, and water supply is sufficient. 58.5% schools have supply of electricity.

Human resources

For imparting Science we need 3 types of manpower. They are the teachers, laboratory assistants and laboratory peons or skilled bearers. In Bangladesh govt. and non govt. public schools has no provision of lab assistant and bearer. There is provision of Teacher only.

4.2 Teachers' Teaching Activities in the Classroom

From the collected data it is found that, in every school (n = 116), teachers' and students were asked to give their opinions regarding teachers' teaching activities in the classroom. Their responses are shown in the Table **. 21**

Table :21 Teachers' Teaching Activities in the Classroom

CT=TEACHERS , ST- STUDENT , CO= CLASS ROOM OBSERVATION

Teaching Activities	Ratings	CT (n=116)		St (n=580)		CO (n=20)	
		No	%	No	%	No	%
Teacher gives lecture	Alway	20	17	100	18	8	40
	Sometimes	80	69	430	73	12	60
	Never	16	14	50	9	-	0.0
Teacher use question answer method	Alway	100	87	500	86	17	85
	Sometimes	16	13	80	14	3	15
	Never	-		-	-	-	0.0
Teacher appreciates while students answer correctly	Alway	116	100	580	100	20	100
	Sometimes	-	-	-	-	-	0.0
	Never	-	-	-		-	0.0
Teacher creates opportunity for group discussion	Alway	100	87	80	14	5	25
	Sometimes	16	13	500	86	10	50
	Never	-	-	-	-	5	25
Teacher gives special attention to weak students	Alway	116	100	450	78	20	100
	Sometimes	-	-	130	22	-	0.0
	Never	-	-	-	-	-	0.0

. Teacher uses chalk board	Alway	100	87	550	94	18	90
	Sometimes	16	13	30	6	2	10
	Never	-	-	-	-	-	0.0
. Teacher maintains class discipline	Alway	116	100	500	86	16	80
	Sometimes	-	-	80	14	4	20
	Never	-	-	-	-	-	0.0
. Teacher tries to make attentive students towards their lesson	Alway	116	100	520	90	4	20
	Sometimes	-	-	50	8	16	80
	Never	-	-	10	2	-	0.0
Teacher uses lesson plan	Alway	**80**	**69**	50	8	-	-
	Sometimes	16	14	10	2	-	-
	Never	20	17	520	90	20	100

From Table 21 it is clear that all categories of respondents stated that, also found in classroom observation, most of the teacher uses question-answer method during classroom teaching and learning.

The teacher and student's opinion also matched with the case of using the lecture method but it did not match with the classroom observation report. While 69% teacher and 73%student claim that the teacher sometimes use lecture method, 40% of classroom observation report declined the fact. According to them most of the time teachers try to maintain class discipline and make students' attention towards their lesson. They also appreciate students while they give correct answer to questions. However, a significant number of respondents also reported that teachers do not give special attention to attract students towards lesson and create opportunity for group discussion which was also found while classroom observation. As a pre-preparation Majority of the teachers told that they use lesson plan while others were

unable to show their lesson plans. The teachers' were asked to show their lesson plan. From their lesson plan it is found that most of them prepare a short lesson plan.

Finding:4.9 most of the teacher uses lecture and question-answer method during classroom teaching and learning. According to them most of the time teachers try to maintain class discipline and make students' attention towards their lesson. They also appreciate students while they give correct answer to questions. , a significant number of respondents also reported that teachers do not give special attention to attract students towards lesson and create opportunity for group discussion. Majority of the teachers don't use lesson plan.

4.2.1 Teachers' Knowledge and Skill

From Classroom observation ,the teachers subject knowledge and skill on a 5-point scale. **Ratings are shown**

Table: 22 Ratings on the Teachers' subject knowledge and skill

Teaching Activities	Ratings	CO (n=25)	
		No	%
1. Teacher's capability of making the student understand	Very Much	14	56.00
	Much	11	44.00
	To some extent	-	-
	Little	-	-
	Very Little	-	-
2. Teachers' capability of answering questions correctly	Very Much	18	72.00
	Much	7	28.00
	To some extent	-	-
	Little	-	-
	Very Little	-	-
3. Teachers' capability of applying the science related teaching methods	Very Much	7	28.00
	Much	18	72.00
	To some extent	-	-
	Litt	-	-
	Very Little	-	-

4. Teachers' capability of motivating the students	Very Much	25	10
	Much	-	-
	To some extent	-	-
	Little	-	-
	Very Little	-	-

The Table 22 indicates that maximum teachers (56%) have the capability of making the student understand the subject .

It is also found most of the teachers (72%) have the capability of answering questions correctly.

While fewer teachers (28%) believe that they can apply science teaching methods perfectly,. However, science teachers motivate the students regarding science learning.

Findings:4.9.1 maximum teachers have the capability of making the student understand the subject. Science teachers motivate the students regarding science learning.

4.2.2 Situation of Teaching Methods and Techniques used in the Classroom

This section analyses the respondents' opinion on teaching learning strategies used by teachers along with effective methods for science teaching.

Table 23 Ratings on the use of teaching learning strategies

Items	Rating								
	Never			**Sometimes**			**Always**		
	CT	St	CO	CT	St	CO	CT	St	CO
Teacher dictates from text books	-	-	-	22.3	3	-	77.7	7	100
. Teacher appreciates student for correct answer	-	-	-	-	-	-	100	100	100
Teacher gives group work	-	10	3	44.5	7	5	55.5	2	2
Students participate in group work	-	-	3	33.4	4	5	66.6	6	2
. .Teacher gives special attention to weak student	-	-	-	-	1	-	100	9	100
Teacher summarizes lesson at the end.	-	-	-	22.3	40	20	77.7	60	80

It reveals from Table 23 that the majority of teachers (77.7%) dictates from the textbooks in comparison to school teachers. It is interesting to note that all the school teachers always appreciate students for their correct responses. But, some teachers (55.5%) always arrange a group discussion as a method of teaching while others (44.5%) do it sometimes. All teachers provide individual help to students and all of them also give attention to weaker students. Most of the teachers (77.7%) also summarize lesson at the end. However, most of these opinions of teachers have been supported by their students and the data of classroom observation. In addition, teachers were asked to name the teaching method used by them in science teaching.

Findings: 4.9.2. The majority of teachers dictates from the textbooks in comparison to school teachers. all the school teachers always appreciate students for their correct responses. But, some teachers always arrange a group discussion as a method of teaching.

Table :24 Use of Teaching Aids by Teachers in the Classroom

Teaching Aids	Ratings %					
	Never		Sometimes		Always	
	CT	St	CT	St	CT	St
Maps/Globes	11.1	40	22.2	20	66.7	40
Charts/pictures	0.0	0.0	11.	60	88.8	40
Scientific apparatus	100	100	0.0	0.0	0.0	0.0
Real objects	0.0	40	11.2	20	88.8	40
Models	0.0	40	33.3	40	66.7	20

It is found from the Table 24 , teacher's opinion that, maps/globes are frequently used. But most of the students (40%) did not support this view. Most of them (40%) opine that, teachers do not use maps/globes at all. The same thing happened in the case of charts/pictures. While the majority (88.8%) of teachers opines that they always use charts/pictures in the class, most of the students (60%) discoursed that their teacher uses charts/pictures occasionally. On the other hand, models and real objects are told to be sometimes used but 40% student declared their view against these opinions. However, scientific apparatus is not used at all. These views have been found true from the classroom observation.

Findings: 4.9.3 teachers do not use maps/globes at all, teacher uses charts/pictures ,model, real object occasionally. scientific apparatus is not used at all.

4.2.3 Situation of Assessment Procedures Used for Science

The teacher and student were asked about formative assessment e.g. whether the teacher assess the student in everyday class or not. All the teachers said that, they assess their students regularly. Class room observation for assessing the students.

Table: 25

Assessment	Class room observation		
	Some time	Most of the time	Rarely
Oral assessment (asking questions)	20%	80%	-
Written assessment (fill in the blanks, answering questions, multiple choice, writing on the chalkboard,	20%	80%	-

drawing)			
Teacher gives homework	20%	80%	-
Teacher arrange group assessment	80%	20%	-

In addition (Table:25) Teachers opinion were taken regarding homework. As their opinion, almost all the teacher gives homework regularly and their views have been supported by most of the (80%) teacher. However, when they were asked about the category of their homework, most of the teachers (80%) claimed that the homework given by them are sometimes creative and sometimes from the book . Most of the time teacher gives homework from the chapter of the book.

Findings:4.9.4 Oral assessment like asking questions and Written assessment like fill in the blanks, answering questions, multiple choice, writing on the chalkboard, drawing used for assessment, almost all the teacher gives homework regularly.

According to RQ3,What challenges do science teachers usually face in science classes?

Table: 26 ***Number of teachers mentioning factors challenges effective teaching***

Limitations factors	N=116			
	S.Agree	Agree	Neutral	Disagree
Resources Insufficient teaching resources including equipment, textbooks, specimens, charts	40%	30%	0%	30%
Lack of well equipped laboratory	60%	10%	0%	30%
Non-conducive classroom environment	40%	10%	0%	50%
Insufficient time for teaching science	40%	10%	0%	50%
Large class size	50%	10%	0%	40%
Heavy class load	70%	10%	0%	20%
Lack of funds for school building and maintenance	30%	10%	0%	60%
Lack of laboratory support staff	60%	10%	0%	30%
Teachers				
Teachers' lack of subject matter knowledge	20%	10%	0%	70%
Inadequate teachers' motivation	15%	10%	0%	75%
Lack of professional development for teachers	20%	10%	0%	70%

Insufficient qualified and dedicated teachers	20%	10%	0%	70%
Curriculum and pedagogy				
Overloaded science curriculum	30%	10%	0%	60%
Poor teaching skills and approaches	20%	10%	0%	70%
Student				
students' attitude to science	60%	10%	0%	30%
Students' poor communication skills	60%	10%	0%	30%

The six most important factors inhibiting effective teaching and learning of science mentioned by the respondents include insufficient teaching and learning resources, lack of well equipped laboratories, Lack of laboratory support staff, non-conducive classroom environment, , heavy class load and large class sizes. Students' poor communication skills were also mentioned as factors that inhibit effective science teaching and learning.

Finding 4.9.5

The teachers indicated that the most important factors inhibiting effective teaching and learning of science in schools include insufficient teaching resources, lack of well equipped laboratories, Students' poor communication skills to science, non-conducive classroom environment, heavy class load and large class sizes.

Quantitative Data Analysis

According to RQ-4 what is the impact of Introducing ICT in Classrooms

Tab : 27 Scince Teacher comments on the benefits of attending class supported by multimedia

Topics	Strongly Agree	Agree	Neutral	Disagree
Learning Become enjoyable and attractive	70%	10%	0%	20%
Learning become easier and realistic	80%	10%	0%	10%

Learning become more practical	70%	20%	0%	10%
Student pay more attention	90%	5%	0%	5%
Tendency develop to attend class regularly	68%	10%	0%	22%
Learning become permanent and lasting	65%	10%	0%	25%
Tendency to memorize reduced	60%	15%	0%	25%
Students participation in classroom activities increased	78%	10%	0%	22%
Can learn new topics	67%	13%	0%	20%
Can know Updated information	50%	10%	0%	40%
Can learn through seeing picture	70%	20%	0%	10%

Tab: 27. Reflect that 70% and 10% Strongly Agreed and Agreed that Learning

Become enjoyable and attractive, only 20% Participants Disagreed that Learning Become enjoyable and attractive,

80% and 10% Strongly Agreed and Agreed that Learning become easier and realistic, but 10% Participants Disagree, 70% and 20% Strongly Agreed and Agreed that Learning become more practical , 10% participants Disagreed, 70% and 20% Strongly Agreed and Agreed that Learning become more practical ,but 10% Disagreed that Learning become more practical. 95% and 5% Strongly Agreed and Agreed that Student pay more attention, only 5% participants Disagreed that Student pay more attention. 68% , 10% and 22% Strongly Agreed , Agreed and Disagreed that Tendency develop to attend class regularly.

In response to Learning become permanent and lasting" 65% , 10% and 25% Strongly Agreed , Agreed and Disagreed

. 60% ,15% and 25% Strongly Agreed , Agreed and Disagreed that Tendency to memorize reduced. 78% and 10% Strongly Agreed, Agreed that Students participation in classroom activities increased but 22% Disagreed. 67% and 13% Strongly Agreed ,and Agreed that Can learn new topics , 20% participants Disagreed. 50% and 10% Strongly Agreed ,and Agreed that Can know Updated information but 40% participants Disagreed. 70% and 20% Strongly Agreed and Agreed that that can learn through seeing picture but 20% Disagreed to the statements.

Findings:4.9.6 The above data reflect secondary level science teachers perception towards introducing ICT tolls in their science class room. The teacher responded positively to the statements. The above data reflects teachers have positive perception towards introducing ICT tools and their perception can guide them towards professional development.

become easier and realistic				
Learning become more practical	65%	10%	0%	25%
Student pay more attention	68%	10%	0%	22%
Tendency develop to attend class regularly	80%	10%	0%	10%
Learning become permanent and lasting	75%	15%	0%	10%
Tendency to memorize reduced	80%	15%	0%	05%
Students participation in classroom activities increased	73%	17%	0%	10%
Can learn new topics	50%	10%	0%	40%
Can know Updated information	75%	10%	0%	15%

Can learn through seeing picture	70%	10%	0%	20%

28 Students perception towards introducing ICT tolls in their science class room

Topics	Strongly Agree	Agree	Neutral	Disagree
Learning Become enjoyable and attractive	80%	10%	0%	10%
Learning	85%	10%	0%	5%

Table : 28 reflect that 80% and 10% Strongly Agreed and Agreed that Learning Become enjoyable and attractive, 85% and 10% Strongly Agreed and Agreed that Learning become easier and realistic.in response to Learning become more practical, there is no big difference is found, 65% and 10% participants Strongly Agreed and Agreed that Learning become more practical, 25% participants Disagreed to the statements. 68% and 10% Strongly Agreed and Agreed that Student pay more attention , 22% participants Disagreed to the statement. in response to" Tendency develop to attend class regularly" 80% and 10% Strongly Agreed and Agreed that Tendency develop to attend class regularly, but 10% participants Disagreed to the statements. 75% , 15% and 10% Strongly Agreed , Agreed and Disagreed that Learning become permanent and lasting., there is difference in data is found.

In response to "Tendency to memorize reduced" there is big difference in data is found , 80% and 15% Strongly Agreed and Agreed that Tendency to memorize reduced, and 5% Disagreed to the statements.

73% and 17% Strongly Agreed and Agreed that Students participation in classroom activities increased.

The data shows 50% and 10% participants Strongly Agreed and Agreed that Can learn new topics, 40% participants Disagreed to the statements, there is no big difference in data is found.

In response to "Can know Updated information" there is big difference in data is found, 75% and 10% participants Strongly Agreed and Agreed that Can know Updated information, 15% participants Disagreed to the statements. 70% and 10% participants Strongly Agreed and Agreed that Can learn through seeing picture.

Findings:4.9.7 The above data reflect secondary level science students perception towards introducing ICT tolls in their science class room. The students responded positively to the statements. The above data reflects students have positive perception towards introducing ICT tools.

According to RQ-5 What challenges do science Teachers face during ICT class?

Table: 29 Opinion of Teacher about challenges in conducting class through multimedia

Topics	Strongly Agree	Agree	Neutral	Disagree
Elecrticity problems / Load shedding	60%	10%	0%	30%
Insufficient space of classroom	80%	10%	0%	10%
Lack of trained teacher	70%	10%	0%	20%
Lack of sufficient multimedia	80%	10%	0%	10%
Lack of speed of internet	60%	10%	0%	30%
Teacher has no personal laptop	80%	10%	0%	10%
Lack of sufficient laptop	70%	10%	0%	20%
Lack of sufficient infrastructure	50%	10%	0%	40%
Shortage of time	50%	10%	0%	40%
Lack of sufficient skill in computer operation	50%	10%	0%	40%
Lack of fund	50%	10%	0%	40%
Disorder of equipment	50%	15%	0%	35%

Table : **29** Ilustrates that 60% and 10% participants Strongly Agreed and Agreed that Electricity problems , 30% Participants Disagreed to the statements.

In response to" Insufficient space of classroom" there is big differences in data is found, 80% and 10% participants Strongly Agreed and Agreed that Insufficient space of classroom , 10% participants Disagreed to the statement. 70% and 10% participants Strongly Agreed and Agreed that Lack of trained teacher, 80% and 10% participants Strongly Agreed and Agreed that Lack of sufficient multimedia, 10% participants Disagreed to the statements.

The data shows that 60% and 10% participants Strongly Agreed and Agreed that Lack of speed of internet, 30% participants Disagreed to the statement.

In response to "Teacher has no personal laptop" there is big difference in data is found, . 80% and 10% participants Strongly Agreed and Agreed that Teacher has no personal laptop , 10% participants Disagreed to the statements.

In response to "Lack of sufficient infrastructure" there is no big difference in data is found, . 50% and 10% participants Strongly Agreed and Agreed that Lack of sufficient infrastructure, 40% participants Disagreed to the statements.

Data reflect that 50% and 10% participants Strongly Agreed and Agreed that Shortage of time , 40% participants Disagreed to the statements.

In response to "Lack of sufficient skill in computer operation" there is no big difference in data is found, . 50% and 10% participants Strongly Agreed and Agreed that Lack of sufficient skill in computer operation, 40% participants Disagreed to the statements.

Data reflect that 50% and 10% participants Strongly Agreed and Agreed that Lack of fund, 40% participants Disagreed to the statements.

The data shows that 50% and 15% participants Strongly Agreed and Agreed that Disorder of equipment, 35% participants Disagreed to the statements.

Findings:4.9.8 Teacher faces various challenges in conducting class through multimedia , challenges are Electricity problems, Insufficient space of classroom, Lack of trained teacher, Lack of sufficient multimedia, Lack of speed of internet, Lack of sufficient infrastructure, Shortage of time , Lack of sufficient skill in computer operation, Lack of fund, Disorder of equipment.

Summary of findings:

Findings: 4.1 Munshigonj Sadar, Science students Decrease all most 1% in 2016. Tongibari , Science students Decrease all most 1% in 2016.Sreenagar, Science students Decrease all most 1% in 2016.Serajdikhan, Science students Increase all most 1% in 2016.Louhajag, Science students Decrease all most 3% in 2016.Gazaria, Science students Decrease all most 1% in 2016.

Findings : 4.2 Science students cause of decreasing from another stream because Shortage of competent and skilled science Teachers. Insufficient trained teacher on the changed syllabus and curriculum. Less scope to get admission in higher education. Science study is comparatively laborious. Science study is comparatively expensive. Science study is comparatively time consuming. Shortage of competent and skilled science Teachers .Inadequacy of teaching and learning materials for science students.Science study is comparatively laborious.Science study is comparatively expensive. Science study is comparatively time consuming.

Finding 4.3

The majority of science teachers in the sample was male from coeducational schools with ages between 21 and 50 years.

Finding 4.4

All of the teachers in the sample had at least two years of bachelor Degree (B.SC) . Most teachers were trained in B.ED education and had teaching qualifications in integrated science, chemistry sciences and biological sciences. Only a few teachers had master degrees in education or science. Almost two-thirds of teachers had 6-20 years teaching experience and more than one-third had less than six years of experience.

Finding 4.5

Class sizes ranged from 20 to 120 students. The mean class size in both rural and urban schools is almost 50 students per class with a modal class size of 30 students per class.

Finding 4.6

Almost a quarter of the teachers believed that the main purpose for teaching science is to improve students' understanding of the environment and their health.

Finding 4.7

The majority of teachers believe that effective science teaching involves hands-on group activity and regular interaction between learners and the teacher made possible by manageable class sizes and adequate facilities and resources.

Finding 4.8

For effective science teaching, a number of conditions were suggested by the teachers including: good mastery of subject matter, relevant skills and approaches, regular engagement in ongoing professional learning and being supported by colleagues, schools principals and local education authorities and also being recognised and being valued by the parents and the broader community.

Finding:4.9 most of the teacher uses lecture and question-answer method during classroom teaching and learning. According to them most of the time teachers try to maintain class discipline and make students' attention towards their lesson. They also appreciate students while they give correct answer to questions. , a significant number of respondents also reported that teachers do not give special attention to attract students towards lesson and create opportunity for group discussion. Majority of the teachers don't use lesson plan.

Finding:4.9 maximum teachers have the capability of making the student understand the subject. Science teachers motivate the students regarding science learning.

Findings: 4.9.2. The majority of teachers dictates from the textbooks in comparison to school teachers. all the school teachers always appreciate students for their correct responses. But, some teachers always arrange a group discussion as a method of teaching.

Findings: 4.9.3 teachers do not use maps/globes at all, teacher uses charts/pictures ,model, real object occasionally. scientific apparatus is not used at all.

Findings:4.9.4 Oral assessment like asking questions and Written assessment like fill in the blanks, answering questions, multiple choice, writing on the chalkboard, drawing used for assessment, almost all the teacher gives homework regularly.

Finding 4.9.5

The teachers indicated that the most important factors inhibiting effective teaching and learning of science in schools include insufficient teaching resources, lack of well equipped laboratories, Students' poor communication skills to science, non-conducive classroom environment, heavy class load and large class sizes.

Findings:4.9.6 secondary level science teachers perception towards introducing ICT tolls in their science class room. The teacher responded positively to the statements. teachers have positive perception towards introducing ICT tools and their perception can guide them towards professional development.

Findings:4.9.7 secondary level science students perception towards introducing ICT tolls in their science class room. The students responded positively to the statements. students have positive perception towards introducing ICT tools.

Findings:4.9.8 Teacher faces various challenges in conducting class through multimedia , challenges are Electricity problems, Insufficient space of classroom, Lack of trained teacher, Lack of sufficient multimedia, Lack of speed of internet, Lack of sufficient infrastructure, Shortage of time , Lack of sufficient skill in computer operation, Lack of fund, Disorder of equipment.

Section: 2 Qualitative Data Analysis and Findings
INTERVIEWS

Introduction

The involvement of all key stakeholders in science education in Munshigonj, in making appropriate recommendations for improving the quality of teaching and learning of science in schools is crucial for reform of science education and for developing scientifically literate citizens.

This section therefore considers the views of the key stakeholders in science and technology education . Science teachers, school head teacher and secondary education officers, participated in the interview. In addition, interviews were also held with a curriculum specialist, subject specialist and ict specialist.

The Chapter is divided into five sections based on the questions used in the focus group meetings and interviews. Section one describes What are the teaching methods and strategies practiced in the secondary science classrooms at present. What challenges do science teachers usually face in science classes are examined in section two and section three describes **suggestions for improving the quality of science teaching and learning**. Section four describes What is the impact of Introducing ICT in Classrooms. Section five What challenges do science Teachers face during ICT class

The last section presents a **summary of the findings** from the focus group meetings and interviews.

Interview participants of the study

By using maximum variation sampling technique (Glaser & Strauss, 1967) fifteen of the participant teachers from same pool of survey respondents were selected and interviewed. In this case, teaching experience, in-service trainings, gender, and subject taught at graduation level were considered. Among the participants four of them were females. The teaching experiences of the participants ranged between two to seventeen years, held Bachelor degree in Education (B.Ed.), have studied separate subjects of Physics and Chemistry along with either Mathematics or Biology at graduating level, received Teaching Quality Improvement training (TQI), Subject Based Cluster training (SBC), Continuing Professional Development (CPD) training, and short term Overseas Training (OT).

B.Ed., Bachelor of Education, TQI, Teaching Quality Improvement; SBC, Subject Based Cluster, CPD, Continuing Professional Development;

Interviews

So that the study would have a national perspective, interviews were conducted with fifteen science teachers. These interviews were conducted between 14th July and 5th August, 2014.

Results

As the participants in the focus group discussions and the interviews were asked the same questions, their responses are considered together. The views of participants across groups have been synthesized into themes which are reported in relation to the questions.

Question : What are the teaching methods and strategies practiced in the secondary science classrooms at present?

Participants' responses about actual science teaching were organised into themes. The themes that emerged were science teaching and learning: method, teaching aids, funding, resources, facilities and class size; curriculum and pedagogy; teacher knowledge, skills, attitude and professional learning; and, community support.

Theme 2.1: Curriculum, pedagogy and teaching learning learning activities

In actual science teaching and learning, theoretical aspects are emphasised and students are engaged in a few hands-on activities thereby making science teacher-centered and too difficult for students. The participants remarked that the science curriculum is overloaded with content, students learn in abstract, the approach is didactic and theoretical, and students do few hands-on practical activities.

"The science curriculum in use in our secondary schools today is overloaded with contents….teacher rarely covers the entire curriculum content for the students before their final examination (CT8, Interview, 24/06/2016)".

"Today, in most of our secondary schools, much emphasis is…..on theory. Students are not practically exposed to the rudiments of science, Occasionally teacher use teaching aids like chart, map and globe. (CT9, Interview,05\08\2016)".

"The teaching of science in our school is a theoretical thing; the practical aspect of it is lacking, most of the time teacher use lecture and question-answer method,
(CT10, Interview, 23/03/04)".

"Students are not practically exposed to the rudiments of science (CT11, Interview, 05/08/2016)".

"…….most of the students cannot actually identify for instance, some of the reagents use in the course of science practical and also cannot identify some of the equipments that are commonly found in science laboratories (CT12, Interview, 28/07/2016)".

Finding 4.16

Science Curriculum content is being overloaded with content, science teaching and learning is didactic and theoretical, and students rarely engage in hands-on practical and activity work. Most of the time teacher use lecture and question-answer method, Occasionally teacher use teaching aids like chart, map and globe,

Theme 2.2: Teacher knowledge , skills, attitude, teaching method, and professional learning

In actual science teaching and learning, schools do not have enough qualified, dedicated and knowledgeable science teachers. Also, science teachers have a limited range of pedagogical skills due to limited opportunities for participation in professional learning activities. The participants explained that most teachers do not have enough background knowledge in the science they teach; do not show enough enthusiasm in science and this has a detrimental effecton students' interest in science.

"Science teachers are not enough in our schools (CT13, Interview, 20/07/2016)".

"Most of the science teachers do not have the knowledge and skills of drawing in biology (CT14, Interview, 24/03/02016)".

"Today, not all the teachers are qualified ……some of those teaching science in our schools do not have enough background knowledge in science subjects in which they are teaching. In some cases, B.SC holders in Biology/Chemistry are teaching Physics aspects of integrated science to students. So, one can not expect much from such a teacher (Secondary education officer , Interview, 24/03/2016)".

"Some of the teachers do not show enough enthusiasm in the teaching of science (Subject specialist , Interview, 25/03/2016)".

"……teachers are not being totally committed to teaching science may be due to poor motivation (Curriculum specialist, Interview, 20/07/2016)".

"Today, a lot of teachers are not so equally dedicated to their profession (Head Teacher, Interview, 24/03/04)".

"……there is generally lack of in-service training in the system. ……many do not know what they need to do any longer because they are not making science lively to the learner

and the learners are becoming very boring (CT 12, Interview, 24/06/04)". "Students …… show no more positive attitude to science in school any longer (CT14, Interview, 05/08/2016)".

Finding 4.17

Schools do not have enough qualified, knowledgeable, skilled and dedicated science teachers. Most of the science teachers do not have the basic knowledge of physics/chemistry or biology aspect of the integrated science they teach. Teachers lack opportunities for professional learning and do not show enough enthusiasm in science, and this affects students' interest in science.

Theme 2.3: Funding, resources, facilities and class size

In actual science teaching and learning, schools lack proper funding for building new classrooms and laboratories, for adequate classroom maintenance and for providing resources and facilities. The participants indicated that the government provides inadequate funds for schools. Schools lack well-equipped laboratories and well-stocked libraries, have insufficient resources including chemicals, reagents, equipment and textbooks, and there is a general lack of maintenance of school facilities. They further remarked that students learn under harsh condition with a noisy environment and without enough seats for students, and that the class sizes are very large thereby making the teaching of science difficult and tedious for the teachers.

"Poverty or lack of funds has made it impossible for secondary schools to run and perform their expected roles (CT1**,** Interview, 14/07/2016)".

"….. secondary school lack well-equipped laboratories and resources (CT2, Interview, 20/07/2016)".

"……..most of the chemicals we have in the laboratories are expired (CT3**,** Interview, 23/03/2016)".

"Our laboratories are nothing to write home on…….. lack of maintenance culture has destroyed all those equipment in the laboratories (CT4, Interview, 14/07/201"

"Majority of student do not have textbooks…….. Most of these schools do not have libraries and where they have one, the textbooks in the libraries are either obsolete or outdated (CT5, Interview, 24/03/2016**)".**

"The class size is so large that the amount of resources for teaching could not meet up with the demand of the large number of students. The class size is such that ……. the number of students to a teacher is about 100 (CT6, Interview, 05/08/2016)".

"Today in most secondary schools in Lagos State, the class size is so large. Teachers find the teaching of science boring due to the large number of students per class (CT7, Interview 25/03/2016)".

"…the learning environment in most of our schools is so bad that students learn under harsh condition ….. which are noisy (CT8, Interview, 24/06/2016)".

Finding 4.15

Schools are not properly funded by the government and lack enough classrooms, well-equipped laboratories, well-stocked libraries and resources including chemicals, reagents, equipment and quality textbooks. There is a general lack of maintenance of the school facilities. The classroom environment is not conducive for learning as they are noisy and there are not enough seats for students. Class sizes are large and teachers find the teaching of science very tedious.

Question 3: What challenges do science teachers usually face in science classes?

Participants' views about the factors inhibiting the teaching and learning of science in Secondary Schools were identified and organised into a similar themes. These included: funding, resources, facilities and class size constraint; curriculum and pedagogy constraints; teachers knowledge, skills, attitude and professional learning constraints; and, community support constraints.

Theme 3.1: Funding, resources, facilities and class size

There is inadequate funding for schools and these have an adverse effect in that there are not sufficient resources for the large number of students. The participants mentioned that science education is poorly funded by government; schools lack enough classrooms, well-equipped laboratories and reagents, libraries, insufficient curriculum resources including textbooks, class sizes are large, and many schools do not have a laboratory assistant.

"Poor funding of science education due to wrong placement of priority by the government is a factor (CT10, Interview, 24/06/2016)".

"……. there are not enough classrooms to accommodate the students for the science (CT17, Interview, 20/07/16)".

"…most of our secondary schools do lack infrastructures like laboratories……there are no equipment, no materials to work with, there are no reagents and chemicals for students….. we do not have enough laboratory staffs like technicians, laboratory assistants and laboratory attendants who would be assisting the science teachers (Head teacher, Interview, 05/08/2016)".

"The schools lack functional libraries and quality science textbooks for teacher and students (CT13, Interview, 24/03/2016)".

"The number of students that offer (study) science this day is very large (CT5 Interview, 25/04/2016)".

Finding 4.18

Most of the schools are poorly funded by government and do not have enough classrooms, and many classrooms do not have enough seats for all the students. They lack well-equipped laboratories with chemicals and reagents and the libraries are without modern quality textbooks. Also, the class sizes are large and most schools do not have laboratory assistants thereby making science teaching difficult and tedious for teachers and so students are less involved in hands-on practical activities. Thus resources limitations impact on the implemented curriculum in ways that limit opportunities for learning

Theme 3.2: Curriculum, pedagogy and learning

Ineffective teaching and assessment strategies have a negative impact on students' interest in science and these factors constitute major hindrances to the quality of science education in schools. The participants emphasised that science the curriculum is overloaded with content; science is taught in abstract; there is insufficient time for science learning and lack of effective assessment and follow-up. They further stated that students lack mathematical background, discipline, interest and communication skills in science because they found the language of instruction in science, that is, English, difficult to comprehend and un-relate to the first language spoken mostly at home.

"Most students do not understand the language of instruction in science (CT15, Interview, 25/03/2016)".

"……students lack mathematical background to do well in science in school. …..Also, most of the students lack communication skills to understand the language of instruction and the

language used by the textbook authors..... There is lack of discipline and interest on the part of the students (CT14, Interview, 23/03/2016)".

"The science curriculum is overloaded with little amount of class time allocated to science teaching in the school timetable to cover the curriculum content (CT10, Interview, 24/03/04)".

"….most of the teaching is in abstract (CT, Interview, 25/03/04)".

"….there is a lack of effective testing and follow-up (CT11, Interview, 28/07/201)

"The interest of the student needs to be considered. …students lack interest in science (CT12, Interview, 23/03/2016)".

"Teachers are overloaded with the number of periods they teach per week. In some cases, science teachers teach about 24 to 30 periods a week while on the other hand they combine science ….. with mathematics teaching which makes the work so overloaded for the teachers (CT14, Interview, 24/03/2016)".

"In our society, a lot of superstitious meanings are attached to the teaching and learning of science in schools (CT15, Interview, 23/03/2016)".

Finding 4.19

The science curriculum is overloaded with content, science is taught in abstract, there is no enough time for science learning in the school timetable and there is no effective assessment and follow-up thereby making science learning teacher-centered and didactic. Also, students are more oriented toward traditional beliefs, and lack mathematical background knowledge, discipline, interest and communication skills because there is a conflict between the language of instruction in science and the first language spoken most of the time at home which limits their learning.

Theme 3.3: Teacher knowledge and skills, attitude, and professional learning

Most schools do not have sufficient human resources and qualified and dedicated science teachers. Also, teachers are not adequately committed to teaching and to support students' learning because they have limited opportunities for participation in professional learning activities and thereby they have limited skills for teaching science. The participants indicated that schools lack enough qualified science teachers, and science teachers' lack in- service training, effective pedagogical knowledge and teaching skills.

"The number of teachers available to teach science subjects in schools is so short compared with the number of students. ……., there are inadequate numbers of science teachers in our secondary schools (CT15, Interview, 24/03/2016)".

"Most of the teachers are not current; they are outdated in the teaching of science. There is lack of in-service training. …… the teachers are not qualified and those that are qualified are not current about the trends in science teaching (CT17, Interview.24/06/2016)".

"…..in science, it is like teachers themselves do not employ appropriate teaching methods.

….teachers ……are lacking in knowledge of how to improvise (CT14, Interview, 05/08/04)".

Finding 4.20

Schools lack enough qualified science teachers with knowledge of effective pedagogy and teaching skills. Also, science teachers lack sufficient opportunities for in-service training to improve their teaching, thereby making them not competent enough to regularly engage their students in practical and activity work.

Summary

This Chapter has looked into the participants' views which include teachers and other key stakeholders in science education about the trends and problems of science and technology education in secondary Education. Specifically, the Chapter has examined the participants' views about the characteristics of an science teaching and learning in schools. Also highlighted in the Chapter are the present situation of science education and the inhibiting factors in Secondary schools. Finally, the Chapter presented the participants' views and suggestions for improving the teaching and learning of science in secondary schools in Munshigonj. The findings summarising the main themes emanating from the participants' arguments and comments are summarised in the tables below.

Theme 1: Funding, resources, facilities and class size

Actual	**Constraints**	**Overcoming constraints**
Schools are not properly funded by the government and lack enough classrooms, well-equipped laboratories, well-stocked libraries and resources including chemicals, reagents, equipment and quality textbooks. There is a general lack of maintenance of the school facilities. The classroom environment is not conducive for learning, characterised with noise and not enough seats for students, large class sizes, and teachers find the teaching of science very difficult and tedious.	Most of the schools are poorly funded by government and do not have enough classrooms, and many classrooms do not have enough seats for all the students. They lack well- equipped laboratories with chemicals and reagents and the libraries are without modern quality textbooks. Also, the class sizes are large and most schools do not have laboratory assistants thereby making science teaching difficult and tedious for teachers and so students are less involved in hands-on practical activities.	There should be more allocation of funds for education by government to build new classrooms and laboratories so that class sizes can be reduced. There should also be sufficient funds to equip the laboratories with chemicals and reagents, for regular maintenance of laboratories and equipment, and to provide quality textbooks for the library.

Theme 2: Curriculum, pedagogy and learning

Actual	Constraints	Overcoming constraints
Science teaching and learning is didactic and theoretical , and students rarely engage in hands-on practical and activity work.	The science curriculum is overloaded with content, science is taught in abstract, there is no enough time for science learning in the school timetable and there is no effective assessment and follow-up thereby making science learning to be teacher-centered and didactic. Also, students are more oriented toward traditional beliefs, and lack mathematical background knowledge, discipline, interest and communication skills because there is a conflict between the language of instruction in science and the first language spoken most of the time at home which limits their learning.	There should be a reduction in the science curriculum content and more time allocated for science per week in the school timetable to provide opportunities for student practical work.

Theme 3: Teachers' knowledge and skills, attitude, and professional learning

Actual	Constraints	Overcoming constraints
Schools do not have enough qualified, knowledgeable, skilled and dedicated science teachers. Teachers lack opportunities for professional learning and do not show enough enthusiasm in science, and this affect students' interest in science.	Schools lack enough qualified science teachers with knowledge of effective pedagogy and teaching skills. Also, science teachers' have not enough opportunities for in-service training to improve their teaching, thereby making them not competent enough to regularly engage their students in practical and activity work.	There should be a regular assessment and a one-year internship in a local secondary school for pre-service science teachers to ensure they are dedicated and competent for teaching. Also, more qualified science teachers should be employed by government in all schools and they should be supported to regularly participate in professional learning activities in science.

Question :Impact to Introducing ICT in Classrooms

Theme: Teacher comments on the benefits of attending class supported by ICT

CT1	I personally deep in my heart with full of interest believe that the use of ICT in today‟ s classrooms is very much important to make the students available to learn of operating in an information age
CT2	I also feel their joys in my heart. I can understand and do realize how a new technology can change a classroom environment rapidly I also feel their joys in my heart. I can understand and do realize how a new technology can change a classroom environment rapidly
CT3	My young learners find new tastes for receiving their necessary lessons in the classrooms and are able to make them understand.
CT4	To expertise the students, the government prove that ICT can enhance the students and teachers quality of teaching and learning in the classroom. Realizing the importance of ICT in education, we want to overthrow all the traditional teaching learning environment from the classrooms of today‟ s society, so that the students can learn to operate in an information age
CT5	My young learners find new tastes for receiving their necessary lessons in the classrooms and are able to make them understand.
CT6	My students look cheerful while showing and presenting the images and video clips related to their day‟ s topic(s).
CT7	When I show and present the fun picture of science and image, the students become very excited. I also feel their joys in my heart. I can understand and do realize how a new technology can change a classroom environment rapidly
CT8	The term „ Information and communication Technology is a thrill to the learners now. A2I project of the Government ICT‟ introduces it in the field of education in Bangladesh and they are providing training on „Making Digital Contents‟ for the teachers of Mathematics, English and General Science.
CT9	In the past days we expressed our thoughts and views through doing acting only. Now we can express our thoughts not only doing acting, but also showing a related video clips or images on the projector.
CT10	I am making the contents carefully also. I am trying my level best to approach and implement my training skills in my classroom
CT11	A2I project of the Government introduces it in the field of education in Bangladesh and they are providing training on „Making Digital Contents‟ for the teachers of Mathematics, English and General

	Science. I have received a training of 14 day course on M.D.C. under ICT, TQI Project, and Ministry of Education with great care.
CT12	The only reason lies behind it-before making digital contents we, the teachers, had to make lesson plans for a traditional classroom and we had to use teaching aids from real life situations or posters or charts and so on. But now we are using the smart teaching aids like OHP, Computer, Laptop, Webcam, Mobile Phones etc.
CT13	I have received a training of 14 day course on M.D.C.under ICT, TQI Project, and Ministry of Education with great care. I am making the contents carefully also. I am trying my level best to approach hand implement my training skills in my class room. Besides, I am trying my classroom to make a smart classroom using new information technology through ICT .
CT14	But now we are using the smart teaching aids like OHP, Computer, Laptop, Webcam, Mobile Phones etc. In the past days we expressed our thoughts and views through doing acting only
CT15	When I show and present the picture of the new words or the idioms and phrases, the students become very excited

Findings: 4.21 A new technology can change a classroom environment rapidly. The use of ICT in today‟ s classrooms is very much important to make the students available to learn of operating in an information age. Now Teacher using the smart teaching aids like OHP, Computer, Laptop, Webcam .learners find new tastes for receiving their necessary lessons in the classrooms and are able to make them understand. Teacher can express their thoughts not only doing acting, but also showing a related video clips or images on the projector.

Question: What challenges do science Teachers face during ICT class?

Teachers stated that, they faced lot of obstacle or hurdle in digitally teaching-learning process. Maximum teachers said that, the main problem of digital teaching-learning process was infrastructure of the school wasn‟ t meet the targeted destination, school has running with insufficient digital equipment, classroom environment wasn‟ t good enough. students look cheerful while showing and presenting the images and video clips related to their day‟ s topic(s).

Theme: Opinion of Teacher about challenges in conducting class through multimedia

CT1	Our school have a school website, but the information wasn‟ t up to date, so that we couldn‟ t take help from school website‟
CT2	Teachers claimed that, interrupted power supply and internet connection hampers digital teaching learning process, "it taken away student‟ s attention‟
CT3	'I have in virus in my laptop provided by the government, I complained it to the authority to check my problem out, but they didn‟ t take any action and I am not expert enough to solve that problem some problems ‟
CT4	while taking class in digitally the sound system was very poor, students making noise in the classroom, so they didn‟ t listen. We complained it to the authority, but they didn‟ t take any attempt to complained it to the authority, but they didn‟ t take any attempt to this problem‟ .solve
CT5	My work time starts at 12 p.m. and end sat 5-15 p.m. I reach home at or around 6-6.15 pm. Reaching home, I can‟ t but deny my personal life. If so, how I can make 5-6 contents daily and when I get time to think of my following day‟ s activity properly.
CT6	Maintaining time is another remarkable barrier for me which obstacles me to going forward. I have to take 5-6 class per day.
CT7	Realizing the Classroom Teaching In a week my total class number is 28. As in science teacher every day I have to take all the science classes from the classesVI-X. Every day I need to make 5-6 digital contents on science items
CT8	Moreover, falling of power supply in our country is now a daily routine. So without both good technical supports in my residence and in the classroom and whole school resources, teachers cannot overcome the barriers preventing them from using ICT.
CT9	Though I have strong confidence and competence, lack of sufficient net connection availability, insuffIcient number of computers every time make me hesitate what should I do.
CT10	I have received only a 14 days training course. Contents, attempts and taste for an effective multimedia classroom require much more training on ICT based education. Only a 14 day course cannot support me to swim in a vast ocean of ICT.
CT11	Technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the internet, printers not printing, malfunctioning computers, and teachers having to work on old computers
CT12	Moreover, falling of power supply in our country is now a daily routine. So without both good technical supports in my residence and in the

	classroom and whole school resources, teachers cannot overcome the barriers preventing them from using ICT.
CT13	As a Science teacher every day I have to take all the Science classes from the classes VI-X. Every day I need to make 5-6 digital contents on Science items. My work time starts at 12 p.m. and end 5-15 p.m. I reach home at or around 6-6.15 pm. Reaching home, I can't but deny my personal life. If so, how I can make 5-6 contents daily and when I get time to think of my following day's activity properly.
CT14	limitations in teachers' ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching make me hesitate what should I do.
CT15	Though I have strong confidence and competence, lack of suffcient net connection availability, insufficient number of computers every time

Findings: , **4.22** interrupted power supply and internet connection hampers digital teaching learning process, "it taken away student's attention. Technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. Maintaining time is another remarkable barrier for teacher which obstacles to going forward, they have to take 5-6 class per day.

Chapter: Five

Discussion of Findings

5.1 Introduction

Here discuss and compare the study result with published findings and to improve science teaching in Bangladesh.

Science students at grade ten in 2015 were 16% out of students 9393(All Group) , on the contray in the year of 2016, Now Science students at grade ten are 15 % out of students 11352. (All Group), That Means Science students Decrease all most 1% in 2016.

Munshigonj Sadar, Science students Decrease all most 1% in 2016. Tongibari , Science students Decrease all most 1% in 2016.Sreenagar, Science students Decrease all most 1% in 2016.Serajdikhan, Science students Increase all most 1% in 2016.Louhajag, Science students Decrease all most 3% in 2016.Gazaria, Science students Decrease all most 1% in 2016 (Table:11, **Findings: 4.1).** This findings are also supported by Banbeis, 2014.

Opinion on cause of decreasing the student enrollment in science group by the respondent Science Teachers.

Science students cause of decreasing from another stream because Shortage of competent and skilled science Teachers. Insufficient trained teacher on the changed syllabus and curriculum. Less scope to get admission in higher education.. Science study is comparatively expensive.. Shortage of competent and skilled science Teachers . Inadequacy of teaching and learning materials for science students. Science study is comparatively laborious.. Science study is comparatively time consuming (Table:12 , findings:4.2). This findings are also supported by Banbeis, 2014.

5.2 Using Lesson Plans

Lesson plans are necessary for effective teaching and better management of large classes (UNESCO, 2006). The curriculum also suggests using lesson plans. Teachers did not use lesson plans (**Finding: 4.9)**, similar to in Sadat's (2001) study. This is also related to teachers' workloads. However, teachers should be encouraged to prepare lesson plans and proper supervision systems should be in place to ensure compliance.

5.3 Reducing Teachers' Workloads

The teachers indicated that the most important factors inhibiting effective teaching and learning of science in schools include insufficient teaching resources, lack of well equipped laboratories, Students' poor communication skills to science, non-conducive classroom environment, heavy class load and large class sizes **(Findings:4.9.5)**

Large workloads were one of the major problems for teachers since it stopped them from preparing and delivering quality science classes. Hossain's (2000) study also identified that teachers' workloads were beyond tolerable levels. School authorities need to consider workloads of science teachers and try to find alternatives such as employing para-teachers or teaching assistants.

5.4 Applying Proper Methods of Teaching

A number of studies, including the present one, have reported that lecture method is most commonly used to teach science. Other interactive teaching methods like group discussion, demonstrations, and learning by doing are not applied for teaching science in practice (ADB, 1998; Hossain, 2000; Sadat, 2001; Huq, 2004; Gomes, 2007 & Orhan, 2009). Teachers reported that short time periods, large syllabi, etc. were the main causes for not practising these methods, similar to Nina (1992), Krishna (1997), & Sadat (2001), who reported that lack of time, unavailability of materials, and lack of laboratory facilities and ingredients were the core reasons for not using demonstration, experimentation, or learning by doing methods. Another alarming result of study was that teachers did not use the inquiry approach at all, similar to Wang & Lin (2009) and Anne & Coll (2010). The inquiry approach is particularly important for science teaching (Joseph, Munro, Prebble & White, 1976). researcher also found that teachers did not involve students in creative activities. Longo (2010) found that the inquiry approach of teaching made students creative. According to Jale, Erdinc & William (2005), using teacher-centric methods such as lecturing or reading from textbooks were characteristic of low-efficacy teachers. Teachers need to be trained properly so that they can use different interactive methods effectively.

Ensuring Student Participation in Teaching-Learning

Students did not participate in teaching-learning and the teachers were not attentive to those learners (**Finding:4.9, Findings: 4.9.2)** who could not achieve a day's competencies. Students were also inattentive to the lesson. Ahsan (2009) also found less participation of students in science classes.

The majority of teachers dictates from the textbooks in comparison to school teachers. all the school teachers always appreciate students for their correct responses. But, some teachers always arrange a group discussion as a method of teaching . teachers do not use maps/globes at all, teacher uses charts/pictures ,model, real object occasionally. scientific apparatus is not used at all(**Findings: 4.9.2, Findings: 4.9.3).** However, teaching aids facilitate student learning by attracting their attention (Adeyanju, 2003). Using teaching aids can ensure student participation and can also help promote higher achievement of the students (Agun, 1986; Agun and Imogie, 1988; Adeanja, 1988; Akanbi, 1988; Akinola; 1988 and Adeyanju, 2003). Although the curriculum suggests that teachers collect teaching aids and then enter science class, teachers did not do so. Teacher should try to collect the proper teaching aids and should also be attentive to all the learners to ensure student participation in the classroom.

5.5 Ensuring Availability of Curriculum and Teachers' Guide

This study identified that the curriculum and teachers' guide were generally unavailable in schools, similar to the results reported by Nina (1992) and Sadat (2001). The lack of the curriculum and teachers' guide appears to be common in Bangladesh, but they are required for better teaching. Hatton (2008) reported on pre-service science teachers who were concerned about the pedagogy of science teaching and they had good command of the curriculum, content, and scientific attitude. Their performance in classrooms was satisfactory. Therefore, steps should be taken to ensure the availability of the science curriculum, teachers' guide, and other necessary materials.

Fostering Effective Classroom Assessment and *Feedback*

Assessment is also an important aspect of the teaching-learning process (Stiggins, 1991).

Oral assessment like asking questions and Written assessment like fill in the blanks, answering questions, multiple choice, writing on the chalkboard, drawing used for assessment, almost all the teacher gives homework regularly (Findings :4.9.4)

Assessing students is a very important part of teaching (Nitko, 1996), and is ideally an integrated process that determines the nature and extent of student learning and achievement (Linn & Gronland, 2005). The curriculum suggests the teachers assess students' knowledge, comprehension, and skills, but it practice only the recall power of students was assessed. Higher-order questions, creative questions, or affective and psycho-motor domain tests were totally absent. MacNeil (2010) and Sternberg (1985) argued that higher-order questioning helped students to learn better. Questioning was also one sided. Students did not ask any questions, but students' questions are important in the assessment and feedback process (Aguiar, Mortimer & Scott, 2010). The teacher should try to ask higher-order questions and at the same time involve students in questioning. Remedial teaching should be practised. Sanalan & Shirley (2009) found that using technology in science classes was helpful for assessment and technology might therefore be useful in science teaching.

secondary level science students perception towards introducing ICT tolls in their science class room. The students responded positively to the statements.

students have positive perception towards introducing ICT tools **(Findings:4.9.7)**.

Integration of ICT in education is significant to reform the traditional teaching-learning system into a modern one. Technology-enriched environment delivers a positive effect on students' performance in all subjects (Look, 2005). As discussed above, GOB has given immense importance on ICT integration in schools in their latest education policy to make students very efficient in technological development as well as increasing economic sufficiency (P: 22, Sl: 10). It is also

described in policy that ICT will help to build a knowledge-based society from where Bangladesh will go forward with her skilled human capital. It will make a considerable impact on economy and development. (National Education Policy, 2010).

ICT offers a robust learning environment which is a transformation of the previous teaching- learning process so that students can deal with knowledge in an active, self-directed and constructive way (De Corte et al., 2003). Most of the teachers and students interviewed for this research also agreed that inclusion of ICT improve the performances of teachers and education became more student-centric. ICT increased the cognitive development of students, enhance creativity, and develop problem-solving skills (Nirgal & Klein, 2004, Drent, 2005, O'Hara, 2008). Previously, it was only a one-sided discussion from the teacher, but now students also participate in the debate and, they try to understand the theme instead of memorizing it. Barak (2004) found almost the same finding in his study, and he said that "The use of ICTs in education would promote deep learning and allows schools to respond better to various needs of students."

Moreover, both students and teachers are becoming more creative and proactive in the classroom. Most of the trained teachers seemed excited about these innovative teaching-learning experiences, and they want some more facilities from institutions and from the government which can help them facilitate all their classes with the support of ICT. Teachers agreed that more interaction between teachers and students encourage students to show up their creative thinking and teachers also get quick feedback from students. In particular, Becta (2003) pointed out that "ICT provide fast and accurate feedback to students, and speed up computations and graphing, thus freeing students to focus on strategies and interpretation. Further use of interactive multimedia software motivates students and leads to improved performance."

Students are more interested now in attending and performing in the classroom activities. It can be easily said, ICT integration encouraging them to study

attentively and to get prepared for the next level of education. In a similar case, Barak (2004) revealed that many of the students finish high School and consider attending college when they are taught routinely by using technology.

Teacher faces various challenges in conducting class through multimedia , challenges are Electricity problems, Insufficient space of classroom, Lack of trained teacher, Lack of sufficient multimedia, Lack of speed of internet, Lack of sufficient infrastructure, Shortage of time , Lack of sufficient skill in computer operation, Lack of fund, Disorder of equipment(**Findings:4.9.8).**

Chapter: Six
Conclusion and Recommendation

6.1 Conclusion:

The study revealed that science teaching in sample schools in Bangladesh was not practised as instructed in the science curriculum. There was a big difference between the prescribed curriculum and what is being practised in the classroom. Learning science is not only learning information and facts, but also acquiring process skills and higher-order thinking. Given the importance of science education, due emphasis should be given to on-time delivery of curriculum materials to teachers, proper training, and curriculum dissemination for teachers. Teachers should be encouraged to plan and prepare before going into class. Optimum learning environments also need to be ensured in schools so that teachers and students can undertake science experiments and activities. Most importantly, the issue of teachers' workloads needs to be taken seriously.

The findings of the study have shown many advantages of introducing ICT approach in the classroom teaching. The respondent teachers found that the students are motivated to learn when they incorporate ICT in the lesson presentation. Students are more eager, more inquisitive and attentive and thus more involved in the classroom activities which are the fundamental for quality learning. Moreover, students are able to retain the knowledge present because the integration of multimedia activate and stimulate the memory process. On the other hand, using ICT in the classes, teachers are also benefited in many ways, such as – presentation of difficult topics in easier way, engaging student in the teaching –learning process which make classroom presentation interesting and effective. This study has affirmed that using technology can promote learning in the classroom, and that student and teachers both have a positive attitude towards ICT and teacher led content development approach.

The study also revealed that students who were taught using Technology education in the classroom developed motivation to excel in the classroom and beyond. Students who are taught using multimedia also develop stronger self-esteem. They took pride in learning through new technology. Multimedia in the classroom encouraged students to work with each other, it helped to develop teamwork skills and peer learning. This kind

of informal peer-to-peer interactions benefits students, building confidence and social skills. ICT brings the world into the classroom and appeals to different learning styles, actively engaging students.

Specific Effects on Students

The study observed that introducing ICT was regarded as one of the big positive change in the education system as well as in the classroom teaching learning process by the students which they welcome with open arms. This approach helped students to be more engaged in the teaching -learning process which makes them active, interested and motivated when it is used. The study also confirmed that selection of better medium are correlated with the better effect on students‟ performance. Student's academic success is shown to be better when multimedia is used than it is with traditional methods of teaching. ICT has helped the students in exercising to solve the creative questions building capacity and enhancing their overall knowledge which has been found in the intervention areas than their peers in the control areas. It has also been found that introducing this approach also lessen the tendency and practice of learning lessons by heart. Getting all these positive reactions about this approach from the students, the study confirms that using „ICT" presentation is one of the important approaches to bring qualitative changes in education initiatives.

Specific Effect on Teachers

The study findings revealed that introducing ICT approach definitely have positive impact on teachers by facilitating his efforts through multimedia and well developed visual presentation. While using this approach creates a sense of confidence, relief and excitement for teachers, then the approach also creates an effect of uncertainty and burden on them. The effect of confidence, relief and excitement developed from their understanding that they can use the same materials again and again using multimedia. The study findings found that this approach also provides opportunities to the teachers to do the experiment with their creativity in new ways that are not only exciting and different to them, but exciting and different to their students. By using different software character analysis becomes more than just words. The study findings revealed that the ICT approach has helped the teachers in divergent ways – it has helped to enhance the teachers‟ capacity and creativity and has helped to avoid repetition,

getting up dated information and knowledge. It also helped them to satisfy the urge of knowledge of students with the help of web portal and help from colleagues. It is words with pictures that create the story of the characters. The study found that MMC also effect teachers to be more students centered. ICT is all about getting students to be actively engaged and involved in the lesson. Teachers used multimedia and ICT presentation which allowed them to become more innovative and organized. To bring the qualitative changes in the classroom teaching -learning efforts, teacher should focus on the student centered activities and multimedia is effective in doing so.

6.2 Recommendation for Science Teaching:

The science teachers may make use of different activity oriented methods in the science class such as inquiry-based teaching integrated with open-ended inquiry based experiments. For this purpose, regular in-service training programs, audio-video materials, seminars, tutorials etc. may be scheduled to train teachers in using modern teaching methodologies along with hand-on lab activities.

The science teacher may assess the students' performance at least once a week. For this purpose, the science teachers may plan quizzes, small oral or written tests such as multiple choice questions, matching item, fill in the blanks, short questions etc.

The education offices may conduct planned as well as surprise inspections to monitor the progress of science education program. For this purpose, a separate science education supervisory staff may be appointed who may monitor monthly assessments of science students, teachers' attendance record, laboratory activities, projects work etc.

There is a need is of proper integration between theory and practical work.

The required practical work may be performed with the related theory topic and must not be done at the end of the course or near annual examination.

- steps should be taken to ensure the availability of the science curriculum, teachers' guide, and other necessary materials.
- teachers should be encouraged to prepare lesson plans and proper supervision systems should be in place to ensure compliance.

- School authorities need to consider workloads of science teachers and try to find alternatives such as employing para-teachers or teaching assistants.
- Teachers need to be trained properly so that they can use different interactive methods effectively.
- Teacher should try to collect the proper teaching aids and should also be attentive to all the learners to ensure student participation in the classroom.
- The teacher should try to ask higher-order questions and at the same time involve students in questioning. Remedial teaching should be practised.

Recommendation for ICT Teaching:

The stakeholders and school authorities need to be provided with adequate facilities and resources for effective implementation of ICT.

effective implementation of ICT in educational institutions of Bangladesh largely depends on teachers and head teachers, who require in-depth professional development due to lack of knowledge and skills.

- Vigilant attention needs to be given to in-service teacher training for both teachers and head teachers and pre-service training for newly appointed teachers before joining the regular classes to acquaint them with the important role of technology in schools settings and to train them on how to prepare and use ICT competently.
- During their teacher training programs teachers need to be given opportunities to practice using technology more practically so that they can see ways in which technology can be used to augment their classroom activities.
- Increasing Number of computer in each school for at least one-to-one usage
- Availability of internet and e-study materials books and exams
- Supply of UPS/IPS until regular supply of electricity is ensured.
- Lowering computer prices to bring it to general people's reach
- make more training program available for teacher
- Recruitment of teachers with high level of training only for computer teaching
- Develop in-house maintenance system

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শিক্ষা ও গবেষণা ইনস্টিটিউট
ঢাকা বিশ্ব বিদ্যালয়
ঢাকা- ১০০০, বাংলাদেশ

Institute of Education and Research
UNIVERSITY OF DHAKA
Dhaka-1000,Bangladesh
Fax:+880-2-9667222
www.du.ac.bd

Date:

To

The Head Master

……..

……

Sub: Seeking Permission for conducting research work

Dear sir/madam

I am pleased to inform you that Md. saidul islam khan ,Rool-146, a phd student of department of science ,mathematics and technology education , Institute of Education and Research , University of Dhaka has been conducting a research on " Trends and problems of Science and Technology Education at the Secondary level of Bangladesh with special reference to Munshigonj district, British Period to till date" to fulfill his partial requirements of Phd degree.

To complete this research work he needs your valuable cooperation and help in collecting data and information from fewer teachers and students of your school. It will be very convenient for him if you provide him with these opportunities of the students for gathering data. I assuring you that collected data will be used only in this study and the participants social identity will be kept secret.

Therefore, I am requesting you to allow the researcher to collect data from your school.

Professor Dr. Md. Abdul Awal Khan

Director

Institute of Education and Research

University of Dhaka

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Institute of Education and Research
University of Dhaka
Dhaka-1000,Bangladesh
Fax:+880-2-9667222
www.du.ac.bd

Date:

To

District Education Office

Munshigonj

Sub: Seeking Permission for conducting research work

Dear sir/madam

I am pleased to inform you that Md saidul islam khan ,Rool-146, a phd student of department of science ,mathematics and technology education , Institute of Education and Research , University of Dhaka has been conducting a research on " Trends and problems of science and technology education at the secondary level of Bangladesh with special reference to Munshigonj district, British Period to till date" to fulfill his partial requirements of Phd degree.

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Professor Dr. Md. Abdul Awal Khan

Director

Institute of Education and Research

University of Dhaka

Appendix -A

Structured question/opinion Schedule for Teacher

Honorable Sir,

These question/opinion schedule has been prepared for the research entitled' Trendes and problems of science and technology education at the secondery school level of Bangladesh. With special reference to Munshigonj District:British to till date

which is a pre-requisite for the partial fulfillment of Ph.D degree of institute of education and research, University of dhaka. All of the questions of this Schedule are related with the study.

Questions provided below, there are blank space in some questions please write your opinion in blank space or put a tick ( ) on alternative answers. If you want you can put tick ( ) s mark in many alternative answers. Please describe your opinion with your valuable experience and vision in open ended questions.

Honorable Teacher, your valuable answer/opinion will only be used for this reasearch. I expect your idenentity will be kept secret. I expect your kind co operation.

Faithfully yours,

MD. Saidul Islam Khan

Ph.D Research, Ier

University of Dhaka

Questionnaire for the Teachers

Thank you very much for participating in this research project entitled "Trends and Problems of Science and Technology Education at Secondary Level of Bangladesh with Special Reference to Munshigonj District: British Period to Till Date.
". This questionnaire requires your information about your perspectives of, and teaching practices for promoting scientific literacy.

The questionnaire is divided into five sections, which ask about:

A. Your general information

B. Information regarding Students

C. Information related to your work load and class size

D. Your views about teaching science and problems

E. Information regarding your science teaching practices

F. Challenges faced in your teaching science

G. Your views about ICT teaching practices

H. Challenges faced in your ICT teaching

Please fill out the questionnaire carefully. Please note that the questionnaire ask for your views and that there are no expected "correct" answers.

A. General information

1. Please Tick one box to mention your sex.

Male	Female

2. Please Tick one box to mention the location of your school.

Urban	Semi-urban	Rural

3. Please fill in the table below for the highest level of education you have completed.

Degree	Year	Major academic field	Institution

4. How many years will you have been teaching altogether by the end of this year?

…… years

5. Please <u>fill in the table below</u> if you participated in any professional development activities in the last 5 years.

Name of the programme	Organisation	Duration (in days)	Comment

6. If you are interested to participate in further activities of this research (e.g. interviews, classroom observation), please <u>give your contact details</u> below.

Name: ……..

School: …

…… Post Office:

…… Police Station: …… District: ..... Phone

number: …… E-mail address: ……...

B. Information regarding Students

Stream wise Students

School Name:
Address:

2015					2016			
School	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total	Science Students at Grade ten	Commerce Students at Grade ten	Arts Students at Grade ten	total

C. Information regarding work load and class size

7. In one week, how many single periods are you formally assigned to teach?

For science subject	For other subjects
…… periods	…… periods

8. On average, how many students are there in each of your grade six to eight science classes?

Boys	Girls

D. Information regarding your views about teaching science

9.

Teachers' Teaching Activities in the Classroom

Please a Tick for each row.

Teaching Activities		
1. Teacher gives lecture	Always	
	Sometimes	
	Never	
2. Teacher use question answer method	Always	
	Sometimes	
	Never	
3. Teacher appreciates while students answer correctly	Always	
	Sometimes	
	Never	
4. Teacher creates opportunity for group discussion	Always	
	Sometimes	
	Never	
5. Teacher gives special alteration to weak students	Always	
	Sometimes	
	Never	
6. Teacher uses chalk board	Always	
	Sometimes	
	Never	
7. Teacher maintains class discipline	Always	
	Sometimes	
	Never	
8. Teacher tries to make attentive students towards their lesson	Always	
	Sometimes	
	Never	

Teaching learning strategies

Please a Tick for each row.

Items	Never	**Sometimes**	**Always**
Teacher dictates from text books			
Teacher appreciates student for correct response			
Teacher gives group work			
Students participate in group work			
Teacher gives special attention to weak students			
Teacher summarizes lesson at the end			

Use of Teaching Aids by Teacher in the Classroom

Please of Tick for each row.

Teaching Aids	Never	Sometimes	Always
Maps/Globes			
Charts/pictures			
Scientific apparatus			
Real objects			
Models			

Science Activities

Subject	Always	Frequently	sometimes	never
science fair				
Science Club				
Science seminar				
Debating				
Field trip				
Science magazine				

E. Challenges encountered in teaching

14. Are there any aspects of scientific literacy in which you feel less confident to teach?

Please write in your words.

15. Do you find any challenge in your teaching science?

Please a Tick for each row.

Subject	Strongly agree	Agree	Undecideed	Disagree
Class load				
Large class size				
Lack of scope in the curriculum				
School assessment system does not support				
Lack of laboratory facilities				
Lack of resources				

17. How do you overcome those challenges?

Please, write in your words.

18. Opinion on cause of decreasing the student enrollment in science group by the respondent Science Teachers (116).

Please a Tick for each row.

Cause of decreasing Science students	Agree	S.Agree	Undecided	Disagree
1. Curriculum of science comparatively rigid				
2. Shortage of competent and skilled science Teachers				
3. Inadequacy of teaching and learning materials for science students				
4. Science study is comparatively laborious				
5. Science study is comparatively expensive				
6. Science study is comparatively time consuming				
7. Students compelled to go to private tution to the science teachers				
8. Difficult to get projected marks in practical exam, so phobia to practical exam				
9 .Science study is comparatively expensive				
9. Inadequate scope of joining the suitable job after completion of Education				
10. Employment scope is more for the candidates from other groups rather than science				
12.Lack of suitable lab in school level institutions				

F. Your views about ICT teaching practices

Teacher facilities

Please a Tick for each row.

Source	Yes	no
Computer		
Laptop		
Internet Connection		
Power Supply Advantage		

Teacher perception on multimedia system (Multiple response)

Please a Tick for each row.

Topics	Strongly Agree	Agree	Neutral	Disagree
Increase in interest, attentation and learning				
Lesson easily understood an effect of visualisation				
Teacher and students remain active				
Lesson become attractive and joyful				
Increase attendance of students				
Students are introduced to modern teaching – learning method				
through internet				
Connecting other through Email				
Installing Software				
Using Face book				
Digital content presentation through Multimedia				

Scince Teacher comments on the benefits of attending class supported by multimedia

Please a Tick for each row.

Topics	Strongly Agree	Agree	Neutral	Disagree
Learning Become enjoyable and attractive				
Learning become easier and realistic				

Learning become more practical				
Student pay more attention				
Tendency develop to attend class regularly				
Learning become permanent and lasting				
Tendency to memorize reduced				
Students participation in classroom activities increased				
Can learn new topics				
Can know Updated information				
Can learn through seeing picture				

G. Challenges faced in your ICT teaching

Opinion of Teacher about challenges in conducting class through multimedia (Multiple response)

Please a Tick for each row.

Topics	Strongly Agree	Agree	Neutral	Disagree
Elecrticity problems / Load shedding				
Insufficient space of classroom				
Lack of trained teacher				
Lack of sufficient multimedia				
Lack of speed of internet				
Teacher has no personal laptop				
Lack of sufficient laptop				
Lack of sufficient infrastructure				
Shortage of time				
Lack of sufficient skill in computer operation				
Lack of fund				
Disorder of equipment				

Appendix: B

Interview Guideline for
Teachers
Secondary School

Interview guide

Interview Schedule for science teachers

Demographic and Background information

Take note of the following

Date:_____
Sex:_____
Place:_____
Interviewee's name:_____
Teaching experience:_____
Subject taught:_____
In-service training:_____

Section A

My Name is saidul Islam Khan, I am a PhD student of IER ,University of Dhaka. The title of my research is: Trends and Problems of Science and Technology Education at Secondary Level of Bangladesh with Special Reference to Munshigonj District: British Period to Till Date.

The purpose of the study is to illustrate the science teachers' beliefs on teaching and learning and their actual practices in Bangladesh**.**

All information gathered through this interview will be used exclusively for the purpose of research and anonymity of respondents will firmly be ensured. You are guaranteed that neither you, this school nor any of its personnel will be identified in any report of the results of the study.

Section:B
Interview (Science related):

Section B

1 In which approach or strategy do you think that science should be taught?

2. Could you describe what an ideal science teaching environment would look like?

3. What do you think teachers should do for effective learning?

4. What are the best ways to learn science? Explain your ideas.

5. What do you think about responsibilities of student when learning science?

6. What should teacher focus on teaching "presenting facts (definition, theory, process, concepts, etc.) or students' individual development of thinking and reasoning"? Please explain your idea/s with reasoning.

Interview (ICT related):

1.What is the impact on teaching standards of ICT use?
2.What is the impact on learning standards of ICT use?
3.What is your opinion on digital literacy?

2. Say something on the method and technique generally you follow in giving lesson in the classroom?

3. What tools do you use in giving lesson following that method?

4. Have you got any opportunity to observe/learn about conducting multimedia classroom? If yes, how?

5. How far it is important to conduct classes using multimedia?

6. How students can be benefitted through the use of multimedia in the teaching system?

7. Is there any difference in the traditional teaching system and teaching using multimedia? If yes, what are the differences?

8. What are the challenges in conducting classes using multimedia and what are the ways to overcome, in your opinion?

9.In which type of lessons you use ICT usually?

- How many times in day/weeks?

10.Are there any chances for students to use technologies in classroom?

- For what they use the technologies?
- How you guide them on using ICT in classroom?

11.Have you found any differences before and after starting ICT in classroom?

- Is there any effect of using ICT in classroom? If yes what are they?

12.Does the ICT help students to understand the topic easily? How did it happen?

13.Have you faced any challenge on integrating ICT in your teaching? If yes, what are those?

14.Do you have any recommendation on ensuring ICT in schools to government?

15.How can ICT play more effective role in secondary education of Bangladesh? what is your opinion?

Thank You Very Much for Your Nice Cooperation

Name of the Interviewer: Mobile No. of the Interviewer: Signature of the Interviewer:

Appendix :C

Trends and Problems of Science and Technology Education at Secondary Level of Bangladesh with Special Reference to Munshigonj District: British Period to Till Date

(প্রতিষ্ঠানসমূহের ল্যাবরেটরি পরিদর্শন চেক লিস্ট)

১। বিদ্যালয়ে ল্যাবরেটরি আছে কি ? ☐ হ্যাঁ ☐ না

মোট কতটি ল্যাব .....টি। বিষয় ভিত্তিক ল্যাবরেটরি .....টি। সমন্বিত ল্যাবরেটরি .....টি।

২। ল্যাবরেটরির ভৌত অবকাঠামো :

সূচক	সংখ্যা (Quantity)/গুণগতমান (Quality)			অতিরিক্ত মন্তব্য
	অপর্যাপ্ত	মোটামুটি	পর্যাপ্ত	
প্রশস্ততা				
দরজা/জানালার সংখ্যা				
আলমারি/র‍্যাকের সংখ্যা				
রসায়নিক দ্রব্যের সংখ্যা				
বৈজ্ঞানিক যন্ত্রপাতির সংখ্যা				
চেয়ার/ টেবিল/ টুল				
গ্যাস সরবরাহ ব্যবস্থা				
পানি সরবরাহ ব্যবস্থা				
বিদ্যুৎ সরবরাহ				
স্টক রেজিস্টার				
ফাস্ট এইড বক্স				

৩। উপকরণ যন্ত্রপাতি কেনার / সংগ্রহের ব্যবস্থা : ☐ নিয়মিত ☐ অনিয়মিত

৪। বিজ্ঞানের সরঞ্জাম কেনার তহবিল : ☐ স্কুলের নিজস্ব ☐ সরকারি অনুদান থেকে প্রাপ্ত ☐ ব্যক্তিগত দান

৫। বিজ্ঞানের সরঞ্জাম ক্রয় ও সংরক্ষণের জন্য বার্ষিক বাজেট : ☐ আছে ☐ নাই

৬। সংগ্রহ/ ক্রয় পদ্ধতি : ☐ প্রজেক্টের মাধ্যমে প্রাপ্ত ☐ টেন্ডারের মাধ্যমে ক্রয় ☐ টেন্ডার ছাড়া প্রয়োজন অনুযায়ী ক্রয়

৭। ল্যাবরেটরি সংরক্ষণ ব্যবস্থা : ☐ আছে ☐ না

৮। ল্যাব বেয়ারার ..... জন। ☐ পদ নাই ল্যাব অ্যাসিস্টেন্ট ..... জন। ☐ পদ নাই

৯। ল্যাবরেটরি বা বিজ্ঞান ভবনটি ☐ ১ কক্ষ ☐ ২ কক্ষ ☐ ৩ কক্ষ বিশিষ্ট আলাদা বিল্ডিং।

☐ আলাদা কোন ল্যাবরেটরি নাই ☐ প্রধান শিক্ষকের কক্ষ/ শিক্ষকের বসার কক্ষটি ল্যাবরেটরি হিসাবে ব্যবহৃত হয়।

প্রতিষ্ঠানের প্রধানের স্বাক্ষর পরিদর্শকের স্বাক্ষর

Semi-structured Observation Checklist (inside classroom)

Date…….

Time……

Name of school…….

Duration of class……..……..

Shift: single /double

Gender(teacher): male/female

Teacher's educational qualification: BSC/ BSC Hons/Master/others

Training: trained /untrained

Number of pupils…….

Boys…….Girls…….

Observation inside classroom

Teachers' subject knowledge and skill
Classroom Observation

Teaching Activities	Very Much	Much	To some extent	Little	Very Little
Teacher's capability of making the student understand					
. Teachers' capability of answering questions correctly					
Teacher capability of applying the science related teaching method					
Teachers' capability of motivating the students					

Teachers'quality: subject based knowledge/ prepared lesson plan / subject based training/ teachers' presenceat school in time / teaching experienced / teachers' motivational knowledge/others

Teachers'quality	**Observed**	**Remark**s
subject based knowledge		
prepared lesson plan		
subject based training		
teachers' presence at school in time		
Teaching experienced		
teachers' motivational knowledge/others		

Teaching style: lectureor ,demonstration method/ participatory method/ child-centric method/ group work/ others

Teaching style	**Observed**	**Remarks**
Lecture method		
Demonstration method		
Participatory method		
Group work method		
Learning by Doing Method		
Use of Inquiry Approach		

Teaching aids: multi-media/ text books/ chalk /black board / duster/others

Teaching aids	**Observed**	**Remarks**
multi-media		
text books		
chalk		
black board		
/ duster		
others		

Classroom assessment: summative assessment / formative assessment / recallquestion / rote based assessment / class tests/ home assignment

Classroom assessment	**Observed**	**Remarks**
summative assessment		
formative assessment		
Recall question		
rote based assessment		
class tests		
home assignment		
Quizz		

Class room Observation (Check list)
Name of school:
Class:
Total students:
Duration:
Observer
Date……. Time

Teaching Activities			
1. Teacher gives lecture	Alway		
	Sometimes		
	Never		
2. Teacher use question answer method	Alway		
	Sometimes		
	Never		
3. Teacher appreciates while students answer correctly	Alway		
	Sometimes		
	Never		
4. Teacher creates opportunity for group discussion	Alway		
	Sometimes		
	Never		
5. Teacher gives special alteration to weak students	Alway		
	Sometimes		
	Never		

Teachers' Teaching Activities in the Classroom

Classroom observation

Teaching Activities	Ratings	observed	
1. Teacher gives lecture	**Always**		
	Sometimes		
	Never		
2. Teacher use question answer method	**Always**		
	Sometimes		
	Never		
3. Teacher appreciates while students answer correctly	**Always**		
	Sometimes		
	Never		
4. Teacher creates opportunity for group discussion	**Always**		
	Sometimes		
	Never		
5. Teacher gives special alteration to weak students	**Always**		
	Sometimes		
	Never		
6. Teacher uses chalk board	**Always**		
	Sometimes		
	Never		
7. Teacher maintains class discipline	**Always**		
	Sometimes		
	Never		
8. Teacher tries to make attentive students towards their lesson	**Always**		
	Sometimes		
	Never		

Assessment

Assessment	Class room observation		
	Some time	Most of the time	Rarely
Oral assessment (asking questions)			-
Written assessment (fill in the blanks, answering questions, multiple choice, writing on the chalkboard, drawing)			-
Teacher gives homework			-
Teacher arrange group assessment			-

মুন্সিগঞ্জ জেলার মাধ্যমিক বিদ্যালয় সম্পর্কিত তথ্য

মুন্সিগঞ্জ সদর উপজেলা

ক্রঃ নং বিদ্যালয়ের নাম	**স্থাপন কাল**
১. বজ্রযোগিনী জে. কে. উচ্চ বিদ্যালয়	১৮৮৩
২. মুন্সিগঞ্জ উচ্চ বিদ্যালয়	১৮৮৫
৩. এ. ভি. জে. এম. সরকারী উচ্চ বালিকা বিদ্যালয়	১৮৯২
৪. বিনোদপুর রামকুমার উচ্চ বিদ্যালয়	১৯১৯
৫. রামপাল এন. বি. এম. উচ্চ বিদ্যালয়	১৯৩৩
৬. কে. কে. গভঃ ইনস্টিটিউশন	১৯৪২
৭. মাকাহাটি জি. সি. উচ্চ বিদ্যালয়	১৯৫৫
৮. রিকাবীবাজার উচ্চ বালিকা বিদ্যালয়	১৯৬১
৯. বানিয়াল উচ্চ বিদ্যালয়	১৯৬৪
১০. মুন্সিগঞ্জ উচ্চ বালিকা বিদ্যালয়	১৯৬৮
১১. ইদ্রাকপুর উচ্চ বিদ্যালয়	১৯৭০
১২. রিকাবীবাজার উচ্চ বিদ্যালয়	১৯৭০
১৩. চম্পাতলা উচ্চ বিদ্যালয়	১৯৭০
১৪. রনছ রুহিতপুর উচ্চ বিদ্যালয়	১৯৭২
১৫. বছিরন নেছা উচ্চ বিদ্যালয়	১৯৭২
১৬. মহাকালী ইউনিয়ন উচ্চ বিদ্যালয়	১৯৭৪
১৭. মিরকাদীম হাজী আমজাদ আলী উচ্চ মাধ্যমিক বি.	১৯৭৭
১৮. ফুলতলা মোহাম্মদীয়া উচ্চ বিদ্যালয়	১৯৮০
১৯. বকুলতলা এইচ. এ. খালেক উচ্চ বিদ্যালয়	১৯৮৩
২০. পঞ্চসার ইউনিয়ন উচ্চ বালিকা বিদ্যালয়	১৯৮৮
২১. শহীদ জিয়াউর রহমান উচ্চ বিদ্যালয়	১৯৯৪
২২. শীলই হাজী মনিরউদ্দিন জুনিয়র বিদ্যালয়	১৯৯৫
২৩. রাষ্ট্রপতি ডঃ প্রফেসর ইয়াজউদ্দিন রেসিডেন শিয়াল মডেল স্কুল এন্ড কলেজ	=
২৪. সৈয়দপুর নিম্ন মাধ্যমিক বিদ্যালয়	=
২৫. মুন্সীগঞ্জ পৌর জুনিয়র বালিকা বিদ্যালয়	=
২৬ সুখবাসপুর শ্যামনলিনী উচ্চ বিদ্যালয়	

উপজেলা- শ্রীনগর

ক্রঃ নং বিদ্যালয়ের নাম	**স্থাপন কাল**
১. রুসদী উচ্চ বিদ্যালয়	১৯২০
২. ষোলঘর একেএসকে উচ্চ বিদ্যালয়	১৯২৪
৩. হাঁসাড়া কালী কিশোর উচ্চ বিদ্যালয়	১৮৭৯
৪. বাড়ৈখালী উচ্চ বিদ্যালয়	
৫. ভাগ্যকূল হরেন্দ্রলাল উচ্চ বিদ্যালয়	১৯০০
৬. বাঘড়া স্বরূপচন্দ্র পাইলট উচ্চ বিদ্যালয়	১৯২০
৭. সমষপুর উচ্চ বিদ্যালয়	১৯৪২
৮. মজিদপুর দয়াহাটা কে. সি ইনস্টিটিউট	১৯৪৪
৯. কোলাপাড়া উচ্চ বিদ্যালয়	১৯৫৭
১০. রাঢ়ীখাল স্যার জেসি বোস ইনস্টিটিউট	১৯৬৬
১১. শ্রীনগর সরকারী সুফিয়া এ. হাই খান উচ্চ বালিকা বিঃ	১৯৬৭
১২. মদনখালী উচ্চ বিদ্যালয়	১৯৬৭

১৩. বেলতলী জি জে উচ্চ বিদ্যালয়	১৯০০
১৪. কুকুটিয়া কে. কে ইনস্টিটিউশন	১৯০১
১৫. হোসেন আলী উচ্চ বিদ্যালয়	১৯৭৩
১৬. শিবরামপুর উচ্চ বিদ্যালয়	১৯৭৫
১৭. হোগলাগাঁও আবুল হাসেম উচ্চ বিদ্যালয়	১৯৭৭
১৮. কামারগাঁও আইডিয়াল উচ্চ বালিকা বিদ্যালয়	১৯৯৩
১৯. শ্রীনগর পাইলট উচ্চ বিদ্যালয়	১৯৭৯
২০. আলহাজ্ব কাজী ফজলুল হক জুনিয়র বিদ্যালয়	১৯৮৫
২১. খোদাইবাড়ী নুরজাহান খান বালিকা উচ্চ বিদ্যালয়	১৯৮৬
২২. ফাতেমা আরশেদ আলী উচ্চ বিদ্যালয়	১৯৮৭
২৩. বাড়ৈগাঁও নিম্ন মাধ্যমিক বিদ্যালয়	=

টঙ্গীবাড়ী উপজেলা

ক্রঃ নং বিদ্যালয়ের নাম	**স্থাপন কাল**
১. সোনারং পাইলট উচ্চ বিদ্যালয়	১৯০০
২. আউটশাহী রাধানাথ উচ্চ বিদ্যালয়	১৯০১
৩. বানারী উচ্চ বিদ্যালয়	১৯০১
৪. দিঘিরপাড় কে. সি ইনস্টিটিউশন	১৯০২
৫. পাইকপাড়া ইউনিয়ন উচ্চ বিদ্যালয়	১৯০৪
৬. ব্রাহ্মণ ভিটা ইউনিয়ন উচ্চ বিদ্যালয়	১৯১৩
৭. আড়িয়াল স্বর্ণময়ী উচ্চ বিদ্যালয়	১৯১৪
৮. পুরা ডি, সি উচ্চ বিদ্যালয়	১৯৩৩
৯. টঙ্গীবাড়ী পাইলট উচ্চ বালিকা বিদ্যালয়	১৯৬১
১০. বালিগাঁও উচ্চ বিদ্যালয়	১৯৭১
১১. চাঠাতিপাড়া শেখ কাবেল আদর্শ উচ্চ বিদ্যালয়	১৯৯৪
১২. আব্দুল গনি আ. করিম উচ্চ বিদ্যালয়	১৯৯৪
১৩. পাঁচগাঁও ওয়াহেদ আলী দেওয়ান উচ্চ বিদ্যালয়	১৯৯৫
১৪. রংমেহের উচ্চ বিদ্যালয়	১৯৯৫
১৫. স্বর্ণগ্রাম আর. এন উচ্চ বিদ্যালয়	১৮৯৮
১৬. আবদুল্লাহপুর উচ্চ বিদ্যালয়	১৯০০
১৭. বেতকা ইউনিয়ন উচ্চ বিদ্যালয়	২০০০

সিরাজদিখান উপজেলা : মাধ্যমিক বিদ্যালয়

ক্রঃ নং বিদ্যালয়ের নাম	**স্থাপন কাল**
১. মালখানগর উচ্চ বিদ্যালয়	১৮৮৯
২. ইছাপুরা উচ্চ বিদ্যালয়	১৮৯২
৩. রাজদিয়া অভয় পাইলট উচ্চ বিদ্যালয়	১৯১৮
৪. রায়বাহাদুর শ্রীনাথ ইনস্টিটিউশন	১৯১৮
৫. রশুনীয়া উচ্চ বিদ্যালয়	১৯৪২
৬. খাসমহল বালুচর উচ্চ বিদ্যালয়	১৯৫৭
৭. ছাতিয়ানতলী উচ্চ বিদ্যালয়	১৯৬৫
৮. বাসাইল উচ্চ বিদ্যালয়	১৯৬৬
৯. আদর্শ উচ্চ বিদ্যালয়	১৯৭০
১০. শেখ মো. মিয়ার হোসেন উচ্চ বিদ্যালয়	১৯৭২
১১. শেখরনগর বালিকা উচ্চ বিদ্যালয়	১৯৭২
১২. শুলপুর উচ্চ বিদ্যালয়	১৯৭৩
১৩.মালপদিয়া উচ্চ বিদ্যালয়	১৯৭৩

১৪. খারশুর উচ্চ বিদ্যালয়	১৯৭৫
১৫. রাজদিয়া আ. জব্বার পাইলট বালিকা বিদ্যালয়	১৯৭৬
১৬. কুসুমপুর উচ্চ বিদ্যালয়	১৯৮৩
১৭. সিরাজদিখান উচ্চ বিদ্যালয়	১৯৮৩
১৮. পাউসার উচ্চ বিদ্যালয়	১৯৮৫
১৯. লতব্দী উচ্চ বিদ্যালয়	১৯৯০
২০. মাস্টার আ. রহমান একাডেমী	১৯৯২
২১. হাজী আবু বকর সিদ্দিক জুনিয়র বিদ্যালয়	১৯৯৮
২২. ছৈয়দপুর আ. রহমান উচ্চ বিদ্যালয়	১৯৭৪
২৩. খাসকান্দি জুনিয়র বিদ্যালয়	১৯৯৯
২৪. গাইজ উদ্দিন জুনিয়র বিদ্যালয়	১৯৯৯
২৫. রাজানগর সৈয়দপুর ইউনিয়ন উচ্চ বিদ্যালয়	=
২৬. চিত্রকোট নিম্ন মাধ্যমিক বিদ্যালয়	=

গজারিয়া উপজেলা

ক্রঃ নং বিদ্যালয়ের নাম	**স্থাপন কাল**
১. ভবেরচর ওয়াজেদ আলী উচ্চ বিদ্যালয়	১৯৩৭
২. হোসেন্দী উচ্চ বিদ্যালয়	১৯৪৬
৩. বাউশিয়া এম. এ আজাহার উচ্চ বিদ্যালয়	১৯৬৪
৪. ভাটেরচর দেওয়ান. এ. মান্নান পাইলট উচ্চ বিদ্যালয়	১৯৭১
৫. গজারিয়া পাইলট বালিকা উচ্চ বিদ্যালয়	১৯৭৭
৬. বাঘাইকান্দি কলিমুল্লাহ উচ্চ বিদ্যালয়	১৯৮০
৭. গজারিয়া পাইলট উচ্চ বিদ্যালয়	১৯৮৪
৮. রায়পাড়া উচ্চ বিদ্যালয়	১৯৮৫
৯. ভবেরচর বালিকা উচ্চ বিদ্যালয়	১৯৯০
১০. হাজী কেরামত আলী উচ্চ বিদ্যালয়	১৯৯০
১১. গুয়াগাছিয়া ইউনিয়ন উচ্চ বিদ্যালয়	১৯৯০
১২. বালুয়াকান্দি ডা. আ. গাফ্ফার উচ্চ বিদ্যালয়	১৯৯৪
১৩. টেংগারচর রাজিয়া কাদের আদর্শ উচ্চ বিদ্যালয়	১৯৯৫
১৪. বসুরচর পাঁচগাঁও জুনিয়র বিদ্যালয়	১৯৯৫
১৫. পোড়াচক বাউশিয়া জুনিয়র বিদ্যালয়	১৯৯৭

লৌহজং উপজেলা

ক্রঃ নং বিদ্যালয়ের নাম	স্থাপন কাল
১. কাজীর পাগলা এ. টি ইনস্টিটিউশন	১৯০১
২. কলমা এ. কে. এল. কে উচ্চ বিদ্যালয়	১৯০১
৩. ব্রাহ্মণগাঁও উচ্চ বিদ্যালয়	১৯০২
৪. হলদিয়া উচ্চ বিদ্যালয়	১৯১৯
৫. পয়সা উচ্চ বিদ্যালয়	১৯২৬
৬. লৌহজং পাইলট বালিকা উচ্চ বিদ্যালয়	১৯৪৩
৭. যশলদিয়া উচ্চ বিদ্যালয়	১৯৬৪
৮. নওপাড়া উচ্চ বিদ্যালয়	১৯৬৯
৯. খিদিরপাড়া উচ্চ বিদ্যালয়	১৯৭২
১০. মেদিনীমণ্ডল আনোয়ার চৌধুরী উচ্চ বালিকা বিদ্যালয়	১৯৮৩
১১. লৌহজং পাইলট উচ্চ বিদ্যালয়	১৮৮৫
১২. হাড়িদিয়া উচ্চ বিদ্যালয়	১৯৯৫

Appendix-E

Student Survey Questionnaire

Trends and problems of Science and Technology Education at the Secondary level of Bangladesh with special reference to Munshigonj district,

Dear Student

This anonymous questionnaire asks for your opinions about the teaching and learning of science in your school. Do not write your name, or any other comments that could identify you on this questionnaire.

There is no right or wrong answer to any of the questions. This is not a test and your answers will not affect your scores and grades. By completing the questionnaire you are consenting to take part in this research. Please read the information below which explains the purpose of this research.

The information you provide will be useful to improve the ways of teaching and learning science. Your answers will remain confidential and any reports about this research will not name any students, teachers or schools.

Thank you for participating in this study.

Md. Saidul Islam Khan , Researcher, University Of Dhaka

SECTION 1: Background Information

Name of School:……

Type of School: Boys' only ☐ Girls' only ☐ Co-educational ☐

Sex: Male ☐ Female ☐

Age: ……Years

Class Level: ☐ ☐ ☐

SECTION 2:

Teaching Activities in the Classroom

Please a Tick for each row.

Teaching Activities		
1. Teacher gives lecture	Always	
	Sometimes	
	Never	
2. Teacher use question answer method	Always	
	Sometimes	
	Never	
3. Teacher appreciates while students answer correctly	Always	
	Sometimes	
	Never	
4. Teacher creates opportunity for group discussion	Always	
	Sometimes	
	Never	
5. Teacher gives special alteration to weak students	Always	
	Sometimes	
	Never	
6. Teacher uses chalk board	Always	
	Sometimes	
	Never	
7. Teacher maintains class discipline	Always	
	Sometimes	
	Never	
8. Teacher tries to make attentive students towards their lesson	Always	
	Sometimes	
	Never	

Teaching learning strategies

Please a Tick for each row.

Items	Never	**Sometimes**	**Always**
Teacher dictates from text books			
Teacher appreciates student for correct response			
Teacher gives group work			
Students participate in group work			
Teacher gives			

special attention to weak students			
Teacher summarizes lesson at the end			

Use of Teaching Aids by Teachers in the Classroom

Please a Tick for each row.

Teaching Aids	Never	**Sometimes**	**Always**
Maps/Globes			
Charts/pictures			
Scientific apparatus			
Real objects			
Models			

SECTION 5: Please write answers to these questions in the spaces provided.

5.1 How could the study of science be improved?

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5.2 How will the study of science help you now or in the future?

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Thank you