ICT for Education Development in Rural Bangladesh – The Current Scenario

Thesis submitted to University of Dhaka in partial fulfillment of the requirements for the award of the degree of Master in Philosophy

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Honor Pledge

I solemnly declare that I was not given nor I received any unauthorized assistance from anybody or any institution as I wrote this thesis. I further declare that 'ICT for education development in rural Bangladesh – The current scenario' is my original work except the quotations and citation, which are also acknowledged by means of complete references.

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DECLARATION

This thesis entitled 'ICT for Education Development in Rural Bangladesh - The Current Scenario' submitted by Ms. Sanchita Pal at the Department of Development Studies, University of Dhaka, towards partial fulfillment of the degree of Master of Philosophy in Development Studies has not been submitted for any other degree of this university or any other university; and it is entirely her own work. I recommend that this thesis be placed before the examiners for evaluation.

Prof. Mahbub Ullah

Supervisor

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Dedication

I dedicate this work to my beloved Mother.

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Acknowledgement

Firstly, I would like to express my sincere gratitude to my supervisor Prof. Mahbub Ullah, for continuous support and guidance. His patience, motivation and immense knowledge guided me to accomplish my research work. I am also grateful to Prof. M. Abu Eusuf, Chairman, Department of Development Studies and its faculty members for their patience and support in overcoming numerous obstacles I have faced through my research. I am also thankful to other staffs of my department for their help.

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Abbreviations

A2I	: Access to Information
BBC	: British Broadcasting Corporation
BCC	: Bangladesh Computer Council
BRAC	: Building Resources Across Communities
BT&TB	: Bangladesh Telegraph and Telephone Board
BUET	: Bangladesh University of Engineering and Technology
CAL	: Computer Aided Learning
CAI	: Computer Assisted Instruction
CAIM	: Computer-Assisted Instruction Material
CALP	: Computer Aided Learning Program
CBL	: Computer Based Learning
DSHE	: Directorate of Secondary and Higher Education
ECA	: Education and Cultural Affairs
ICT	: Information and Communication Technology
MPO	: Monthly Pay Order
NCTB	: National Curriculum and Textbook Board
PACE	: Post Primary basic and Continuing Education
RI-SOL	: Relief International – Schools Online
SPIDER	: Swedish Program for ICT in Developing Regions
SPSS	: Statistical Package for the Social Sciences
T.V.	: Television

Abstract

This study intends to investigate the effect of Information and Communication Technology in education development in rural Bangladesh. It has been noticed worldwide that combine technology in education improved the quality of education. In Bangladesh also, to achieve the desired result of quality education various activities are going on by means of technological support in teaching and learning process. Now to evaluate the effect of computer as an aid in teaching learning process in education this experimental study has been conducted. In total 272 eighth standard students from four schools in academic year 2015, represent the target population of this study in Bangladesh. This pre-test, post test experimental study selected 129 students from two experimental schools, and 143 students from two control schools. The post test General Science result showed that when instruction was given using computer as an aid to experimental group and as the control group received instruction in traditional method the t-test analysis had been statistically significant. The pre-test science score of both group revealed that when the method of instruction is traditional, the null hypothesis had not been found statistically significant. Other factors which may have an effect on students' achievement have also been analysed in this study. Factors such as family education level, occupation, number of earning members in family and time spent on study as well as watching television by students are identified as covariate variables and was analysed by cross tabulation and correlation. No correlation coefficient was found statistically significant, except one. So it is evident that Computer Aided learning has an effect on students' outcome. And with the help of Information and Communication Technology the quality of education can be improved.

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CHAPTER ONE

1.1. Introduction :

Learning is a personal action. Throughout our life we learn different things by being taught or through study and experience. Some lessons come to us naturally from our daily life and for some we solicit. Though the act of learning is complex in nature, from our daily life we learn so many things we can't recognise its complexity. When we face some difficulty to learn something, the nature of its complexity comes into forth. The learning process always proceeds and shaped by previous learning and gained knowledge. Though the process looks simple, numerous studies and theories speak for its intricacy.

Education is a form of learning in which knowledge, skill transferred from one generation to another by teaching and practical training. Education disseminated mainly by the educators but also may occur by self learning. In this modern era education can be divided into two branches – formal and informal. Formal education can be obtained from institution where learners learn following a proper curriculum. On the other hand, informal education can be obtained from home, society, work place and from day to day interactions.

Now a day, Educationalists raise questions against the formal education because monotonous method of learning in the institution can't help the students to grasp the difficult subject easily. With that, most of the time learners can't remember the learnt subject at later of their life. Educationists argued that this shouldn't be the aim of education because education is a lifetime experience. According to Tapscott (1998), a transformation in learning is taking place from what he labels "broadcast" learning to "interactive"

learning. Today's digitally equipped generation are not satisfied for being a passive learner but want to become the part of learning process by interaction. Here the role of new technological tools comes. It has been observed that Information and Communication Technology (ICT) can motivate students to learn new thing by their own and can fulfil the gaps which has been created through years. ICTs, as a powerful tool can support traditional education system to enhance its effectiveness. ICTs can be classified into two forms – 'old' and 'new'. Television, telephone, radio are old ICTs and computer, internet, wireless technology and satellite are new ICTs.

In present time educational institutes transform its conventional classrooms to multimedia classroom. Multimedia classroom gives a joyful learning environment with lots of interactive sessions. In multimedia classroom teachers use computer as an aid in learning process. The method of Computer Aided Learning doesn't weaken the need of teacher or lecture. On the contrary computer aided learning with the combination of lecture and audio-visual aid enhances the teaching learning process.

There are many learning theories which have supported ICT and Computer Aided Learning as essential tool for education. These theories illustrated that students can learn faster and can retain the subject longer when ICT are used as teaching tool. Constructivists believe that all humans have the ability to construct knowledge in their own minds through a process of discovery and problem-solving. Through computer aided learning students can take this advantage. Seymour Papert, believer of constructivism and inventor of programming tool LOGO, argued that structured education system damaged natural curiosity of the children. The medium by which children were being taught force them to take a passive recipients role. And thus they were not motivated to learn something for their lifetime. Learning according to Constructivists is a question of motivating an individual to attach new meaning to past cognitive experiences. Computer aided learning can motivate learners,

give the opportunity to enhance problem solving skills and engage learners as active participants.

Cognitive theory of multimedia learning is one of the cognitivist learning theories introduced by an American psychology professor Richard Mayer in the 1990s. Basic concept of Mayer's theory is that the human working memory has two sub-components that work in parallel - visual and verbal and according to him learning can be more successful if both of these channels are used for information processing at the same time. Mayer claimed that if ICT has been used as learning tool students can learn faster and can retain the subject for longer time. With constructivism and cognitivism, learning theory of Multiple Intelligence also mentioned Computer Aided learning as effective learning tool. Howard Gardner's Multiple Intelligence theory identified seven distinct intelligences which can be grown with the help of drawings, verbal and physical imagery. ICT within the framework of Multiple Intelligence can enhance the teaching learning experience. So there are many learning theories which suggest ICT or Computer Aided Learning is effective in learning process.

1.2. Background of the Research :

It has been observed that last few decades the world has been shifting from industry based society to knowledge based society. The countries which are taking advantage of its working human population i.e. the demographic dividend and making those population more skilled based resources are developing very fast like India, China. Bangladesh also improving very fast within a very little span of time and as part of its development goals, the government of Bangladesh established Vision-2021. And the concept of Digital Bangladesh is associated with Vision-2021. So National ICT Policy-2009 and National Education Policy-2010 had been form to act as catalyst in the country

movement to become Digital Bangladesh by 2021. To build more skilled human capital National Education Policy 2010 of Bangladesh emphasized on more knowledge based education. The first two plans of National Education Policy 2010 for Primary, Madhyamik and vocational education are- i) Computer should be used as a tool of teaching from the primary level of education and ii) Before entering Madhyamik level all students must be computer literate. Government has decided to transform the traditional classroom to Multimedia Classroom for all secondary and primary schools and madrasahs. In 2015 government modified the National ICT Policy and mentioned that every Primary, Secondary and Higher Secondary teachers should be capable of using computer at classroom with special emphasis should be given on Mathematics, Science and English teaching. Policy also declared that interest-free loans on easy terms and grants would be given to teachers to buy computers, laptops and ICT machines. With that all schools should have internet connection and all off grid education institution should be connect with internet through solar electricity. The Master Plan for Information and Communication Technology in Education (2012-21) has also declared the same proposal. Special emphasis has been given to ICT training to build skilled teachers, develop ICT materials and establish education friendly environment in education institutions. Also to encourage the teachers, prize and certification shall be distributed for content development.

The present teaching method of Bangladesh is a lecture based one way non interactive pattern where students get limited space to participate. Classes are text book centric, theoretical knowledge based and there is a lack of peer interaction through group work. This is mainly because of the high teacher-student ratio. The average number of students in a rural secondary classroom in Bangladesh varies from 60 to 70. Students do not get proper opportunity to learn, which results in low performance.

To change this trend and as the part of national policy Bangladesh Computer Council (BCC) providing desktop computer, laptops, Projector, Modem and Internet facility to schools and colleges. With that BCC also arranges training to the teachers so that they can provide Computer Aided Learning to the students. 15,500 secondary schools, 5,000 madrasahs and 1,500 primary schools have already been transformed to Multimedia Classroom. And approximately 75% secondary and 15% primary students are benefited from this system.

To facilitated Computer assisted learning all text books of primary, secondary, madrasah and technical curriculum had been converted into e-book. Now teachers and students can get this facility through online at www.ebook.gov.bd. This platform is very much interactive with lots of animation, videos and graphics. Another platform has been created where teachers can upload digital content which are helpful for the students. Almost 18000 teachers trained to create digital content. At teacher's content blog (www.ictinedubd.ning.com) 12000 contents are available now.

Lots of activities are going on to build full-fledged ICT oriented education system. To sustain this development a proper monitoring tool has been designed by Access to Information (A2I) and supplied to Directorate of Secondary and Higher Education (DSHE) for field level monitoring. Various initiatives have been taken by nongovernmental organisations also to build a strong ICT backed education system. No doubt, objective of these initiatives are to improve the quality of the education as well as improvement of the students. With computer aided learning students can learn various subjects easily in a joyful interactive environment. As various initiatives have been taken now it's time to analyse whether these initiatives reach its target in real.

1.3. Statement of the Problem :

Many national policies have been implemented to introduce and establish strong ICT based infrastructure in education in Bangladesh. Computer lab established in both urban and rural schools and teachers have been trained to develop and deliver the content with the help of computer, projector and internet. The progress and budget is increasing rapidly throughout the process. The ultimate goal of this total process is to increase student achievement and to build skilled human capital.

The students of urban areas get more exposure to various ICTs than students of rural areas. Economic condition of the rural areas is not comparable with urban areas and there are many students who are the first generation school goers. Infrastructure and facilities are also not up to the level in rural schools. Poor method of instruction and poor learning environment also have its impact on student achievement. Now, as the ministry of education trying its level best to improve the learning environment and method, it is the demand of time to do some study to investigate the effect of technology in teaching. Computer is the common ICT element which is used in schools. Using computer as an aid and through digital content teacher can easily present complex lesson effortlessly. Teachers take the advantage of audio-visual feasibility of computer to present the lecture. To evaluate the student achievement after receiving Computer Aided Learning this study selected rural schools in Narshindi and Dhamrai in Bangladesh. This study is investigating the students' achievement in education and by that the effect of ICT would be disclosed.

1.4. Objective of the Study :

This study has revealed the effect of ICT on education development. That's why this study intended to compare Computer Aided Learning (CAL) method and Traditional Learning method in teaching eighth grade science in Bangladesh.

The specific objectives of this study are –

a) To verify the difference in performance in science between those who expose to CAL method and those who got traditional instruction.
b) To verify when students exposed to traditional method perform equally.
c) To examine other factors that may influence the performance of the students.

1.5. Research Questions :

Following research questions are being examined in the study –

1) Primary Research Questions are –
   a) Does achievement is greater for the students who received instruction in science through CAL than the students who received instruction in science through traditional method?
   b) Does achievement is same for the both experimental and control group students when received instruction in science through traditional method?
2) Secondary research questions are –
   a) Does father's education level affect the post test scores of both experimental and control group?
   b) Does Mother's education level affect the post test scores of both experimental and control group?
   c) Does the occupation of the family head affect the post test scores of both groups?

d) Does number of earning members of the family affect the post test scores of both groups?
e) Does inter generational literacy have an effect on student's outcome?
f) Does higher study time have an effect on the post test scores of both experimental and control group?
g) Does televiewing time have an effect on the post test achievement of both experimental and control group?

1.6. Research Hypotheses :

The following research hypotheses were tested –

a) Post test scores of students who received general science instruction through CAL are no different from the Post test scores of students who received traditional instruction in general science.
b) Pre-test scores of students of both experimental and control groups are not different when received instruction in traditional method in general science.
c) Father's education level is not affecting the post test scores of both experimental and control group.
d) Mother's education level is not affecting the post test scores of both experimental and control group.
e) Number of earning members of the family is not affecting the post test scores of both experimental and control group.
f) Higher study time has no effect on the post test scores of both experimental and control group.
g) Times spent on watching Television is not affecting the post test achievement of both experimental and control group.

1.7. Theoretical Framework :

The theoretical framework is necessary to organize the research process. It helps the researcher and the reader to construct and to understand the study. With that it connects to all aspects of empirical enquiry. It helps to identify the various domains in the given context and possible perspectives to be taken into consideration. This is important for assuring that all significant aspects are considered and a systematic approach has been followed.

This study was followed the Constructivism Theory. This theory postulates that each person individually constructs meaning when he or she learns. The person or learner are not the passive learner and gain knowledge passively from the educator. But through interaction the learner gain knowledge actively. CAL method gives opportunity to the student to learn by being a part of learning process actively. It helps the learner to construct knowledge by themselves. In CAL method though students get the same instruction, the inferences, discoveries and conclusions are their own. As per constructivism teachers' role is not only to disseminate knowledge but teachers should take part actively by raising questions, engage in problem solving activities. Using computer and digital content teachers can present the lesson attractively with lots of problem solving activity. By this manner students will learn the lesson by active participation.

The present research was concentrated on Computer Aided Learning (CAL) and its effect on students' outcome. Use of computer in education is referred by many names. But this study embraces the term Computer Aided Learning or CAL. The research followed the quantitative research approach. The achievement in general science is the dependent variable and instruction methods are independent variables in this research. Other factors are also investigated in this research to check whether those are affecting the outcome or not. Those factors are identified as covariate variables since these factors

might affect the result but not primary concern of this research. Below figure reflects the framework in picture -

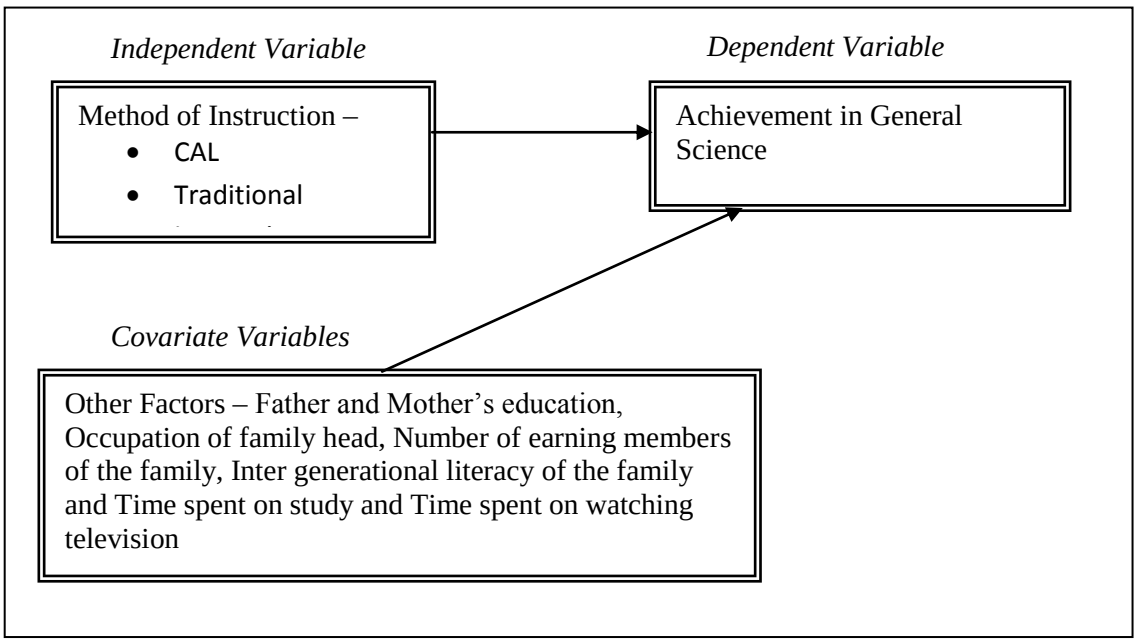


Figure 1.1. Study Framework

1.8. Significance of the Study :

Every skilled human capital carries economic value. So to build maximum skilled human capital government tries to improvise policies, infrastructure in education sector because every student in the country is potential human capital. Then the responsibility comes to the educational institutions to follow the set curriculum and effective learning process with a view to preparing skilled human resource. The present research verified the effective learning process and therefore be beneficial to -

Bureau of Education – by study this research education department can verify its policies or formulate new policies to promote ICT based education in school curricula.

School Administrators – this research will help them to encourage implementing ICT based education in school and persuade them to construct best policies to support computer aided learning in school.

Teachers (science) – influence the teachers to adopt computer aided learning in teaching process.

1.9. Delimitation of the Research :

a) Study delimited to four rural secondary schools only. The data sample in this research represent the target population of Bangladesh.
b) This study delimited to verify the effect of computer aided learning on science subject only.
c) Only eighth grade students were included in the research.

1.10. Definition of Terms :

Information and Communication Technology – Diverse set of technological tools and resources used in creating, storing, processing, communicating and disseminating information of all kinds.

Computer Aided Learning – Use of computer as an aid or assistance for teaching or to give training.

Traditional Learning/ Teaching/ Instruction – Teacher oriented chalk and talk method where teacher lectured with the support of black/white board.

Curriculum – Academic content which is taught in an educational institute.

Televiewing – the act of watching television

Multimedia Classroom – Classroom equipped with five types of media - text, video, sound, graphics and animation. These media helps to enhance the learning environment. Using the ICT component like computer, projector, sound box, software, CD/DVDs are used in multimedia classroom.

Digital Content – Products available in digital form. Products can be information, music, videos, images which are in digital form. In respect to education, digital content can be the topics of the curriculum transformed into digital form.

Vision 2021 – The Government of Bangladesh has declared 'Vision 2021' with a target to make Bangladesh as a middle income country using Information and Communication Technology (ICT) and development of favorable business environment for innovative companies.

Digital Bangladesh – Digitalizing Bangladesh by ensuring an ICT based society where information will be available on line.

Access to Information Programme (a2i) – It's a project to provide support in building a digital nation through delivering services at the citizen's doorsteps. The programme aims to improve quality, widen access, and decentralize delivery of public services to ensure responsiveness and transparency.

Madhyamik – also called S.S.C., is a centralised examination conducted by the Boards of Intermediate and Secondary Education in Bangladesh, at the end of the 10th standard of high school.

Madrasah – Madrasah generally refers to Muslim education institute with core emphasis on Islamic studies and Arabic literacy.

CHAPTER TWO

Literature Review

2.1. Introduction :

To study whether computer is supporting and developing teaching learning process, it is important that we first identify the meaning of learning, knowledge and education and difference between them. The definition of learning is: the act of gaining new, or modifying and strengthening existing knowledge, behaviors, skills, values, or preferences. With that learning also may involve in amalgamating different types of information. After learn something one person wants to disseminate that learning to another person or vice versa. Hence learning travels through from one generation to another. Every day we learn something from our daily life but in fact it is a sequential process of gaining knowledge.

On the other hand, knowledge is association, realisation or understanding of someone or something which can acquired through experience or education. Knowledge can be theoretical or practical understanding of a subject. It can be gained through practical experience or skill, as well as can be achieved by theoretical understanding of a subject. Knowledge can be changed when new information has been gained.

Finally the difference between knowledge and learning is that knowledge is gained through experience and learning. So knowledge can't be established without learning. Knowledge is about understanding a particular fact or an event. After learning science one can have scientific knowledge. Whereas learning cannot be defines into small spheres, it is on the whole a complete

system with facts related to age group and a person. It is rather more explicit and defined.

On the other hand, the phrase book meaning of education is – it's the act or process of acquiring knowledge, developing the powers of reasoning and judgment and preparing oneself or others intellectually suitable. Individual person attain education from outer source but learning involves in inner self. Through experience one can learn and gain knowledge, where through teaching one become educate and earn knowledge. In other words, in a formal structure with some define rules and curriculum education helps the learner to learn new information and by that can acquire facts or knowledge.

2.2. History and Development of Education :

The learning content and style has been changed through the path of civilization. The journey of education began in prehistory when adults trained the young to acquire knowledge and skills considered necessary in their society. In pre-literate societies education was achieved orally and through imitation. Story-telling was the medium through which knowledge, values, and skills passed from one generation to the next. As cultures began to expand formal education system took its shape. In ancient India there was Gurukul system of education in which students who wished to study went to a teacher's or Guru's house and requested to be taught. The teacher used to teach according to students' aptitude and capability. Knowledge was conveyed orally in this period. And methods of learning were memorization, critical analysis, introspection, storytelling, question and answer method, hands-on method, seminars like debates and discussion.

Writing system began to flourish in ancient civilisations from approximately around 3500 B.C. World's oldest known alphabet was developed in central

Egypt around 2000 B.C., known as hieroglyph. Later these Egyptian hieroglyphics script was adapted by the Greeks in Europe. The Greeks were the first Europeans to learn to write with an alphabet. Later these Greek alphabets were identified as the principal of all modern European alphabets. Plato was the founder of education academy in Athens, Greece. His academy was the first institution of higher learning in Europe. The subject which were studied by the student at that time were drawing, painting, and sculpture, rhetoric, mathematics, geography, natural history, politics, and logic.

In China, during the Zhou Dynasty (1045 BC to 256 BC), there were five national schools in the capital city, Pi Yong. The schools mainly taught the Six Arts: rites, music, archery, charioteering, calligraphy, and mathematics. Confucius (551-479 BCE), was China's most influential ancient philosopher, and his educational ideas continues to influence the societies of China and neighbors like Korea, Japan and Vietnam. His Analects were written down by followers and have continued to influence education in East Asia into the modern era.

During the middle ages across the Middle East, Islamic science and mathematics appreciated under the Islamic caliphate. This period is traditionally understood to have begun during the reign of the Abbasid caliph Harun al-Rashid (786 to 809), when he inaugurate of the House of Wisdom in Baghdad. Here, scholars from different parts of world and cultural background gathered and translate all of the world's classical knowledge into Arabic. The House was supreme centre for the study of humanities and for sciences, including mathematics, astronomy, medicine, chemistry, zoology and geography. In the 9th century, Bimaristan medical schools were formed in the medieval Islamic world, where medical diplomas were issued to students of Islamic medicine. Al-Azhar University, founded in Cairo, Egypt in 975, which offered a variety of post-graduate degrees.

In 6th century BC in India, Takshasila was a chief center of learning. Also Nalanda, Vallabhi, Vikramasila, Ujjain, Salotgi were other learning institution in ancient India. And the subjects which had been taught at that time were art, architecture, painting, logic, mathematics, grammar, philosophy, astronomy, literature, Buddhism, Hinduism, Arthashastra (Economics & Politics), law, and medicine, warfare, ethics.

The Catholic Church became one and only academic protector, after the fall of Rome, in Western Europe. For advance studies church established cathedral schools in the early middle ages. The first medieval institutions gradually deemed to be universities were established in Italy, France, and England in the late 11th and the 12th centuries. The courses which were offered here were arts, law, medicine, and theology. Cathedral schools and monasteries remained important throughout the middle ages. Sculpture, paintings and stained glass windows were fundamental educational media through which Biblical themes and the lives of the saints were taught to illiterate viewers.

In medieval period in China, for the first time, during the Sui Dynasty (605 AD), an examination system was established. This merit-based imperial examination system for evaluating and selecting officials accelerates to build schools that taught the Chinese classic texts. The core curriculum for this imperial civil service examination from the mid-12th century onwards was the Four Books, representing a foundational introduction to Confucianism.

After Renaissance in Europe a new age of scientific and intellectual inquiry and appreciation guided the modern era. In 1450, Johannes Gutenberg discovered printing press, and this discovery allowed works of literature to spread more quickly. Western classical education has three stages, each with a different purpose. The first stage is Primary education, where students taught how to learn. The second stage called Secondary education, where students build a conceptual framework, and develop the fundamental skills. The third stage is

Tertiary education where a student can pursue a profession such as law, theology, military strategy, medicine or science. The present modern education system is still following this three tire structure. The modern education is the mixture of traditional western culture, with a particular focus on education as understood and taught in the middle and the classical age. For example, the philosophical ideas of Greek period can be observed in modern physics, including the laws of thermodynamics and the proposition that matter can neither be created nor destroyed – merely transformed. So the fact is though the paradigm of modern education shifting from mere learning to actively participation but this pattern of education system is not a new idea.

2.3. Learning Theories :

From ancient time the learning urge established the teacher student relationship. Teachers, who possess the knowledge from their experience and wisdom, delivered that knowledge to their students. The process of disseminating their learning to learner can be numerous. For thousands of years, philosophers and psychologists have wanted to understand the nature of learning. They wanted to comprehend, how the learning process occurs, and how one can influence the learning of another person through teaching and similar activities. To understand how we gain knowledge and retain skills, many learning theories constructed their worldviews. The modern psychological study of learning can be mentioned from the work of Hermann Ebbinghaus (1850–1909), whose famous study of memory was published in 1885. Ivan Pavlov (1849– 1936), whose research on classical conditioning was begun in 1899 though it was first published in English in 1927. These theories focused on explaining the behavior of individuals and became known as behavioral theories. Behaviorists look at learning as an aspect of conditioning and believer of rewards and targets system in education. But afterwards there has been a major paradigm shift in education from theories of "learning" to

theories of "cognition." The approach of cognitive science towards teaching and learning is not conventional. It postulates how the human, as an information processor, functions and uses information. Educators who adopted cognitive theory believe that the definition of learning as a transformation in behavior is too narrow. They prefer to study the learner rather than the environment; in particular, they inquire complexities of human memory. On the other hand, those who advocate constructivism believe that a learner's ability to learn depends to a large extent on what he already knows and understands. And acquisition of knowledge should be an individually personalised process of construction.

In recent time Howard Gardner has identified seven distinct intelligences and his theory is known as Multiple Intelligence theory. This theory has emerged from recent cognitive research and it explains that students possess different kinds of minds and therefore learn, remember, perform, and understand in different ways. According to this theory visual, sound and motion are important medium which helps learner to understand, retain and perform better.

2.4. Journey of Computer Aided Learning :

Many learning theories discuss the fact that ICT can be an important medium in learning. In present time education institutes have established multimedia classrooms to exercise the method of CAL in teaching learning process. The full form of CAL is Computer Aided Learning and it is the most pronounced word within education. In education sector CAL is almost the synonym of ICT. In Computer aided learning method teachers with the help of computer deliver the lecture in the class. It has been noticed that from mid 1980s the term Computer Aided Learning or CAL increasingly visible in the education field to describe the use of technology in the education sector. With CAL another word CBL is also detected in this sector. In CBL or Computer Based Learning

method student learn from the sole medium computer. No teacher is present or no face to face lecture is delivered in CBL. For many years these two terms was not clear to many organisations. It was believed that CAL and CBL are same in method. But on contrary in CAL method the importance of teacher or lecture never dismantled. CAL is very much interactive method where computer is used as teaching aid. In CAL method students directly taught by the teacher with the support of Audio-visual digital content.

Accordinting to Amirhassan Monadjemi et al, *"CAL's history began in the early 60's, when the third generation of digital computers were built and introduced. These systems were cheaper and more reliable than the earlier models. So digital computers became typical facilities in universities and research centers."* And according to him the consequence of this facility inspired the researchers to develop new fields of application for computers and CAL was one of those applications. One of the first computer based learning package was called PLATO, developed in early 1960's and was produced by the Urbana campus of the University of Illinois. The design of PLATO came from Professor Don Bitzer. PLATO is the first online community, with email and chat rooms long before the idea of the World Wide Web. In a article called "PLATO: The Emergence of Online Community" the author David R. Woolley (1994) states that, PLATO was a timesharing system, both educators and their students use the same high-resolution graphics display terminals, which were connected to a central mainframe.

Thomas Kurtz shifted the function of computers from mere research activity to an academic one. Kemeny and Kurtz developed a new, easy-to-use language, called BASIC in 1964. It spread rapidly and was used to make computer-based instructional materials for a broad range of subjects and for all levels of education. In 1963, Patrick Suppes and Richard Atkinson established a program of research and development on computer-assisted instruction in mathematics and reading. This self operated program allowed a student to

practice the subject solely and by this way to take an active role in the learning process. In the early seventies, Seymour Papert developed an advance approach to technologies in education. He designed a programming language, LOGO, to encourage rigorous thinking about mathematics. The constructivist believes and claims that learning is reconstruction of knowledge. And Papert argued that learning can be more effective when the learner by themselves constructs a meaningful product.

In late seventies personal computer were seen everywhere – in the office, classroom, home, shop. And henceforth computers were not identified as luxury but necessity.

2.5. Research and Studies on CAL :

To go with the flow of present and future digital era it is high time to enhance the quality of education. For that purpose to develop a well structured computer aided instructional package for educational research course in Islamic University of Technology, Bangladesh, Aktaruzzaman and Muhammad (2011) selected two perfectly matched groups to investigate the effect of Computer Aided Instruction (CAI) on student achievement in educational research course as compared to traditional method of instruction. The investigation revealed that the experimental group outperformed the control group. And they concluded that the findings of this study may be a source of encouragement for the widespread use of CAI at various grade levels and in varied subject areas.

To find the relationship between computers and students' educational achievement, Fuchs and Woessmann (2004) studied international student achievement test of 15-year-old students from 32 developed and emerging countries. Research found that students who never use computers or the internet at school showed lower performance than students who sometimes use computers or the internet at school. But students who use them several times a week perform even lower. Also when student use computer at home for e-

mailing, webpage viewing and use educational software then students' performance showed a positive effect.

In Tehran, to find out the effect of traditional teaching and Computer Aided Instruction on grade one students' creativity in math classes Aqda, Hamidi and Rahimi (2010) conducted one experimental study. Fifty seven students were selected according to simple random sampling where research instrument was the Persian version of Torrance Creativity Test. With that a personal information questionnaire was also used to formulate a profile of participants' demographic. Results confirmed that Computer Aided Instruction was significantly more effective on creativity, elaboration, and originality of students than traditional teaching of math.

Kara and Kahraman (2008), examined the academic achievement of 253 students of 7^{th} grade in Denizli, Turkey, in 2006-2007 Academic year. They restricted their study in Physics subjects of 7th grade science lesson. This experimental study followed pre-test and post test model with 139 students of control group and 114 students of experimental group. The result showed that there was no difference in achievement in pre-test scores of both groups but there was difference in post test scores. The experimental group who had received instruction through CAI scored better in post test than control group.

The study carried out by Cepni et al (2006) with 52 students of 11^{th} grade in central city of Trabzon in Turkey, had investigated the effects of a Computer-Assisted Instruction Material (CAIM) related to "photosynthesis" topic on student cognitive development, misconceptions and attitudes. The result of this study revealed that using Computer Assisted Instruction Material in teaching photosynthesis topic was very effective for students to reach comprehension and application levels of cognitive domain. However, it did not change major misconceptions related to photosynthesis topic in experimental group as expected but the misconceptions were decreased more than control group. It was also found out that there was little change about students' attitudes towards

science education in both groups. This study transmitted that computer aided learning has different effect on different domain.

In a different study, Füsun G. Alacapinar (2007), didn't found significant difference between computer assisted education and traditional education. Third grade students were the target population in Alacapinar's (2007) mixed method study. Three groups were created from the sample population. One group received traditional instruction, second group received computer assisted instruction and third group received the systematic learning approach. The result had showed no significant difference between Computer Assisted education and Traditional education. Another study, conducted by Soeder (2001), in Pennsylvania, involved two groups of middle-school students. All the students from two groups attended their respective schools for three years from class six to eight. One group received computer assisted instruction on mathematics where another group has not for three years. The result reveals no measurable difference in scores between the two groups. Whereas the study of Wainwright (1989) reveals that control group achieves higher score than experimental group. In this study, the experimental group received reinforcement via microcomputer while the control group received traditional instruction over three weeks on general chemistry classes in high school in Minnesota.

Different result discovered when 47 students of standard three of science Teaching department, Education Faculty at Cumhuriyet University in Sivas, Turkey, were investigated by Hançer and Tüzemen (2008). They divided the students in experimental and control group and the research had continued together with pretest, final test and permanence test periods during 12 weeks. After t-test analysis, data showed that computer assisted teaching was more effective than teacher-centered methods to increase academic achievement.

Bayrak and Bayram (2010) investigated 28 sixth grade students of science and technology course in Istanbul to find the effect of computer aided teaching on the academic achievement. Result of the study declared that teaching of acid-

base subject supported with computer aided teaching had a positive effect on the achievements of students in science and technology course. Yusuf and Afolabi (2010) had founded that performance of students exposed to CAI either individually or cooperatively were better than their counterparts who were exposed to the conventional classroom instruction. Their quasi experimental 3 x 2 factorial design study investigated the performance in Biology subject of 120 first year (grade 10) senior secondary school students in Oyo State, Nigeria. They also found that students who worked on the computer cooperatively performed better than those who work on the computer singly. They suggested that to spread CAL each class does not need computer for individual student basis.

Serin (2011), studied 52 fourth grade science and technology students to find the effects of computer based instruction on achievement and problem solving skills. The result of the study reveals that there was a statistically significant increase in the achievements and problem solving skills of the students in the experimental group that received the computer based science and technology instruction. Research carried out by Iravani and Delfechresh (2011) discovered that computer aided learning had an effect on students' achievement and CAI software package in science subject has equally affected on boys and girls and the gender factor does not have its effectiveness on achievement in science scores of students.

Akram et al (2011) investigated the effect of Computer Assisted Instruction on both private and public sector higher secondary schools. They came with the conclusion that computer assisted instruction had an influence on students' achievement in both public and private sectors. However it was more significant in private sector than public sector. According to them this may be due to private school students are much more usual with English language than public school students.

Pal, Sana and Ghose (2012) examined 100 class eight students on a single unit of Physical Science curriculum in West Bengal, India. And they found that

computer assisted multimedia courseware facilitates students learning in Physical Science better than the traditional chalk and talk method.

In another study, Županec et al (2013) analyzed the effectiveness of Computer-Assisted Learning (CAL) method in biology on 214 primary pupils of 6th grade from two schools in Novi Sad, Serbia. The analysis of results of the post test and the retest showed that the pupils from the CAL group achieved significantly higher quantity and quality of knowledge in all three cognitive domains which are knowing, applying, and reasoning than the pupils from the traditional group.

With the aim of investigating the effect of Computer Assisted Instruction on creativity and academic performance, Moradnezhad et al (2014) randomly selected 31 sixth grade students from one school in Kerman, Iran. They divided the students in two groups -16 for experimental group and 15 for control group. After getting two months Computer Assisted Instruction post test was examined. The conclusion of the research was that computer-assisted instruction in creativity and meta-cognition has a significant impact but significant difference could not be seen on students' academic performance.

The work of Jesse at el (2014) also revealed that learners taught through Computer Assisted Instruction performed significantly better than learners taught through conventional instructional technique in science in Embu district, Kenya. According to the results of the research which was carried out by Yıldız and Aktaş (2015), computer based learning is very much effective. They found that achievements of all students increased after the process and according to them this opportunity can provide deeply and effectively concept learning for students. Besides, computers can give some extra opportunities to students such as doing practice and repetitions in the amount of they need.

Aktas, S. and Aydin, A. (2016), examined the effect of using smart boards to the students' retention of the information on science education. 7th grade students were involved in this experimental research in Turkey. According to

the results of the permanence test applied four weeks after the application, the students' recall rate was higher among the students of the experimental group than of those in the control group. In another study in Turkey, 48 twelve grade students were investigated by Koseoglu and Efendioglu (2015) and found that multimedia based Biology teaching was more effecting than teacher centered Biology. Also teacher centered teaching was ineffective in terms of time management, engaging attention and repetition was needed to learning the subject. Vinita and Banswal (2015) tested 80 eighth grade students to verify the retention effect of computer assisted instruction as well as the effect of computer assisted instruction students' achievement. Pre-test, post test result revealed that experimental group achieved better in post test. They also conducted a retention test one month after the post test and the result showed that student retain the lesson for long period in computer assisted instruction than traditional instruction.

As the effect of CAL varies from one study to the next, now some meta-analysis oriented study can be reviewed to identify the reason for the variation. Meta-Analysis is known as 'the analysis of analyses' (Glass, 1976). James Kulik (2003) at the University of Michigan performed a meta-analysis on studies published since 1990 and included 61 well-controlled studies from elementary and secondary school education level. And his study asserted that computer based education had an impact on learning. Though his 2003 work had represented number of conclusions. The negative result which he got was that instructional technology didn't have positive effects in every area but computers can make teaching more effective in elementary and secondary education.

In 1994, Jay Sivin-Kachala and Biala reviewed 133 research studies from 1990 to 1994 to analyse the effect of technology on student achievement, self-concept and attitudes about learning and teacher-student interaction. They found that technology had established a positive effect on students' achievement in major subject areas. Here it is contradicting Kulik's findings.

The study also revealed that technology had established a positive effect on student attitudes toward learning and on student self-concept. With that the use of technology in education changes the learning environment in a positive way.

In 2003, Waxman, Lin and M. Michko conducted a meta-analysis to found the impact of technology in student outcome. They investigated 40 studies published from 1997 to 2003. The result of their quantitative analysis showed a modest, positive effect on student outcome when teaching and learning process assembled with technology.

Yuen-kuang Cliff Liao, Chang and Chen performed a meta-analysis in 2007 to examine previous research to compare the effects of computer-assisted instruction against traditional instruction on elementary school student achievement in Taiwan. From four sources they selected 48 studies. And the quantitative data of these studies was transformed into effect size. The results reveal that CAI is more effective than traditional instruction in Taiwan. Though which factor truly contributes in positive outcome had not been identified in this research.

Meta-analysis performed by Tekbiyik and Akdeniz (2010) with 52 studies interpreted that average student's achievement moved from the 50th percentile to the 87th percentile in science learning when computer assisted instruction was used. The results indicated that the most effective grade level was elementary (4th-8th) and most ineffective was the secondary (9th-12th) level. Similarly Liao (2007) also found the smallest effect size at high school (10th-12th) and interpreted it because of nationwide college-entrance-examination.

The meta-analysis carried out by Karen Larwin and David Larwin (2011) investigated 70 studies across a forty year period of time. They examined the effect of computer assisted instruction on student achievement in post secondary statistic education. The result revealed that CAI has a moderate impact on student achievement and suggested that impact of CAI is growing. So, most of the studies claimed that there has some positive effect of computer

or CAL on students' achievement. And few studies confirmed that there has no effect of computer aided learning on outcome or found negative effect on outcome.

2.6. Computer Aided learning in Bangladesh :

Computer Aided Learning is not a new phenomenon in Bangladesh. In June, 1985 a news article published in The Bangladesh Observer by A.K.M. Mahfuzur Rahman Khan, where he had stated that classes and training were conducted through CAL in Bangladesh University of Engineering and Technology (BUET) and Bangladesh Telegraph and Telephone Board (BT&TB). But that was the era when computer was used for research and training only.

In present time government is supporting in massive scale to build multimedia classroom in every schools in Bangladesh. Previously it has been observed that classroom environment and teacher's inabilities to attract students in learning process are some of the reasons which discourage students to retain in schools. In present time also, teachers find it challenging to build affection for study in large classes of 60 to 100 learners. Considering these problems many organisations and public institutions came forward to eliminate this setback with computer aided learning. Also in this digital era it is important for both students and teachers to accustom with computer and other ICT tools. Considering this fact, Post Primary basic And Continuing Education (PACE) by BRAC had started developing the Computer Aided Learning Program (CALP) in 2004 to improve the teaching capacity of the teachers and to make the classes interesting, interactive and exciting for the students. PACE selected seven schools at Mirzapur upazila and developed interactive software based on national curriculum. Though it had started developing interactive software with Mathematics, later in 2006 English and Science were included. To develop the interactive software PACE was involved teachers and trained them because

teacher's competency is essential in CAL. With government's initiative to provide ICT access to all schools, Relief International—Schools online (RI-SOL), a US-based International NGO, has also been working in education sector of Bangladesh to integrate ICT in classroom learning and teaching. In May 2009, RI-SOL had collaborated with Intel Corporation and the U.S. State Department Educational and Cultural Affairs (ECA) Bureau to provide ICT skills and training to teachers in Bangladesh. With that Bangladesh Virtual Classroom is a Swedish Program for ICT in Developing Regions (SPIDER) - funded project run by Orebro University, Sweden, focuses on using electronic means to provide education to rural areas of Bangladesh.

Save the Children conducted one program using Information and Communication Technology (ICT) in education in Bangladesh. In this program Save the Children developed e-content based on national curriculum of English Class 4 and tested that in selected government primary schools. The pilot project covered 810 students and 23 teachers. To determine the impact of the use of content on students' learning, the researchers collected the annual English test scores from 15 ICT schools and 15 non-ICT schools in November of 2013. The researchers found a higher achievement for students in ICT schools than students in non-ICT schools. With that researchers also declared that the success of the latest technology depends on the design, implementation and training.

The education initiatives by Access to Information (A2I) Program of Government of Bangladesh, aims to make teaching and learning more effective and enjoyable for both students and teachers using ICT. Report published by Access to Information (A2I) programme, has described that learning through Multimedia Classroom helps students to perform better. Ashirul Amin (2006) had examined the attitude of rural youths towards computer literacy program in Bangladesh. 241 students from Computer Literacy Program schools and 108 students from non Computer Literacy Program were selected for this research and the result revealed that students who were exposed to computers were

much skillful and all of the evidence partly confirm that students who were guided by CAL, superior in their academic achievement.

In another research done by Chowdhury at el (2011), 63 teachers were empowered to produce digital content by themselves and deliver them to classes. 21 schools had been selected from six districts in Bangladesh where 414 students from 6, 7 and 8 classes were exposed to these contents. The result proved that teachers were empowered to produce powerful and relevant PowerPoint presentations for classes. Also Student's creativity attitude and analytical capacity were enhanced and students hence forth use ICT as learning aid. In a different research Shamim and Raihan (2015) had disclosed the effectiveness of ICT in teaching and learning where 120 polytechnic institute's teachers in Bangladesh were interrogated. The outcome stated that ICT makes the teaching learning process easy, interesting and time saving than tradition instruction method. So, maximum studies have illustrated that computer aided learning is acting as a catalyst to improve the teaching learning process in Bangladesh.

Alauddin Ahmed et al (2004) had conversed over three stage ICT model for computer aided education in Bangladesh. According to them, policy maker level, regional coordination level and school level are the three stages. They argued that many past technology education programs in developing countries failed to sustain because of little or no support for teachers' professional development, national ICT-in-education policies, or community involvement though schools were supplied with expensive equipments. Khan, Hasan & Clement (2012) describes internal and external barriers which is hindering implementation of ICT in education in Bangladesh. Regarding barriers Snoeyink and Ertmer (2001) stated that, "*first-order (external) barriers include problems with access, software, planning, or technical support, while second-order (internal) barriers include teachers' beliefs about teaching or technology, the organizational culture, instructional models, and a lack of openness to change."* And according to Khan, Hasan & Clement (2012),

infrastructure and lack of resources, insufficient fund, vision and plan, political, social and cultural factors, teacher's attitude and beliefs about ICT, lack of knowledge, skill and time are the internal and external barriers to promote ICT in education in Bangladesh. Despite lots of disadvantages in economic, infrastructure and implementation sphere Bangladesh is succeeding enormously to establish ICT backed education system.

2.7. Summary :

This chapter has provided a review of literature on the use of Computer Aided Learning in teaching and learning. This section demonstrates the history of education, learning theories, emergence of technology in education and studies investigated the effect of CAL in students' achievement. Elevating student achievement in science is not a new challenge. The reviewed literature illustrated the effect of CAL on students' achievement in different domains and the issues which can be considerate by strategy makers to improve student's learning process.

The present study has examined the effect of technology in education in rural schools. With the effect of CAL, this study also examined the effect of other factors which might have an influence in students' achievement. Most of the reviewed literatures restricted its study area to investigate the effect of computer on students' achievement and scrutinized the effect of other domains like student creativity, gender and various subject of curricula. This study with the effect of CAL also investigated the effect of parental education level, inter generational literacy, occupation of family head, number of earning members of the family and time spent by the student in study as well as in watching Television in students' achievement. Chapter three describes the methodology of this research.

CHAPTER THREE

Research Methodology

3.1. Introduction :

The purpose of the study is to determine whether the Computer Aided Learning (CAL) carried out by the experimental schools had an impacts on eighth standard students' achievement over specific general science topics. The study had compared between pre-test scores and post-test scores to determine if the scores of eighth standard students who had received instruction through CAL were greater than those of the students who had received traditional instruction. Alongside the exam scores, other factors which might have an involvement in achievement of students were also taken care of in the study. The factors like family background, interest and involvement of students were taken into consideration. This chapter described the methodology used to conduct the study including the research design, population and sample, instrumentation, validity, data collection, data analysis and limitations.

3.2. Research Design :

The research design is materialisation of logic by a set of methods that enhance the validity of data for research problem. According to Punch (1998), "*The design of a study refers to the way a researcher guards against, and tries to rule out, alternative interpretations of results.*" This study was a quantitative research which followed the deductive process. Quantitative research designs can be either descriptive or experimental. This study was mainly experimental in nature though there were descriptions to justify the research questions.

3.2.a. Experimental Research Design:

One of the important elements in quantitative research is the comparison between groups. And in experimental research, experiment is based on comparisons between the groups (Punch, 1998). The plan of an experimental research is to investigate the possible cause and effect relationship between independent variable and dependent variable. In experimental study, researchers try to manipulate one independent variable to influence dependent variable of the experimental group and measure the level of manipulation through statistical means. By this process it can be measured whether any difference appeared after the treatment in experimental group. Experimental design is formulated to confirm or reject a hypothesis and this type of design assigns some criteria. For example, in experimental research the sample group must be selected randomly and there must be one control group and only one variable can be manipulated and tested. Randomisation helps to prove that if any difference appears in the post-test that is because of manipulation of independent variable rather than possible difference between the experimental and control groups.

This experimental study had used pre-test and post-test scores of General Science eighth standard students in Dhamrai upazila and Narsigndi district, Bangladesh. The independent variable was the 'instruction method' used in the classroom and dependent variable was the students' score or achievement for 2015 school year. Students who had received instruction in general science through CAL were the experimental group. And students who had received instruction through traditional method were control group. Data were used to determine if the achievement of eighth grade students, who received instruction through CAL method, in general science was greater than those students who received traditional instruction.

Research Design			
Group	**Pre-test**	**Treatment**	**Post-test**
Experimental Group	T_1	X	T_3
Control Group	T_2	(X)	T_4

Figure 3.1. Research Design

Where $\mathbf{T_1}$ and $\mathbf{T_2}$ is Pre-test

X is intervention

(X) is no intervention

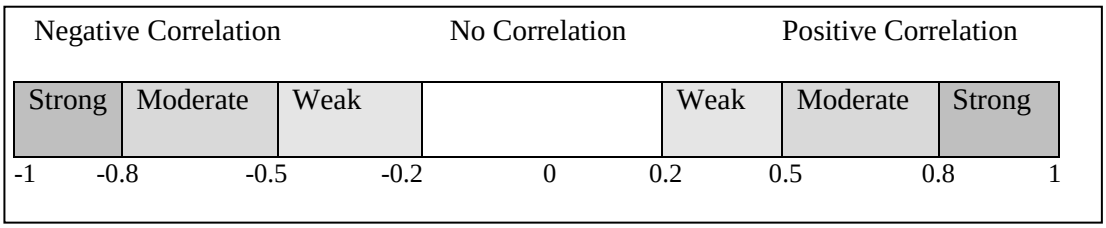
$\mathbf{T_3}$ and $\mathbf{T_4}$ is Post-test

3.2.b. Descriptive Research Design:

Descriptive research finds the answers of "What is". And to collect data descriptive research uses observational and survey methods. In quantitative descriptive research, survey method is used to collect descriptive data. In this type of research the report measures the central tendency including the mean, median, mode, deviance from the mean, variation, percentage, and correlation between variables. Descriptive research has a distinct feature that it can analyse a single variable like it can simply report the percentage summary on a single variable. As descriptive research can attempt to determine the extent of a relationship between two or more variables using statistical data, it is often categorised as correlational research. Correlational research only describes and attempts to explain the nature of relationships that exist, and do not examine causality.

This study had examined whether computer aided learning has an impact on students' achievement. To determine the answer it was necessary to measure other variables which might have an involvement with students' outcome, such

as, parents' education level, occupation of family head, number of earning members of the family, inter generational literacy of the family and how much time spent on study as well as watching television by the students. To find out whether there was any relation between each variables and students' achievement, Pearson correlation coefficient had been calculated. Pearson correlation coefficient has a value between +1 and −1, where 1 is total positive linear correlation, 0 is no linear correlation, and −1 is total negative linear correlation. From figure below, the strength of the correlation can be predicted.



Note. Adapted from mathcaptain.com

Figure 3.2. Pearson Correlation Coefficient Interpretation

In addition to correlation, cross tabulation analysis was also reported in this study to analyse the relation between the above mentioned variables. A cross-tabulation is a two or more dimensional table that records the number or frequency of respondents that had the specific characteristics described in the cells of the table. Cross-tabulation provides a worth of information about the relationship between the variables. As for some variables it was appropriate to analyse through cross tabulation. For this experimental research cross tabulation and correlation analysis both were used in descriptive part.

3.3. Population and Sample :

Population for this study included eighth standard students of Afazuddin School & College and Alhaj Jamaluddin High School in Dhamrai upazila and

Ideal High School and Satirpara Kali Kumar Institution School & College in Narsingdi district in the 2015 academic year. The demographics, diversity and structure of these schools were similar. Afazuddin School and College of Dhamrai and Ideal High School in Narsingdi were the experimental schools where teaching instruction were carried out through CAL over specific topics of general science subject after pre-test. Satirpara Kali Kumar Institution School & College in Narsingdi and Alhaj Jamaluddin High School in Dhamrai were the control school where traditional teaching method followed for general science subject. A random selection process was used to select students for the experiment. Students from different sections of eighth standard were selected from both experimental and control school. Students were selected randomly from student register without regard to any characterizing factor. The sample of this study includes total 129 students from two experimental schools, while 143 others students from two control schools.

Of the 129 students, 64 were selected from one experimental school, while 65 students from another experimental school were selected for this study. On the other hand, 73 students out of 143 were selected from one control school and 70 students from another control school. So, the sample size of this study was set at total 272 students under the 2015 academic year.

Table 3.1.

Sampling Grid

School Type	Total Population	Sample	Total
Experimental Schools	438	129	272
Control Schools	489	143	

Source: Field Data

3.4. Instrumentation :

Both the experimental schools and control schools had administrated two main examinations for their students every year --one is half yearly examination and another is the final examination. Here, for this study, the general science score of the half yearly exam was included for both groups and termed it as pre-test. In the experimental schools, the half yearly examination of general science subject was conducted before the CAL intervention on the subject in 2015. The nature of half yearly examination is mainly descriptive type and the total marks carried out in 100.

After half yearly examination experimental schools were started to use Computer Aided Learning on selected topics of general science. And two months after the end of final board examination of eighth standard in 2015, the post-test was conducted with 20 multiple choice questions where each question carried 1 mark. Both groups of students had to answer 20 questions by marking the choice in the question-answer sheet. The topics which had been selected for the post-test exam were those which were delivered through CAL in the experimental schools. The questions were all same for the both groups. The topics included were –

- 6^{th} Chapter – Develop Idea and Structure of Atoms
- 11^{th} Chapter – Light –Refraction of Light
- 12^{th} Chapter – Natural and Artificial Planet

This post-test examination session was strictly timed. And question arrangement was set haphazardly for the students to stop duplication however the questions were all same. There were four sets of questions arranged randomly for this purpose. (See Appendix C for the post-test question paper).

Questionnaire was prepared to address the research questions. Two sets of student questionnaire were formulated to deal with experimental and control school students separately. As experimental school students were the treatment

groups, they had faced some extra questions. For students questionnaire total 40 and 25 questions were there for experimental and control school respectively. (See Appendix A and B for the questionnaires).

3.5. Validity :

The National Curriculum and Textbook Board (NCTB), Bangladesh, every year publishes and distributes textbooks among the students of every government, non-government, and private schools of Bangladesh. To understand the topics clearly and to deliver the lesson NCTB Bangladesh initiated the creative question-answer method for the students. The half-yearly examination was conducted by the school administrator and the examination was based on the syllabus from the textbook given by NCTB, Bangladesh. There were overall 14 chapters in general science textbook published for the 2015 academic year.

The Pre-test (half-yearly) was carried out of 100 marks and the post-test was carried out of 20 questions with each having 1 mark i.e. 20 marks in total. The post-test multiple choice questions were also selected from the general science textbook and were verified by educators.

3.6. Data Collection Procedure :

From one district (Narsingdi) and one upazila (Dhamrai) many schools had been selected where ICT equipments were provided by the government. After selection the respective authority and principals had been contacted to get the information whether Computer Aided Learning method was practiced in teaching learning process in those schools. After receiving positive information from two schools, request had been made to the respective principal to give permission to conduct the research in the schools. Likewise, two similar category schools were also searched for, in the same area, as control schools.

After identifying those schools, the similar procedures were also followed to get the permission to conduct research in their schools. In that process questionnaires were shown to them for approval. With that it was also conveyed that a test (post-test) will be conducted for research purpose. Randomly selected students were the sample population from whom the data had been collected.

3.7. Data Analysis :

Independent two samples t-tests were performed to determine the significance of difference in student achievement between the two means of pre-test and two means of post test scores of students who got the instruction through CAL and students who got the instruction through traditional method for the school in 2015. The following research questions and corresponding null hypotheses (H0) were the focus of this study. SPSS computer software was used to perform the statistical analysis needed for this study.

Data analysis was performed to address the following research questions and the corresponding null hypothesis:

a. The research hypothesis was to find whether the student achievement was greater for the students who had received instruction in specific topics of general science through CAL than the students who had received instruction for those specific topics in general science through traditional method. The following null hypothesis, ―post-test scores of students who received general science instruction through CAL are no different from the post-test scores of students who received traditional instruction in general science (H0: μ group1 = μ group2), was examined using SPSS computer software.

b. The second research hypothesis was to find whether the students' achievement was same for the both student groups who had received

instruction in specific topics of general science through traditional method. The following null hypothesis, ―pre-test scores of students of both experimental and control groups are not different when received instruction in traditional method in general science, (H0: μ TRD (group1) = μ TRD (group2)), was examined using SPSS computer software.

c. To verify other factors which might have an influence in the post-test score were also investigated in this experimental research. Factors such as father's and mother's education level, occupation of family head, number of earning members of the family, inter generational literacy of the family and how much time the students spent on study as well as watching television. Answer of some additional research questions and hypotheses had been given by cross tabulation and correlation analysis.

- Does father's education level affect the post-test scores of both experimental and control group?
- Does mother's education level affect the post-test scores of both experimental and control group?
- Does the occupation of the family head affect the post-test scores of both groups?
- Does number of earning member of the family affect the post-test scores of both groups?
- Does generation-wise education status have an effect on student's outcome?
- Does higher study time have an effect on the post test scores of both experimental and control group?
- Does televiewing time have an effect on the post-test achievement of both experimental and control group?

Cross tabulations were conducted to get the information about the relation between two variables. With that Correlation Coefficient was used in this study

to investigate the co-movement between two variables of above research questions. All the analyses were done with the help of SPSS software.

3.8. Summary :

The purpose of the study was to determine if the instruction given through CAL had an impact on eighth standard students' achievement over specific topics of general science subject. This study examined student general science scores of the pre-test and post-test held in 2015 and 2016 respectively. Students were divided into two groups – experimental group and control group. The experimental group was comprised of students who got the instruction through CAL after pre-test and the control group was comprised of students who did not get the instruction through CAL. SPSS computer software was used in this study to perform all the statistical analysis needed for the study. Independent two samples *t*-tests were conducted to determine the effect. Chapter four describes the results of the statistical analyses of the data.

CHAPTER FOUR

Results

4.1 Introduction :

The purpose of the study is to determine if students' achievement is greater in eighth standard general science subject for those who received instruction through CAL than for students who received traditional instruction. The study focused on four rural schools from one district and one upazila. A total of 129 students who received instruction through CAL were from experimental schools and 143 students who received traditional instructions were from control schools. Total 272 eighth standard students from four rural schools for 2015 school years were part of this study.

A statistical computer software (SPSS) was used for the analysis portion of the research. A *t*-test for two independent samples was conducted to determine if student achievement is greater for students who received general science instruction through CAL than student achievement for students who received general science instruction in a traditional class setting in eighth standard science.

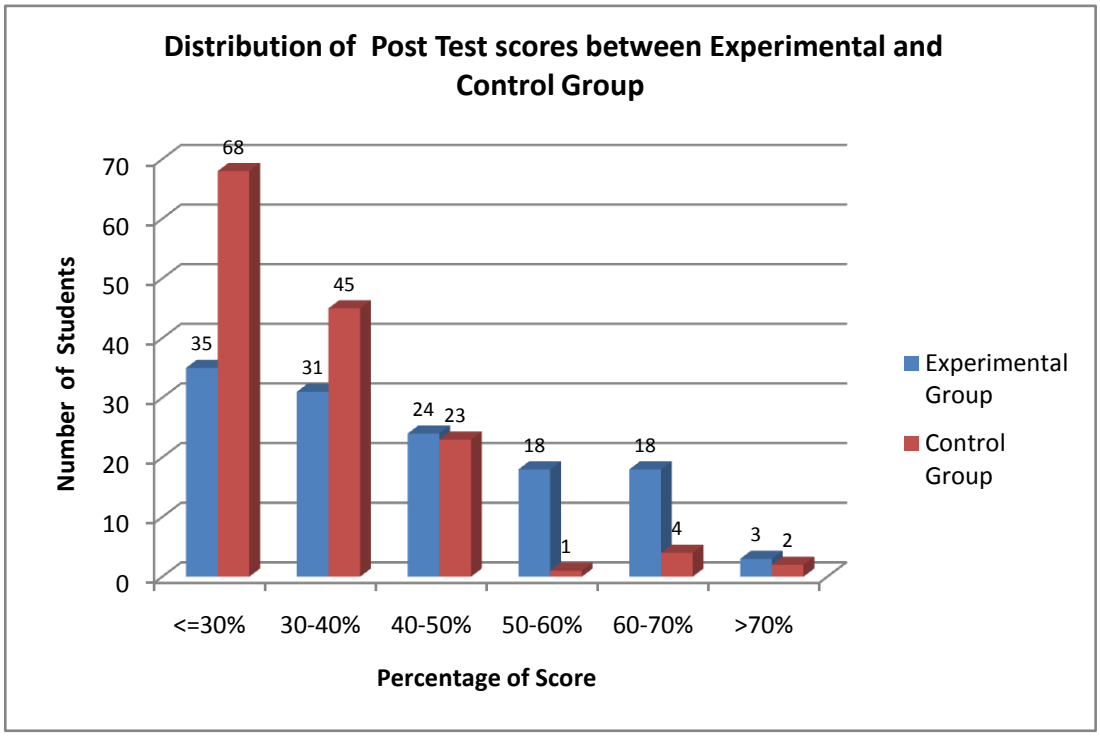
4.2. Hypotheses Testing Results

4.2.a. Comparing Post Test Achievement :

The first hypothesis is addressed by using an independent two samples *t* test for the following null hypothesis: Post test score of students who received general science instruction through CAL are no different from the Post test score of students who received traditional instruction in general science (H0: μ group1 = μ group2).

The alternative hypothesis is: the post test score of students who received general science instruction through CAL are different from the Post test score of students who received traditional instruction in general science (H0: μ group1 ≠ μ group2).

A *t*-test for independent two samples was used to compare Post test of students who received instruction through CAL (experimental group) with the Post test scores of students who did not received instruction through CAL program (control group). The below figure represents the Post test score distribution between experimental and control group -



(Source: Field data)

Figure 4.1. Distribution of Post test scores between Experimental and Control group

The figure 4.1 is explaining that the achievement of experimental group is better than control group in post test. In Table 4.1 and Table 4.2 the results of the statistical test is illustrated.

Table 4.1

Post Test Group Statistics

Group Statistics					
	School Type	N	Mean	Std. Deviation	Std. Error Mean
Post Test scores obtained in Science	Experimental Schools	129	42.83	16.722	1.472
	Control Schools	143	34.62	11.780	.985

Here the mean of each of the two groups 'Experimental School & Control School' are in the "Group Statistics" section. The Table 4.1 shows that 129 students of experimental school and 143 students of control school are included in the test. This output also shows that the average post-test score of the Experimental School, which is 42.83, is higher than that of the Control School, which is 34.62.

This difference of mean [42.83-34.62 = 8.21] is also reflected in the Table 4.2. The chance of having this difference between two means is highly significant as p value is less than the level of significance ($\alpha = 0.05$).

Table 4.2

Result of t-test based on General Science performance in Post test

Independent Samples t-Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Post Test scores obtained in Science	Equal variances assumed	21.312	.000	4.718	270	.000	8.214	1.741	4.787	11.642
	Equal variances not assumed			4.637	227.207	.000	8.214	1.771	4.724	11.705

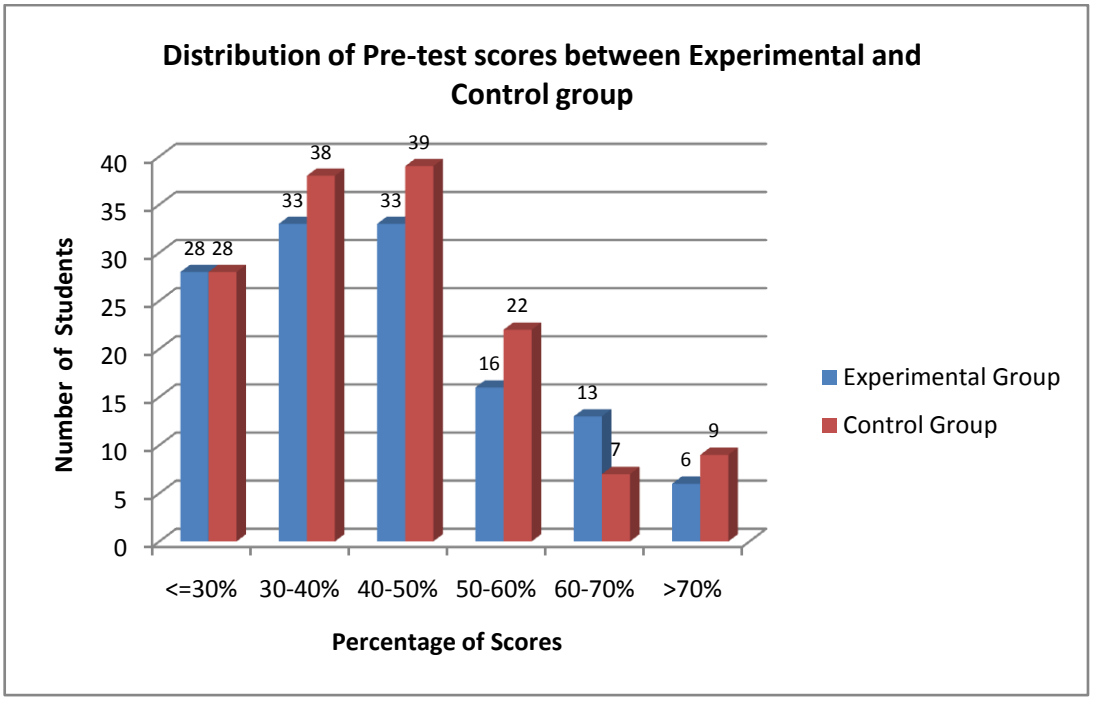
In Table 4.2, the result shows that t = 4.718, with 270 d.f. and p-value =0.000, which is less than the level of significance ($\alpha = 0.05$), implying that the difference in means with experimental school and control school are statistically significant at the 5% level of significance. In other words, in the Table 4.2, the Levene's test for equality of variance yields a p-value of 0.000 which means that the difference between the variance is statistically significant. The 95% confidence interval for the difference between two means is (4.78, 11.64). So, the null hypothesis is rejected and the alternative hypothesis is accepted. The result illustrates that the average Post test general science score of students who received General Science instruction through CAL is higher than the students who received general science instruction through traditional method.

4.2.b. Comparing Pre-test Achievement :

The second question is - Does achievement is same for both experimental and control group students when received instruction in science through traditional method? The following null hypothesis — Pre-test scores of students of both experimental and control groups are not different when received instruction in traditional method in general science. (H0: μ TRD(group1) = μ TRD (group2)), was examined using SPSS computer software.

The alternative hypothesis is: The pre-test general science scores of experimental school students are different from the pre-test general science scores of control school students (H0: μ TRD(group1) $\neq$ μ TRD (group2)). A t-test for two independent samples was used to compare the two groups. Here both groups received traditional instruction for general science course.

The figure below is illustrating the Pre-test score distribution of experimental and control schools –



Source: Field data

Figure 4.2. Distribution of Pre-test scores between Experimental and Control group

The figure 4.2 illustrating that the distribution of scores between experimental and group is almost same. To find out the difference statistical test has been done. Table 4.3 and Table 4.4 illustrated the result of statistical test -

Table 4.3

Pre-test Group Statistics

Group Statistics					
	School Type	N	Mean	Std. Deviation	Std. Error Mean
Pre-Test scores obtained in Science	Experimental Schools	129	43.19	15.196	1.338
	Control Schools	143	43.62	14.126	1.181

Here, the mean of each of the two groups 'Experimental School & Control

School' are in the "Group Statistics" section. The Table 4.3 shows that 129 students of experimental school and 143 students of control school are included in the test. This output also illustrates that the average half yearly exam score of the Control School, which is 43.62, is slightly higher than that of the Experimental School but the two values are nearly same.

This mean difference [43.62-43.19 = 0.43] is also reflected in the Table 4.4. The chance of having this difference between two means are not significant as p value is higher than the level of significance ($\alpha = 0.05$).

Table 4.4

Result of t-test based on General Science performance in Pre-test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Pre-test scores obtained in Science	Equal variances assumed	.907	.342	-.237	270	.813	-.422	1.778	-3.922	3.079
	Equal variances not assumed			-.236	261.890	.813	-.422	1.785	-3.936	3.093

Here t = -0.237, with 270 d.f. and p-value = 0.813, which is greater than the level of significance (α =0.05), implying that the difference in means with experimental school and control school are not statistically significant at the 5% level of significance. So, the null hypothesis is accepted and the alternative hypothesis is rejected. Hence, there is no significant difference between scores of pre-test of two groups, which essentially states that when instruction method is same, here which was traditional method, there is no difference in student achievement at $t(270) = -0.237$ and $p = 0.813$.

Also, in the Table 4.4, the Levene's test for equality of variance yields a p-value of 0.342 as well which means that the difference between the variance is not statistically significant. The 95% confidence interval for the difference between two means is (-3.922, 3.079).

4.3. Results of other Factors' Involvement with Students' Achievement

To see whether other factors are influencing the students Post test scores some covariate variables are also scrutinized. Covariate variables like Father and mother's education, inter generational literacy of the family, occupation of family head, number of earning members of the family, time spent on study, time spent watching television are being examined. These variables can promote indirect effects on students' achievement. The data of these variables were collected from the response of CAL questionnaire.

4.3.a. Father's Education :

The research question is : Does father's education level affect the post test scores of both experimental and control group? Several researches have shown that father's educational level effects their son's or daughter's education. Researchers had noted that educational achievement of a child's parents is a good predictor of the academic achievement of the child, other things being equal.

In this research, year wise father's education level had been collected with the help of students. The mean, standard deviation and standard error of 'father's education level' are as follows –

Table 4.5

Group Statistics of Father's Education

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
Father's Education	13.08	19.744	1.73	129	12.15	18.807	1.572	143

The standard deviation is 19.744 for experimental school and 18.807 for control school, which explains that the data are not very concentrated around the mean. Though standard error is 1.73 and 1.572 respectively which clarifies that sample mean is small and reflecting the actual population mean.

Based on the 'father's education' data, four categories of educational level have been created – No education, Class 1to 12, class 13 to 18 and father absent. To verify the effect of father's education on student achievement a cross tabulation has been produced with the post test score.

Table 4.6

Cross Tabulation of Father's Education and Post test

Type of School	Post test exam score obtained in science (in %)	Year-wise Father's Education				Total
		No Education	1-12	13-18	Father Absent	
Experimental Schools	<= 30%	1	26	6	2	35
	30-40%	7	21	2	1	31
	40-50%	5	13	5	1	24
	50-60%	3	8	6	1	18
	60-70%	4	10	4	0	18
	> 70%	0	1	1	1	3
	Total	20	79	24	6	129
Control Schools	<= 30%	6	55	5	2	68
	30-40%	6	30	6	3	45
	40-50%	5	12	5	1	23
	50-60%	0	1	0	0	1
	60-70%	0	4	0	0	4
	> 70%	0	0	2	0	2
	Total	17	102	18	6	143

Source: Field data

It is true that in a regular school, percentage of low scoring student is small, so as high scoring students. But in the above table it is showing that maximum students those whose father's education level is from 1 to 12 got the lowest mark. Also 11 students those whose father's education level is from 13 to 18 got below 30% in post test exam. And only 3 students got above 70% marks whose father's education level is 13 to 18. With that 4 students got 60-70% score whose father has no education in experimental school. So for this study it is clear that father's education level has no effect on students' Post test achievement in eighth standard science.

To verify the relationship between father's education level and students' achievement a statistical correlation has been calculated. The null hypothesis is: Father's education level is not affecting the post test scores of both experimental and control group. The result of Pearson or product-moment correlation is –

Table 4.7

Pearson Correlation Coefficient of Father's education and Post test for Experimental Group

Correlations			
		Father's Education	Post Test exam score obtained in Science
Father's Education	Pearson Correlation	1	.023
	Sig. (2-tailed)		.795
	N	129	129
Post Test exam score obtained in Science	Pearson Correlation	.023	1
	Sig. (2-tailed)	.795	
	N	129	129

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to 0.023 which indicates a very weak positive relationship between father's education and post test exam score in experimental schools. This

means that father's education does have an effect on students' achievement but for this study the relation is very weak. Also the p-value (2-tailed) is 0.795, indicates that there is no statistically significant correlation between two variables at α = .05. Hence the null hypothesis is accepted and concludes that father's education is not related to student's post test exam score in experimental school.

Table 4.8

Pearson Correlation Coefficient of Father's Education and Post test for Control Group

Correlations			
		Father's Education	Post Test exam score obtained in Science
Father's Education	Pearson Correlation	1	.050
	Sig. (2-tailed)		.551
	N	143	143
Post Test exam score obtained in Science	Pearson Correlation	.050	1
	Sig. (2-tailed)	.551	
	N	143	143

From the above correlation table, it can be seen that the correlation coefficient (r) is equal to 0.050 which indicates a very weak positive relationship between father's education and post test exam score in control schools. This also explains that there is a relation between father's education and students' achievement but the relation is very weak for this study. The p-value (2-tailed) is 0.551, indicates that there is no statistically significant correlation between two variables at α = .05. So we can accept the null hypothesis and conclude that father's education is not related to student achievement in control group.

4.3.b. Mother's Education :

Mother's education effect children's outcome in many ways. It has been

observed that those mothers whose education level is higher help children in their homework and understand the subjects and lesson more than those how have less education level, other things being equal. In this study mother's education level has been collected through the student questionnaire. The research question is - Does mother's education level affect the post test scores of both experimental and control group?

The mean, standard deviation and standard error are as follows-

Table 4.9

Group Statistics of Mother's education

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
Mother's Education	10.09	14.440	1.27	129	8.72	13.956	1.167	143

The std. deviations for 'mother's education' are 14.440 and 13.956 for experimental and control school respectively, which illustrates that data are not concentrated around the mean but the std. errors are small which explains that sample is representing the overall population.

A cross tabulation has been generated with mother's education level and students' post test score –

Table 4.10

Cross tabulation of Mother's education and Post test

Type of School	Post test exam score obtained in science (%)	Year-wise Mother's Education				Total
		No Education	1-12	13-18	Mother Absent	
Experimental Schools	<= 30%	3	28	2	2	35
	30-40%	3	27	1	0	31
	40-50%	6	16	1	1	24
	50-60	2	13	3	0	18
	60-70%	2	13	3	0	18
	> 70%	0	2	1	0	3
	Total	16	99	11	3	129
Control Schools	<= 30%	12	54	1	1	68
	30-40%	12	30	2	1	45
	40-50%	2	19	1	1	23
	50-60%	0	1	0	0	1
	60-70%	0	3	1	0	4
	> 70%	0	0	2	0	2
	Total	26	107	7	3	143

Source: Field data

The above table shows that in experimental school, children of those mothers whose education level is from 1 to 12 scored low to moderate. Two students out of 3 in this category scored above 70% whose mother's education level is 1-12 in experimental school. But in control school maximum student scored low whose mother's education level is 1 to 12. Two students scored 60-70% whose mother has 'no education' in experimental school.

In the experimental school 7 students out of 11 got above 50% whose mother's education level is 13-18. Where as in control school 3 students out of 7 scored above 50% whose mother's education level is 13-18. As the number of mothers whose education level is higher is very low so it is difficult to put any conclusion based on these results for this particular study.

To find whether mother's education level affects student's post test

achievement, statistical correlation has been generated. For this the null hypothesis is: Mother's education level is not affecting the post test scores of both experimental and control group. The results are as follows –

Table 4.11

Pearson Correlation coefficient of Mother's education and Post test for Experimental Group

Correlations			
		Mother's Education	Post Test exam score obtained in Science
Mother's Education	Pearson Correlation	1	-.108
	Sig. (2-tailed)		.222
	N	129	129
Post Test exam score obtained in Science	Pearson Correlation	-.108	1
	Sig. (2-tailed)	.222	
	N	129	129

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to -0.108 which indicates a very weak negative relationship between mother's education and post test exam score in experimental school. That means mother's education does have an effect on child's outcome but that effect is not strong or in other words it is nearly unrelated. The negative relation implies that not only mother's education but other factors of mother-child relation might be affecting the result. The p-value (2-tailed) is 0.222, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$. Hence we can accept the null hypothesis and conclude that mother's education is not related to student's achievement in experimental group.

Table 4.12

Pearson Correlation coefficient of Mother's education and Post test for Control Group

Correlations			
		Mother's Education	Post Test exam score obtained in Science
Mother's Education	Pearson Correlation	1	.070
	Sig. (2-tailed)		.403
	N	143	143
Post Test exam score obtained in Science	Pearson Correlation	.070	1
	Sig. (2-tailed)	.403	
	N	143	143

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to 0.070 which indicates a very weak positive relationship between mother's education and post test exam score in control school. This illustrates that mother education has an effect on children outcome in this study but very inadequately. The p-value (2-tailed) is 0.403, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$. Hence we can accept the null hypothesis and conclude that mother's education is not related to student's post test score in control group.

4.3.c. Occupation of Family Head :

Occupation refers to a person's usual or main work or business, specifically as a factor of earning to live. So the occupation of father or mother or family head plays a very important role in children's educational outcome. Types and status of occupation perform a very important role directly or indirectly in student's performance. So, does the occupation of the family head affect the post test scores of both groups? To verify the influence of occupation of the family head on the student achievement a cross tabulation is generated based on the data which were provided by the students through questionnaire. The collected occupational status categorized into two section – manual and non-manual labor. Manual labor involves physical strength and non-manual labor

involves mostly mental activity rather than physical strength. To identify the manual and non-manual labor, three other options were placed with the occupation column in the questionnaire, which are – *i) Done by self, ii) done by self and employee and iii) Done by employee*. So the occupation 'farmer' which is actually a manual job can be non-manual when the job is done by employee only. After categorization a calculation has been done and the result is –

Table 4.13

Cross Tabulation of Occupation of family head and Post test

Type of School	Post test exam score obtained in Science (in %)	Occupation of Family Head						Total
		Manual Labour		Non-Manual Labour		Not Applicable		
		No.	%	No.	%	No.	%	
Experimental Schools	<= 30%	26	(20.15%)	8	(6.20%)	1	(.77%)	35
	30-40%	27	(20.93%)	4	(3.10%)	0	0	31
	40-50%	18	(13.95%)	6	(4.65%)	0	0	24
	50-60%	11	(8.52%)	7	(5.43%)	0	0	18
	60-70%	13	(10.07%)	5	(3.87%)	0	0	18
	> 70%	1	(.77%)	1	(.77%)	1	(.77%)	3
	Total	96	74.42%	31	24.03%	2	1.55%	129
Control Schools	<= 30%	62	(43.36%)	6	(4.19%)	0	0	68
	30-40%	37	(25.87%)	7	(4.89%)	1	(.69%)	45
	40-50%	18	(12.58%)	5	(3.49%)	0	0	23
	50-60%	1	(.69%)	0	0	0	0	1
	60-70%	3	(2.09%)	1	(.69%)	0	0	4
	> 70%	0	0	2	(1.39%)	0	0	2
	Total	121	84.62%	21	14.68%	1	.69%	143

Source: Field data

From the above table it is clear that maximum number of family head is engaged in manual labor in this study. In experimental school, children of almost 74% manual labor secured <=50% score. And almost 26% manual labors' children secured above 50% in post test score. Where almost 58% non-manual labor's children scored <=50% in post test score and almost 42% non-manual labor's children scored above 50%. From the above table it is clear

that maximum student from experimental school, who scored less than or equal to 50%, belong to those family where head of the family is engaged in manual labor. To compare the two categories to find out which category scored better to secure above 50%, it is clear that non-manual group scored better to secure above 50% in experimental school.

The explanation is very simple for control school as 117 out of 143 students scored less than or equal to 50% whose family head engaged in manual labor. And the percentage is higher for non-manual labor's children to obtain above 50% marks though the number is very small. 14% non-manual labor's children scored above 50%, where only 3% manual labor's children scored above 50% in control school.

But, as the distribution of participant is not equal for categories, it is not logical to come to any conclusion. However, apparently for this study, students whose family head involved in non-manual labor scored better in general science post test.

4.3.d. Number of Earning Members of the Family :

If good earning is related with better education for children, it is also associated with number of earning member of the family. If labor force participation is higher in a family, it begets more income flows in the family and besides it other opportunities also lead to better educational opportunity for the children.

The research question is - Does number of earning members of the family affect the post test scores of both groups? First, the mean, standard deviation and standard error of 'number of earning members of the family' has been calculated. The end result of calculation has delivered the average, variance of mean, and accuracy of data respectively.

Table 4.14

Group Statistics of 'Number of earning members'

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
Number of earning members of the family	1.33	.675	.059	129	1.36	.698	.058	143

Here, the standard deviation is .675 for experimental schools and .698 for control schools, which reflects that data are concentrated around the mean and standard error is .059 and .058 respectively which tells that sample mean is reflecting the actual population mean.

To identify if the number of earning members has any effect on students' achievement a cross tabulation has been generated with post test exam score. In table below, the category 'No earning member' explains that these families are financially supported by extended family. The table below explains an overall effect –

Table 4.15

Cross Tabulation of Number of earning member' and Post test

Name of the school	Post test exam score obtained in Science (%)	Number of earning members of the family					Total
		No earning members	1 earning member	2 earning members	3 earning members	4 earning members	
Experimental Schools	<= 30%	1	26	4	3	1	35
	30-40%	0	26	4	1	0	31
	40-50%	0	17	7	0	0	24
	50-60%	0	12	5	1	0	18
	60-70%	1	10	6	1	0	18
	> 70%	1	0	1	0	1	3
	Total	**3**	**91**	**27**	**6**	**2**	**129**
Control Schools	<= 30%	0	54	9	5	0	68
	30-40%	1	28	8	8	0	45
	40-50%	0	19	2	1	1	23
	50-60%	0	0	1	0	0	1
	60-70%	0	4	0	0	0	4
	> 70%	0	0	2	0	0	2
	Total	**1**	**105**	**22**	**14**	**1**	**143**

Source: Field data

Table shows that most of the family has single earning member. In experimental school 91 out of 129 participants has single earning member and in control school 105 out of 143 has single earning member. But percentage wise students scored better whose family has two earning members for both experimental and control school.

The null hypothesis for correlation is – Number of earning members of the family is not affecting the post test scores of both experimental and control group. A correlation has been computed and the result is –

Table 4.16

Pearson Correlation Coefficient of 'Number of earning members' and Post test for Experimental Group

Correlations			
		Number of earning members of the family	Post Test exam score obtained in Science
Number of earning members of the family	Pearson Correlation	1	.060
	Sig. (2-tailed)		.502
	N	**129**	**129**
Post Test exam score obtained in Science	Pearson Correlation	.060	1
	Sig. (2-tailed)	.502	
	N	**129**	**129**

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to 0.060 which indicates a very weak but positive relationship between number of earning members of the family and post test exam score. So we can say that though we get a positive relation between these two variables which explains that higher number of earning member helps to achieve good outcome, the value of relation is near to zero. Also the p-value (2-tailed) is 0.502, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$. That's why we can conclude that number of earning members of the family is not related to student's achievement in experimental group.

Table 4.17

Pearson Correlation Coefficient of 'Number of earning member' and Post test for Control Group

Correlations			
		Number of earning members of the family	Post Test exam score obtained in Science
Number of earning members of the family	Pearson Correlation	1	.069
	Sig. (2-tailed)		.416
	N	**143**	**143**
Post Test exam score obtained in Science	Pearson Correlation	.069	1
	Sig. (2-tailed)	.416	
	N	**143**	**143**

The Correlation table explains that the correlation coefficient (r) is equal to 0.069 which indicates a very weak positive relationship between number of earning members of the family and post test exam score of control school. So we can say that though the relation is positive but it is very weak, near to zero. Also p-value (2-tailed) is 0.416, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$, so the number of earning members of the family is not related to student's post test exam score in control schools.

4.3.e. Inter Generational Literacy :

Many researches claim that students score better when students belong to a family which had a long school going history, in other words, had an educational history for generations. Researchers tried to show that those students whose grand parents went to school get better support from family than those students whose brother or sister or that student himself/herself went to school first from that family. It is also noticed that parents who went to school for first time in their family but dropped out early don't support their children to get better education. The research question of this section is - Does inter generational literacy have an effect on student's outcome?

First, with the sample data the mean, standard deviation and standard error of the variable '1st member of family to go to school' has been calculated to know the average, variance of mean, and accuracy of data respectively.

Table 4.18

Group Statistics of Inter Generational Literacy

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
1st member of family to go to school	1.65	.633	.055	129	1.97	.509	.042	143

Here, the standard deviation is .633 for experimental group and .509 for control group, which reflects that data are concentrated around the mean and standard error is .055 and .042 respectively which tells that sample mean is reflecting the actual population mean.

In this section, the students have been segregated in 3 categories to identify the inter generational literacy. 1st generation belongs to those students whose grand parents went to school. 2nd generation assigned to parents, uncles and aunts. And 3rd generation are those students whose elder brother, sister and the student himself/herself went to school for the first time in their family. The cross tabulation shows-

Table 4.19

Cross Tabulation of Inter generational literacy and Post test

Name of the school	Post test exam score obtained in Science (%)	1st member of family to go to school						Total
		1st Generation		2nd Generation		3rd Generation		
		No.	%	No.	%	No.	%	
Experimental Schools	<= 30%	12	9.3%	22	17.05%	1	.77%	35
	30-40%	12	9.3%	17	13.17%	2	1.55%	31
	40-50%	11	8.52%	9	6.97%	4	3.1%	24
	50-60%	10	7.75%	6	4.65%	2	1.55%	18
	60-70%	8	6.20%	8	6.20%	2	1.55%	18
	> 70%	3	2.32%	0	0	0	0	3
	Total	**56**	**43.39%**	**62**	**48.04%**	**11**	**8.52%**	**129**
Control Schools	<= 30%	7	4.89%	53	37.06%	8	5.59%	68
	30-40%	9	6.29%	30	20.97%	6	4.19%	45
	40-50%	3	2.09%	18	12.58%	2	1.39%	23
	50-60%	0	0	1	.69%	0	0	1
	60-70%	1	.69%	3	2.09%	0	0	4
	> 70%	1	.69%	1	.69%	0	0	2
	Total	**21**	**14.65%**	**106**	**74.08%**	**16**	**11.17%**	**143**

Source: Field data

In experimental schools, it has been observed that though the numbers of students are higher for those whose 2nd generation received the formal education first but students' performance is better for those whose 1st

generation got the opportunity to receive formal education. And only 11 students out of 129 students belong to 3rd generation, so it is difficult to conclude but apparently students' achievement is not good in this case.

In control schools also the number of students is very high for those whose 2nd generation went to school first but the performance level is better for those students whose 1st generation went to school in their family. And performance level is low for 3rd generation, in control schools.

From the above result it is difficult to conclude that students whose 1st generation went to school first in their family performed better in this study, because year-wise education information for 1st generation is difficult to collect from the students. So, if anyone's grandparents dropped out after pre-school or 1st or 2nd standard then question can be raised about their contribution.

4.3.f. Time Spent on Study :

To find out whether study time and student achievement has a relationship cross tabulation and correlation analysis have been executed. The research question is - Does higher study time have an effect on the post test scores of both experimental and control group? Before exploring the cross table the mean, standard deviation and standard error of 'time spent on study at home' is presented below to know the average, variance of mean, and accuracy of data respectively.

Table 4.20

Group Statistics of 'Time spent on Study'

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
Time spent on study at home	3.78	1.145	.100	129	3.67	1.271	.106	143

Here, the standard deviation is 1.145 for experimental group and 1.271 for control group, which reflects that data are concentrated around the mean and standard error is .100 and .106 respectively which tells that sample mean is reflecting the actual population mean.

In this particular research, students had mentioned how much time they usually spent for study through the questionnaire. On the basis of that data it can be observed in the cross tabulation that maximum students who replied that they spent 3 to 4 hours in study got marks below 30% for both type of group. In experimental group 10 students out of 39 scored above 50% when studied for 1 to 3 hours and rest of 29 students scored above 50% when studied for 4 and above hours. In control group 3 out of 7 students scored above 50% when studied at home for one to three hours and rest of 4 students scored above 50% when studied for 4 and above hours. So quality and quantity may have some bearing on the outcome. Also race, peer and class attendance may also have significant impact on this situation.

Table 4.21

Cross Tabulation of 'Time spent on study' and Post test

Name of the school	Post test exam score obtained in Science (%)	Time spent on study at home						Total
		1 hour	2 hours	3 hours	4 hours	5 hours	> 5 hours	
Experimental Schools	<= 30%	1	5	8	17	1	3	35
	30-40%	1	4	7	16	2	1	31
	40-50%	1	1	5	13	2	2	24
	50-60%	1	0	1	9	3	4	18
	60-70%	0	3	4	7	2	2	18
	> 70%	0	0	1	0	2	0	3
	Total	**4**	**13**	**26**	**62**	**12**	**12**	**129**
Control Schools	<= 30%	1	13	22	20	8	4	68
	30-40%	1	8	12	10	9	5	45
	40-50%	0	2	6	7	3	5	23
	50-60%	0	0	0	1	0	0	1
	60-70%	1	0	1	0	1	1	4
	> 70%	0	1	0	1	0	0	2
	Total	**3**	**24**	**41**	**39**	**21**	**15**	**143**

To find out whether there is any relationship between these two variables correlation has been computed. The null hypothesis is – Higher study time has no effect on the post test scores of both experimental and control group.

Table 4.22

Pearson Correlation Coefficient of 'Time spent on study' and Post test for Experimental Group

Correlations			
		Time spent on study at home	Post Test exam score obtained in Science
Time spent on study at home	Pearson Correlation	1	.167
	Sig. (2-tailed)		.059
	N	**129**	**129**
Post Test exam score obtained in Science	Pearson Correlation	.167	1
	Sig. (2-tailed)	.059	
	N	**129**	**129**

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to 0.167 which indicates a weak positive relationship between duration of time spent by the student for study at home and post test exam score. This explains that there is a relation between these two variables and which is a positive one but weak. The p-value (2-tailed) is 0.059, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$, so we can conclude duration of time spent on study at home is not related to post test exam score in experimental group.

Table 4.23

Pearson Correlation Coefficient of 'Time spent on study' and Post test for Control Group

Correlations			
		Time spent on study at home	Post test exam score obtained in Science
Time spent on study at home	Pearson Correlation	1	.114
	Sig. (2-tailed)		.176
	N	**143**	**143**
Post Test exam score obtained in Science	Pearson Correlation	.114	1
	Sig. (2-tailed)	.176	
	N	**143**	**143**

From the Correlation table, it can be seen that the correlation coefficient (r) is equal to 0.114 which indicates a very weak positive relationship between duration of time student spent for study at home and post test exam score. Here also the result is positive but very weak. The p-value (2-tailed) is 0.176, indicates that there is no statistically significant correlation between two variables at $\alpha = .05$, as a result we can conclude amount of time spent on study at home is not related to post test exam score for control school.

4.3.g. Time Spent on Watching Television :

To find out the effect of televiewing time on student achievement quality and quantity of televiewing has been examined in this section. Does televiewing time have an effect on the post test achievement of both experimental and control group? - is the research question of this segment. The content wise frequency table and time wise cross table with post test scores has been investigated in this part. Also correlation analysis has been inquired to know the correlation between televiewing time and students' post score.

Table 4.24

Group Statistics of 'Time spent on watching television

	Experimental Group				Control Group			
	Mean	Std Deviation	Std. Error	N	Mean	Std Deviation	Std. Error	N
Time spent watching T.V.	1.85	1.206	.106	129	1.52	.956	.079	143

In the above table the standard deviation is 1.206 for experimental schools and .956 for control schools, which reflects that data are concentrated around the mean and standard error is .106 and .079 respectively which tells that sample mean is reflecting the actual population mean.

For this particular topic this study observed that most of the students watched several programs for their entertainment. Like most of the students of experimental group watched news, sports, study and science related program on TV. And students of control school mostly watched sports, News, science related and serial/drama. Two groups watched almost same type of content. The table below explained the frequency of responses.

Table 4.25

Frequency table of television contents watched by the students

Type of Program	**Responses of Experimental Group**			**Responses of Control Group**		
	N	**Percent**	**% of Cases**	**N**	**Percent**	**% of Cases**
Serial/Drama	36	11.7%	27.9%	38	13.1%	26.6%
News	54	17.5%	41.9%	52	18.0%	36.4%
Sports	53	17.2%	41.1%	70	24.2%	49.0%
Cartoon	42	13.6%	32.6%	27	9.3%	18.9%
Study related	41	13.3%	31.8%	26	9.0%	18.2%
Program on Animals	33	10.7%	25.6%	35	12.1%	24.5%
Science related	49	15.9%	38.0%	41	14.2%	28.7%
Not applicable	1	0.3%	0.8%	-	-	-
Total	**309**	**100.0%**	**239.5%**	**289**	**100.0%**	**202.1%**

Source: Field data

Now, to find out how much time students spent watching TV and their achievement in post test exam, a cross tabulation has been generated.

Table 4.26

Cross Tabulation of 'Time spent on watching television' and Post test

Type of School	Post test exam score obtained in Science (%)	Time spent on watching Television							Total
		1 hour	2 hours	3 hours	4 hours	5 hours	> 5 hours	N/A	
Experimental Schools	<= 30%	17	8	7	0	1	2	0	35
	30-40%	13	9	4	4	0	0	1	31
	40-50%	12	9	2	0	0	1	0	24
	50-60%	9	7	2	0	0	0	0	18
	60-70%	10	7	1	0	0	0	0	18
	> 70%	3	0	0	0	0	0	0	3
	Total	**64**	**40**	**16**	**4**	**1**	**3**	**1**	**129**
Control Schools	<= 30%	51	14	1	1	1	0	0	68
	30-40%	25	16	2	2	0	0	0	45
	40-50%	12	8	1	0	1	0	1	23
	50-60%	0	0	1	0	0	0	0	1
	60-70%	3	1	0	0	0	0	0	4
	> 70%	0	2	0	0	0	0	0	2
	Total	**91**	**41**	**5**	**3**	**2**	**0**	**1**	**143**

Source: Field data

The above table explains that most of the students watched T.V. for 1 to 2 hours. And it is also clear from the table that though the students watched television for 1 hour their score was not good in post test. From the cross table it is clear that experimental group scored better when watched the television for less time. 17% students scored above 50% marks when they watched television for one hour in experimental group. And only 2% scored above 50% marks in control group when watched the television for one hour though 64% students of

control school watched television for one hour. When televiewing for 2 hours, 11% students from experimental group scored above 50% and below <=70%. Where 2% student from control schools scored above 50%, when watched television for 2 hours. From this 2% students two students scored above 70%. So it is clear that experimental group scored less when they watched television for long hours. But no such trend is visible for control group. So there could be other factors which might play role in their achievement.

Pearson Correlation has been examined to find out whether there is any relation between 'time spent for watching Television' and 'score'. The null hypothesis is – Times spent on watching Television is not affecting the achievement of both experimental and control group.

Table 4.27

Pearson Correlation Coefficient of 'Time spent on watching television' and Post test for Experimental Group

Correlations			
		Time spent on watching Television	Post Test exam score obtained in Science
Time spent on watching Television	Pearson Correlation	1	-.153
	Sig. (2-tailed)		.082
	N	**129**	**129**
Post Test exam score obtained in Science	Pearson Correlation	-.153	1
	Sig. (2-tailed)	.082	
	N	**129**	**129**

From the Correlation table, it is clear that the correlation coefficient (r) is equal to -0.153 which is indicating a very weak negative relationship between time spent for watching TV and post test exam score. This makes clear that increased television watching time have an effect on students' outcome though here it is very weak. The p-value (2-tailed) is 0.082, indicates that there is not statistically significant correlation between two variables at $\alpha = .05$. Hence we can conclude that time spent on watching TV is not related to post test exam score in experimental schools.

Table 4.28

Pearson Correlation Coefficient of 'Time spent on watching television' and Post test for Control Group

Correlations			
		Time spent on watching Television	Post Test exam score obtained in Science
Time spent on watching Television	Pearson Correlation	1	.171*
	Sig. (2-tailed)		.041
	N	**143**	**143**
Post Test exam score obtained in Science	Pearson Correlation	.171*	1
	Sig. (2-tailed)	.041	
	N	**143**	**143**
*. Correlation is significant at the 0.05 level (2-tailed).			

From the Correlation table of control schools, it can be seen that the correlation coefficient (r) is equal to 0.171 which is indicating a weak but positive relationship between times spent for watching TV and post test exam score. Here it is positive because from the cross table above (Table No. 4.26) it is clear that students of control schools watched television for lesser time than experimental school. The p-value (2-tailed) is 0.041, indicates that there is statistically significant correlation between two variables at $\alpha = .05$. Hence the null hypothesis is rejected. So for control group higher TV watching time does have an effect on students' outcome in post test exam.

4.4. Summary :

After testing the data with SPSS statistical software the result revealed that CAL has positive effect on student achievement and student scored better when receive instruction through CAL. With that, when both group of students received instruction through traditional method, achievement is same for both groups. Other factors which may influence the outcome are also being tested. The result showed that no additional factors are manipulating the student achievement in this study, except one. Chapter five will discuss about the findings in detail.

CHAPTER FIVE

Discussion and Conclusion

5.1. Introduction :

The objective of the study is to find whether Computer Aided Learning has an effect on students' achievement. To fulfill this purpose an experimental research has been conducted. In experimental research, comparison between two groups is verified. Cause and effect relationship between Independent and dependent variables is checked. A total 272 eighth standard students from four schools for 2015 school year were part of this experimental research. Two groups had been formed, one was experimental group consisting of 129 students and other one was control group consisting of 143 students. In this study the independent variable is the 'instruction method' used in the classroom and dependent variable is the students' score. The study compared pre-test and post test exam scores to determine if eighth standard student's scores are greater for those who received instruction through CAL than for those who received traditional instruction. Hypotheses and research questions were formed and tested. Information analyzed quantitatively using T-test, cross tabulation and correlation with the help of SPSS software.

5.2. Summary of Findings :

Two different t-tests for independent two samples were conducted to determine if student achievement was greater for students who received general science instruction using CAL than students who received instruction by traditional method.

5.2.1. Findings of Post Test Achievement :

The first hypothesis is, post test scores of students who received general science instruction through CAL are no different from the post test scores of students who received traditional instruction in general science. The average post test scores are calculated and the average post-test score of the Experimental School is 42.83, which is higher than average post test score of Control School, which is 34.62. So the mean difference is 42.83-34.62 = 8.21. The T-test outcome showed t = 4.718, with 270 d.f. and p-value =0.000, which is less than the level of significance ($\alpha = 0.05$). Hence, there is significant difference between scores of Post-test between two groups, so the null hypothesis is rejected.

Post test was structured with 20 marks multiple choice questions. Two months after the final board examination post test was conducted in experimental and control schools. The result revealed that experimental group scored better than control group after getting instruction in CAL method. CAL as an audio-visual medium has its advantage over traditional instruction method. Students can retain the lesson for longer time after getting instruction through CAL. So when post test was conducted two months after the final examination then also the students of experimental group scored better. The retention power of CAL showed its effect on experimental students. Work done by Pilli (2008), Akengin (2011), Vinita and Banswal (2015) supported the above fact of retention. From the result it can be concluded that Computer Aided Learning has positive effect on students' achievement in general science. Similar findings also found by Kara and Kahraman (2008), Jesse at el (2014), Serin (2011), Pal, Sana and Ghose (2012). Meta analysis done by Kulik (1994), Liao (2004) and Tekbiyik and Akdeniz (2010) also support the above findings. So Computer Aided Learning is emerging as an effective medium of learning in comparison with traditional way of teaching. Lastly it can be said that

initiative taken by the policy makers to improve the learning method for sustainable education development is succeeding in rural areas also.

5.2.2. Findings of Pre-test Achievement :

To find out whether there was any difference in achievement between the groups before CAL intervention occurred in experimental schools, pre-test scores have been examined. The average mean difference of pre-test between two groups is 0.43. This is nearly same value. After performing the T-test the result showed t = -0.237, with 270 d.f. and p-value = 0.813. The p-value point out that its value is higher than the level of significance, so the null hypothesis is accepted. It is clear that when the instruction method is same for the both school there is no difference in achievement level in science. In other words, before intervention achievement levels are same for the experimental and control schools. This result is consistent with the previous studies done by Županec et al (2013), Bayrak and Bayram (2010), Hançer and Tüzemen (2008). So it is clear that intervention, which is CAL for this particular study, is showing a positive effect towards education system.

5.2.3. Findings of Other Factors' Involvement with Achievement

With pre-test, post test experimental research, other factors are also analyzed to find its involvement in the study. Covariate variables like father's and mother's education level, occupation of family head, number of earning members of the family, inter generational literacy of the family and time spent on study as well as watching television by the students have also been examined. Cross tabulation and correlation analysis have been set up to analyze these covariate variables.

5.2.3.i. Father's Education :

In this study, to identify the affect of father's education on students' achievement cross tabulation and correlation analysis have been conducted. Null hypothesis is - Father's education level is not affecting the post test scores of both experimental and control group. The cross table shows that maximum student got less than 50% marks in post test whose father's formal education level is from 1 to 12 standard. And only 8.5% students from experimental group and 1.4% students from control group scored above 50% marks whose father's education level is from 13 to 18 formal education year. With that 5% student from experimental group scored above 50% marks whose father has no formal education. So, no affirmative conclusion extracted from cross tabulation and it is easy to state that father's education doesn't have any impact on student achievement of both groups. After cross tabulation, correlation analysis has been done. The result of correlation yield a positive correlation between father's education level and post test score but the relation is very weak for experimental schools. Also for experimental school the p-value is 0.795, which indicates that there is no statistically significant correlation between two variables at $\alpha = .05$. For control schools also a very weak positive relationship is found between these two variables but no statistically significant correlation found between father's education and post test score where p-value (2-tailed) is 0.551 at $\alpha = .05$. Hence we can accept the null hypothesis and conclude that father's education is not correlated to student's post test exam score in experimental schools as well as control schools. The positive correlation found in both cases confirms that father's education has an effect on students' achievement but in this study not statistically significant.

Most of the research acknowledged that father's education level has an effect on children. On 23rd September 2014, The Guardian published a report of the Office for National Statistics (ONS) UK, which claims that children are seven and a half times less likely to be successful at school

if their father failed to achieve, compared with children with highly educated fathers. Illiterate parents are unable to help in children's study, so it not only tells upon a pupil's creativity and thinking, but also affect his/her academic achievement (Drajea & O'Sullivan, 2014). According to Maitra & Sharma (2009), the effect of parental education on children's schooling cycle varies over different stages. Mother's education is important at the initial levels but father's educational achievement has almost no role in this part. Father's educational attainment becomes crucial in the decision making part where children are about to continue on to post-secondary levels. It has also come out that parental education level had no direct effect on children's educational level. According to Sewell & Shah (1968), inconsistency in parents' educational achievements is not related to children's achievement. From the above discussion it is clear that, the weak positive correlation may occur due to other influences. Further research is needed to verify this part. But as the result is statistically insignificant so father's education is not affecting the post test score in this study.

5.2.3.ii. Mother's Education :

To identify the effect of mother's education on students' achievement a null hypothesis has been produced which is: Mother's education level is not affecting the post test scores of both experimental and control group. Cross tabulation and Pearson Correlation have been executed. Outcome of cross tabulation revealed that most students' mother's education level varies from 1 to 12. In experimental group, those students whose mother has 'no education' means no formal education scored poor as well as good. But in control group students scores are not good whose mother has 'no education'. Also experimental school students scored better than control school students whose mother's education level is from 1 to 12.

After Pearson Correlation analysis the result shows that there is a very weak negative relation between mother's education and post test exam score of experimental group. Though p-value is 0.222, indicates that there is not statistically significant correlation between two variables at $\alpha = .05$ in experimental group. And for control group Pearson correlation yield very weak positive relation between mother's education and post test achievement. With that p-value (2-tailed) is 0.403 which is statistically insignificant at $\alpha = .05$. The above results reveal that in both cases the null hypothesis is accepted. The correlation is negative, though very weak for experimental group which means that post test scores increase as the education level of mother decreases. The negative relation signifies that not only mother education but other factors of mother-child relations might be involved to lead to this result. The survey questionnaire collected the mother's education level but other factors which are also involved with mother-child relationship are not verified because those are not the purpose of this study. On other hand, correlation is positive though very weak nearly unrelated for control group which convey that mother's education has an effect on students' achievement. Moore and Schmidt (2004) suggested that maternal investments in education may have positive enforcement on children's academic outcomes. Parveen and Alam (2008) also came up with the fact that performance is better of those students whose mothers have higher educational qualification. Baker and Stevenson (1986) proposed that educated mothers are more concerned about their child's performance; they interact with the teachers frequently and supervise their children for better academic achievement. According to Carneiro et al (2011) mother's education increases the child's performance mostly at ages of 7-8, but these effects tend to be smaller at ages of 12 to 14. The report of Office of National Statistics, UK, also declared that, in comparison to father's education, mother's education level is important to a lesser degree. In this present study the correlation between mother's

education and students' achievement is very weak and statistically insignificant. So it is clear that mother's education level is not affecting the students' outcome in this research.

5.2.3.iii. Occupation of Family Head :

Types and status of occupation of father, mother or family head perform a very important role directly or indirectly to student's performance. The research question is – does the occupation of the family head affect the post test scores of both groups? To verify whether occupation of the family head do have an effect on students' performance, a cross tabulation analysis has been performed. Before analysis, occupation of the family head is divided into two categories - manual and non-manual labor. Manual labor associated with physical strength and non-manual labor involves mostly mental activity rather than physical strength. The result exhibits that children of non-manual labor category scored better for both experimental and control groups. Several researches supported this fact, such as research done by Akinsanya (2014) found that occupation does have an effect on educational achievement, because high ranking occupation might have adequate income to support their children. The research of Usaini (2015) revealed that students whose parents involved in formal occupation scored high marks than those whose parents involved in informal occupation. Kapinga (2014) got the same result from his research that students achieve better whose parent got involved in formal occupation. Study of Shah and Anwar (2014) also support that parent's occupation have a huge impact on children performance.

But as the number of non-manual labor is very small in this study, it is difficult to make a conclusion. However, percentage wise students whose family heads are involve in non-manual labor scored better in

general science post test. But in contrast experimental group scored better than control group whose family heads are involve in non-manual labor.

5.2.3.iv. Number of Earning Members of the Family :

Maximum labor force participation in a family helps large amount of income flow in the family. Adequate amount of income support the family in healthy living as well as in education also. Cross tabulation has been generated to find out whether large labor force participation in a family helps to improve students' achievement. The null hypothesis is - number of earning member of the family is not affecting the post test scores of both experimental and control group. The cross table shows that most of the student's family has a single earning member. In experimental school 91 student's family has a single earning member out of 129 students and in control school 105 student's family has single earning member out of 143. The result also reveals that though the distribution is uneven percentile wise student scored better whose family has two earning members. Further, to find out the significance correlation analysis has been done. A very weak positive correlation has been found for the experimental group. That means there is a correlation between 'number of earning members' and 'post test score' in experimental group but the correlation is very weak. With that, the null hypothesis has been accepted which means there is no statistically significant correlation between these two variable. In control school also a very weak positive relation is found between these variables, but on the other hand statistically insignificant correlation came out from the result. From the result it is clear that there is a relation present between large labor force participation in the family and students' achievement but for this present research the outcome is statistically insignificant. So for both groups null hypothesis has been accepted.

Other studies also have contrasting results, like, research done by Dahl and Lochner (2012) stated that income has an effect on students' achievement. Susan E. Mayer (2002) suggests that permanent income is more important to children's outcomes than short-term income. Where Chiu J. et al (2012) haven't found any significant difference in family income and students' achievement.

5.2.3.v. Inter Generational Literacy :

Many studies supported that when a student comes from a family which has a long history of formal education get better support from family. Parent or guardian from this type of family not only encourage their children for schooling and studying but also support them with other learning related activity. To verify the research question – does inter generational literacy have an effect on student's outcome? –a cross table analysis has been executed. The cross table showed that maximum students belongs to that family in which father or mother or uncle or aunt went to school as first member. In experimental group it is clear that those students scored better whose first generation means grandparent went to school as the first member of that family. Percentage wise chronologically those experimental school students whose grandparent went to school first scored above 50%, then those whose brother or sister or him/herself went to school first and in last those students scored above 50% whose second generation means father or mother or uncle or aunt went to school as first member. Though the distribution is not equal the result reveals that generation wise education status is not affecting the students score in experimental group.

In control group, percentage wise highest number of students scored above 50% whose grandparent went to school first in their family, than those students scored above 50% whose second generation means father

or mother or uncle or aunt went to school first and lastly no students scored above 50% whose brother or sister or him/herself went to school first. So here, in control school, it is somehow reflecting that generation wise education status has an impact on students' achievement. But here also, the distribution of generation is not even.

According to Hancock et al (2016) higher levels of grandparent educational attainment is associated with achievement of grandchildren. Yu and Daraganova (2014) also found that when grandparents obtained a higher educational degree, the parent also expect higher educational level for their children. So it is clear that grandparents or parents educational attainment have an effect on students' outcome but if anyone's grandparent or parent dropped out in Standard 1 or 2 then their contribution may be doubted for their children's education. Because this low education level could not bring any help for their children's education.

5.2.3.vi. Time Spent on Study :

Many studies found a strong relationship between study time and students' outcome. Likewise various prior studies have found it difficult to establish a positive relationship between study time and students' achievement. A null hypothesis has been developed to analyze - higher study time has no effect on the post test scores of both experimental and control group. To find out whether study time is affecting students post test score a cross tabulation has been generated. After analysing the cross table it has come out that in experimental group maximum students studied for 4 hours at home everyday, but haven't scored well in post test exam. But 7 students out of 12 students scored above 50% after studying for 5 hours at home. But again only 6 students out of 12

scored above 50% but less than equal to 70% marks after studying more than 5 hours at home every day.

And in control school maximum students fail to secure good marks after studying 3 to 4 hours per day. Also 20 students out of 21 scored less than equal to 50% after studying for 5 hours. Apparently the cross table reveals that there is no relation between study time and post test score. To find out the relation between these variables correlation has been calculated. For experimental group the correlation analysis disclosed that there is a weak positive relationship between duration of time the students' spent on study at home and post test exam score. But between two variables there is no statistically significant correlation. So for experimental group study time is not affecting the achievement.

For control group, a very weak positive relation came out from the analysis but here also the analysis is accepting the null hypothesis and indicating this correlation is statistically insignificant. So from the result it is easy to say that there is a weak but positive relation between study time and scores. Cooper, Robinson, and Patall (2006) analyzed 69 correlations between homework and achievement from 32 documents. From which 50 correlations were in a positive direction and 19 in a negative direction. In respect to insignificant correlation between study time and achievement, Cooper et al (2006) argued that distractions present in a young student's home environment would make home study less effective. According to Hammonds and Mariano (2015) test grade was not correlated with reported study time. Significant effect can sometimes be found when quality, quantity and prior knowledge and skill are also taken into consideration. This is also true for this study, the correlation between these two variables – study time and post test score, is statistically insignificant. So without any doubt it can be said that retention factor of CAL enhances the post test score of experimental group and not the time spent on study at home.

5.2.3.vii. Time Spent on Watching Television :

Relation between watching television and students' achievement depends on content and as well as quantity of time. Spending lots of time watching television may hamper study time. But if someone watching education related program, that may help him/her in study. In this present study content of the program and quantity of time both has been investigated. The null hypothesis for this section is - Time spent on watching Television is not affecting the post test achievement of both experimental and control group.

Through frequency table it has come out that content wise experimental group liked to watch mostly news, then sports, science related, cartoon and study related programs and so on. Where control group preferred to watch mainly sports then news, science related, serial/drama and program on animals. After frequency analysis cross tabulation has been generated to check whether quantity or duration of time has an effect on post score. Cross tabulation analysis revealed that control group watched television less time than experimental group. Where 64% students of control school watched television for one hour, in experimental almost 50% students watched television for one hour. Beside that only 3.5% control school students watched television for three hours, where 12% experimental student watched television for three hours. So the level is higher for the experimental group.

The cross tabulation also revealed that experimental group scored better when watched the television for less time. 17% students scored above 50% marks when they watched television for one hour in experimental group. And only 2% scored above 50% marks in control group when watched the television for one hour though 64% students of control school watched television for one hour. When watched television for two hours 11% students in experimental group scored above 50% marks and in control group 2% students scored above 50% marks. But it is

important to discuss that 2 students of control group scored above 70% marks when watched television for two hours. But no students scored above 70% marks when watched television for two hours in experimental group. There is a very clear trend visible for experimental group when analyzing the cross table which is, as the hour of televiewing increases post test score decreases. But no such trend is visible for control school in cross table.

To verify whether any relation exist between 'time spend on watching television' and test score, correlation analysis has been done. For experimental group, correlation analysis of these two variables shows that there is a very weak negative relation. This means when televiewing time increases the score decreases. But the correlation is statistically insignificant for experimental school in this present study, which illustrate that, higher TV watching time does not have an effect on students' outcome. The correlation analysis for control group revealed a weak positive relationship between time spent on watching TV and post test exam score. This explains maximum exposure to televiewing increases test score. Also statistically significant correlation is found between these two variables. So for control group higher TV watching time does have an effect on students' outcome and that too a positive one. The result expose a weak positive relation because may be control group watched television less time than experimental group and also IQ was not related to hours of televiewing (Perry R. Childers and James Ross, 1973). With that quality and quantity may also affect the result of control group. Anderson et al (2001, p.134) differing with Marshall McLuhan, stated "*The medium is not the message. The message is the message!*". Television as a tool of ICT conveying educational content has proved its positive impact on the post test scores of control group. But Computer, another modern audio-visual ICT tool overpowered the television and that's why experimental group scored better in post test.

5.3. The Final Words About Findings :

This experimental research aimed to find whether Computer Aided learning has an effect on students' achievement. Pre-test and Post-test experimental design has been implemented to find the result based on hypotheses. The pre-test outcome acknowledged that there is no significant difference in scores between two groups. In other words, examination outcome is same for both experimental group and control group if instruction method is same, here which is traditional method. After intervention of CAL in experimental school, post-test examination has been conducted. The post-test result showed significant difference between scores of experimental and control group. Experimental group scored better in general science after receiving instruction through CAL than control group who received instruction through traditional method.

The study has found the evidence of impact of CAL on students achievement conducting Pre-test and Post-test experimental design. Now it's time to see whether other factors are also involved in students' achievement. In this study covariate variables, like father's and mother's education level, occupation of family head, number of earning member of the family, inter generational literacy of the family and time spent on study as well as watching television by the students are examined. Cross tabulation and correlation analysis has been done. After analyzing the variables no straight slope found in cross tabulation analysis, also no correlation coefficient found statistically significant, except one. So it is evident that other factors are not affecting the achievement.

5.4. Limitations :

Following are the limitations which are observed in this study.

First, this study is limited to four private secondary schools under government's monthly pay order (MPO). Moreover, this work is focused on eighth standard students only. Thus the findings may not be applicable to other public and private schools and to other standards.

Second, use of computer is limited to the presentation of curriculum contents only. And the curriculum content for post test is limited only to three chapters.

Third, the limitations in this study included student absenteeism and the natural effect of computers have on students.

Fourth, the pre-test score is basically school's half yearly examination score. The half-yearly test scores are also has its limitations like accuracy, dependability and reliability.

Despite these limitations findings are relevant, particularly in the use of CAL in the rural school system in Bangladesh.

5.5. Suggestion for Further Studies :

1. The experimental schools, Afazuddin School and College in Dhamrai and Ideal High School in Narsingdi are similar in demographics and diversity to control schools Satirpara Kali Kumar Institution School & College in Narsingdi and Alhaj Jamaluddin High School in Dhamrai. Further research is needed to support such findings with additional schools in neighboring districts.

2. This present study examined the science subject to verify the effect of CAL on student achievement. Subject like mathematics, English may be verified to find the comparable result.

3. In this study other factors are also taken into considerations to check their contribution. Factors like father and mother's education

attainment effecting children's achievement. In this present study these factors are statistically insignificant to students' achievement. To support similar findings further research may be needed. With that 'mother's education level' found negatively related with post test score in experimental group. Further research may be organized to check why the relation exhibited negatively.

4. Further research can be done separately to verify the socio-economic factors and students' achievement using CAL.

5. About the 'study time at home' factor further research may be needed to verify both student and parent reports about time spent on study at home.

6. On students televiewing factor further study may be conducted to examine the affect of quality and quantity on student achievement.

5.6. Recommendations :

Considering the findings of this study, recommendations here are some points given below, which provide some recommendations to the policymakers and authorities.

1. The effect of Computer Aided Learning on students' achievement has been found in this study. So CAL should be used in teaching science in schools. It will create interest in science lesson among students and will enhance the achievement.

2. Most of the teacher's technological knowledge and skill are not adequate to carry on Computer Aided Learning in schools. In this study, two science teachers out of 7 from two experimental schools hadn't received any ICT training. So, Government and other stakeholders should ensure proper training for teachers and with that proper kind of monitoring is also needed to check appropriate implementation.

3. Presence of ICT resource in school is relatively inadequate. Computer or laptops are needed mostly. To incorporate CAL in everyday teaching and learning process ministry of education with other stakeholders should take necessary actions to equip the schools with adequate ICT hardware and software. Also inoperable computers and tools are the main issue to promote technology in education. Government, stakeholders and school management should take necessary actions to overcome this barrier.

4. Similarly, ministry of education with other stakeholders should ensure that necessary policy guidelines are not only formulated but also implemented to promote ICT in the teaching and learning process in schools.

5. School management should attempt to provide suitable environment for the use of CAL in schools.

5.7. Conclusion :

The paradigm of present education system is changing from inactive participation to active participation. In this method teacher and student actively participate in teaching learning process. This technique of teaching learning process is not a new trend. In classical and medieval period, active participation in learning process was observed by engaging in debate and discussion activity. Modern education philosophy constructivism claimed that learning is not a passive process but learner has some responsibility to learn. Learners construct meaning after getting information by themselves. The modern approach of involving Information and Communication Technology (ICT) in education engages learners to construct knowledge through activity and by this the acquired knowledge would reside for lifetime.

To bring development in teaching and learning process Bangladesh government is giving emphasis on ICT in education sector. Lots of activity is going on to build multimedia classroom in every school. To make the program successful rigorous training for teachers and curriculum wise content development also have been taken care off. At this instant, it is significant to verify whether the effort to incorporate ICT in education initiating development. To identify the improvement this experimental study evaluates and compares the science scores of students who learnt through CAL method and traditional teaching and learning method. Besides this other factors were also tested out to investigate whether those factors were influencing the result or not. Total four rural schools had been selected from one district and one upazila. Among four schools two schools had been selected for experimental schools and two for control schools. Total 272 students for 2015 school year were the sample. After selection pre-test, post test experimental research had been conducted. To find out other influencing factors questionnaire were also distributed to collect additional data.

The result revealed that computer aided learning had an effect on students outcome. After post test the result disclosed that students who learned through

CAL scored better than students who followed that traditional method. And when the instruction method was same, in this case which was traditional method, there was no difference in achievement in both groups. Covariate variables like father's and mother's education level, occupation of family head, number of earning member of the family, inter generational literacy of the family and time spent on study as well as watching television by the students are examined. After analysing the covariate variables no relation found statistically significant, except one with post test score. So it is evident that other factors are not affecting the result of post-test. Thus it was revealed that CAL has an effect on students' achievement. So, in other words, ICT is promoting educational development in rural Bangladesh.

In respect to the research outcome policy makers should build interest to use CAL more rigorously in schools. And to implement CAL in schools proper training in ICT for all teachers is needed. With that, procurement and maintenance of ICT materials for multimedia class are also needed necessary action to promote CAL in teaching learning process.

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Appendix A

Students Questionnaire Experimental School : ICT for Education Development in Rural Bangladesh-The Current Scenario

Date: Code :

Identification of the student :		
নাম :	শ্রেণী :	বিভাগ :
বিদ্যালয়ের নাম :	বিদ্যালয়ের ঠিকানা :	
বিদ্যালয়ের ধরন: □ সরকারি □ বেসরকারি □ আধাসরকারি □ অন্যান্য	লিঙ্গ :	
অর্ধবার্ষিক পরীক্ষায় বিজ্ঞান বিষয়ে প্রাপ্ত নম্বর :	জেএসসি পরীক্ষায় বিজ্ঞান বিষয়ে প্রাপ্ত গ্রেড :	

ব্যক্তিগত তথ্য :									
নাম	বয়স	লিঙ্গ	পারিবারিক প্রধানের সঙ্গে সম্পর্ক	বছর হিসেবে শিক্ষালাভ	বৈবাহিক অবস্থা ০১ বিবাহিত ০২ অবিবাহিত ০৩ বিধবা ০৪ বিপত্নিক ০৫ বিচ্ছিন্ন ০৬ তালাকপ্রাপ্ত	প্রধান পেশা	প্রধান পেশায় ভূমিকা		
							নিজে করে	অন্যকে দিয়ে করায়	নিজে করে এবং অন্যকে দিয়ে করায়

১. তোমাদের পরিবারে প্রথম প্রথাগত শিক্ষায় শিক্ষিত ব্যক্তি কে?

□ দাদা □ দাদি □ নানা □ নানি □ বাবা □ মা □কাকা

□ মামা □ বড়ভাই □ বড়বোন □আমি নিজে

২. তোমার লেখাপড়া করতে কেমন লাগে?

□ খুব ভালো লাগে □ ভালো লাগে □ মোটামুটি □ ভাল লাগে না □ পড়তে মন লাগে না □ উত্তর নেই

৩. কোন বিষয়টি পড়তে তুমি সবচেয়ে বেশি পছন্দ করো?

□ বাংলা □ ইংরেজি □ গণিত □ বিজ্ঞান □ ভূগোল □ ইতিহাস

□ কম্পিউটার □ গল্পের বই □ কোনোটাই না

Home Environment:

৪. নিচের কোন কোন জিনিষ তোমার বাড়িতে ব্যবহার করা হয়?

□ টিভি □ ভিসিডি/ডিভিডি □ ইন্টারনেটসহ মোবাইলফোন □ ডেস্কটপ কম্পিউটার □ ল্যাপটপ

□ প্রিন্টার □ ডিজিটাল ক্যামেরা □ ট্যাব □ রেডিও □ অন্যান্য_____

৫. স্কুলের বাইরে লেখাপড়ায় কে তোমাকে সাহায্য করে?

□ বাবা □ মা □ ভাই/বোন □ আত্মীয় □ গৃহশিক্ষক □ কোচিং সেন্টার

□ অন্যান্য_____

৬. বাড়িতে তুমি কতটা সময় লেখাপড়া করো?

□ এক ঘন্টা □ দুই ঘন্টা □ তিন ঘন্টা □ চার ঘন্টা □ পাঁচ ঘন্টা □ আরো বেশি

৭. পড়ালেখা করতে তুমি প্রধানত কোন বিষয়গুলোর সাহায্য নাও?

□ পাঠ্যপুস্তক □ নোটবই/গাইডবই □ শিক্ষক/বড়দের তৈরি করা নোট

□ অন্যান্য সহায়ক বই □ ওয়েবপেজ □ অন্যান্য_____

৮. পড়ালেখার কাজে তুমি কি ICT'র ব্যবহার করো?

□ কখনই না □ মাঝেমধ্যে □ বেশিরভাগ সময় □ সবসময়

৯. তোমার বাড়িতে কি কম্পিউটার আছে?

□ আছে □ আছে কিন্তু নষ্ট □ নেই

১০. তোমার বাড়িতে যদি কম্পিউটার না থাকে, তাহলে তুমি কি লেখাপড়ার কাজে তোমার বন্ধু বা আত্মীয়ের বাড়িতে কম্পিউটার ব্যবহার করে থাকো?

□ অবশ্যই করি □ মাঝে মাঝে করি □ করি না

১১. স্কুলের সময় ছাড়া লেখাপড়ার কাজে কতটা সময় তুমি কম্পিউটার ব্যবহার করে থাকো?

□ এক ঘন্টা □ দুই ঘন্টা □ তিন ঘন্টা □ চার ঘন্টা □ চার ঘন্টার বেশি

১২. তুমি টিভিতে কোন্ অনুষ্ঠান দেখো?

□ নাটক □ খবর □ খেলাধুলা □ কার্টুন □ পড়াশোনার বিষয় □ পশুপাখির অনুষ্ঠান □ বিজ্ঞান সংক্রান্ত

১৩. তুমি টিভিতে কোন্ অনুষ্ঠান দেখো?

□ নাটক □ খবর □ খেলাধুলা □ কার্টুন □ পড়াশোনার বিষয় □ পশুপাখির অনুষ্ঠান □ বিজ্ঞান সংক্রান্ত অনুষ্ঠান

School Environment:

১৪. স্কুল তোমার কাছে কেমন লাগে?

□ খুব ভালো লাগে □ ভালো লাগে □ মোটামুটি □ ভালো লাগে না □ উত্তর নেই

১৫. তুমি শিক্ষক-শিক্ষিকার প্রশ্নের উত্তর দিতে না পারলে শিক্ষক/শিক্ষিকা তোমাকে

□ শাস্তি দেন □ বুঝিয়ে বলেন □ বকা দেন □ অন্যান্য

১৬. তুমি স্কুলে নিয়ম ভঙ্গ করলে শিক্ষক/শিক্ষিকা তোমাকে

□ শাস্তিদেন □ বুঝিয়ে বলেন □ বকা দেন □ বুঝিয়ে বলেন □ অন্যান্য

School Input

১৭. কে তোমাকে কম্পিউটার ব্যবহারের শিক্ষা দিয়েছেন?

□নিজেই □ শিক্ষক □ অভিভাবক □ বন্ধু □ অন্যান্য

১৮. স্কুলে তুমি কি তোমার লেখাপড়ার জন্য কম্পিউটার ব্যবহার করতে পারো? (IT বিষয় ব্যতিত)

□ ভালই ব্যবহার করতে পারি □ মাঝে মাঝে ব্যবহার করতে পারি □ খুব কম সময় ব্যবহার করতে পারি
□ একেবারেই ব্যবহার করতে পারি না

১৯. স্কুলে কোথায় তুমি কম্পিউটার ব্যবহার করো?

□ শ্রেনীকক্ষে □ ল্যাবরেটরিতে □ কোথাও না □ অন্যান্য

২০. স্কুলে একটি কম্পিউটারে তোমরা কতজন বসো?

□ একটি কম্পিউটারে একজন □ একটি কম্পিউটারে দুইজন □ একটি কম্পিউটারে তিনজন □ একটি কম্পিউটারে চারজন
□ আরো বেশি □ ব্যবহার করি না

২১. কোন শ্রেনী থেকে তুমি স্কুলে প্রজেক্টরের মাধ্যমে বিষয় সম্পর্কিত শিক্ষা গ্রহণের সুযোগ পেয়েছো?

□ ৪র্থ □ ৫ম □ ৬ষ্ঠ □ ৭ম □ ৮ম □ ৯ম □ ১০ম

২২. আইসিটির সাহায্যে শিক্ষা সংক্রান্ত ক্ষেত্রে যে ভাষা ব্যবহার করা হয়, তা কি তুমি বুঝতে পারো?

□ ভালোই বুঝতে পারি □ বুঝতে পারি □ মোটামুটি বুঝতে পারি □ মাঝে মাঝে বুঝতে পারি না □ বুঝতে পারি না

২৩. তোমার শিক্ষক কোন ভাষা ব্যবহার করেন, যখন আইসিটির মাধ্যমে তিনি শিক্ষা দেন? (ভাষা বিষয়ক বিষয় বাদ দিয়ে)

□ বাংলা □ ইংরেজি □ উভয় ভাষাই

২৪. অষ্টম শ্রেণীতে স্কুলে কোন কোন জিনিষ তুমি ব্যবহার করেছিলে?

□ ভিসিডি/ডিভিডি □ টিভি □ এমপিথ্রি প্লেয়ার □ ডেস্কটপ কম্পিউটার □ ল্যাপটপ □ প্রজেক্টর □ প্রিন্টার
□ ওপরের কোনোটাই না □ অন্যান্য

২৫. চিহ্নিত করো কোন বিষয়গুলি তুমি স্কুলে অষ্টম শ্রেনীতে কম্পিউটারের সাহায্যে জ্ঞান লাভ করেছো?

□ বাংলা □ ইংরেজি □ গণিত □ বিজ্ঞান □ ইতিহাস
□ ভূগোল □ কম্পিউটার শিক্ষা □ ধর্ম শিক্ষা □ ওপরের কোনোটাই না □ অন্যান্য

২৬. অষ্টম শ্রেণীতে কোন ধরনের অ্যাপ্লিকেশনগুলি তুমি বা তোমার শিক্ষক ব্যবহার করছিলে শিক্ষা ক্ষেত্রে?

□ শিক্ষনীয় ওয়েব পেইজ পরিদর্শন □ পাওয়ার পয়েন্ট □ ওয়ার্ড প্রসেসর □ সাধারণ ইমেইল করা □ অন্যান্য_____

২৭. অষ্টম শ্রেণীতে বিজ্ঞান বিষয়ে শিক্ষক কি ডিজিটাল কনটেন্টের ব্যবহার করেছিলেন?

□ সবসময় □ মাঝে মাঝে □ অল্পসময় করেছিলেন □ কখনই করেননি

২৮. অষ্টম শ্রেণীতে ডিজিটাল কনটেন্টের সাহায্যে পড়ানোর পূর্বে তোমাদের কি বিজ্ঞানের বিষয়গুলো বুঝতে কোনো সমস্যা হতো?

□ একেবারেই সমস্যা হতো না □ সামান্য সমস্যা হতো □ সমস্যা হতো □ পার্থক্য বুঝতে পারি না
□ উত্তর নেই

২৯. ডিজিটাল কনটেন্টের সাহায্যে পড়ানো বিষয়গুলো কি বেশি সহজবোধ্য বলে তোমার মনে হয়?

□ বেশি ভালোভাবে বুঝতে পারি □ ভালোভাবে বুঝতে পারি □ মোটামুটি বুঝতে পারি □ বুঝতে পারি না
□ একেবারেই বুঝতে পারি না □ উত্তর নেই

৩০. তোমার স্কুলে কি ইন্টারনেট সংযোগ আছে?

□ হ্যাঁ আছে □ বর্তমানে নেই □ কখনই ছিলো না □ সঠিক বলতে পারবো না

৩১. অষ্টম শ্রেণীতে তোমার পড়ালোখার জন্য তুমি কি স্কুলে ইন্টারনেট ব্যবহার করেছিলে?

□ দরকার হলেই ব্যবহার করতাম □ মাঝে মাঝে করতাম □ ব্যবহারের সুযোগ পেতাম না □ না করিনি

৩২. অষ্টম শ্রেণীতে স্কুলে তুমি কতটা সময় ইন্টারনেট ব্যবহারের সুযোগ পেতে?

□ প্রতিদিন □ সপ্তায় একদিন □ মাসে দু'একদিন □ খুব কম □ কখনই না

৩৩. অষ্টম শ্রেণীতে লেখাপড়ায় সহায়তার জন্য শিক্ষক কি ইন্টারনেট ব্যবহার করতেন?

□ সবসময় করতেন □ মাঝে মাঝে করতেন □ কখনই করতেন না □ সঠিকভাবে জানি না

৩৪. তুমি সবথেকে কি পছন্দ করো যখন ডিজিটাল কনটেন্টের মাধ্যমে শিক্ষা দেওয়া হয়?

□ সুনির্দিষ্ট বিষয়ে পাঠদান □ শিক্ষকদের তাৎক্ষণিক মতামত □ পাঠ সংক্রান্ত অনুশীলন বা প্রশ্নোত্তর
□ পড়ার জন্য প্রিন্টারে ছাপানো যে নোট দেওয়া হয় □ সহপাঠী ও শিক্ষকের সঙ্গে পড়া বিষয়ে আলোচনা □ অন্যান্য

৩৫. তুমি সবথেকে কি অপছন্দ করো যখন ডিজিটাল কনটেন্টের মাধ্যমে শিক্ষা দেওয়া হয়?

□ সুনির্দিষ্ট বিষয়ে পাঠদান □ শিক্ষকদের তাৎক্ষণিক মতামত □ পাঠ সংক্রান্ত অনুশীলন বা প্রশ্নোত্তর
□ পড়ার জন্য প্রিন্টারে ছাপানো যে নোট দেওয়া হয় □ সহপাঠী ও শিক্ষকের সঙ্গে পড়া বিষয়ে আলোচনা □ অন্যান্য

৩৬. তোমার কি মনে হয় ডিজিটাল কনটেন্ট ব্যবহার করে পড়াশোনা করলে লেখাপড়া করতে ভালো লাগে আর পাঠ মনে রাখা যায়?

□ খুবই ঠিক কথা □ ঠিক কথা □ ঠিক না □ কোনোভাবেই ঠিক না □ মন্তব্য নয়

৩৭. শিক্ষার মাধ্যম হিসেবে আইসিটি ব্যবহার করে তোমার বিজ্ঞান বিষয়ে কোনো উন্নতি হচ্ছে কি?

□ খুবই ভালো হচ্ছে □ ভালো হচ্ছে □ মোটামুটি হচ্ছে □ একই রকম আছে □ বুঝতে পারছি না
□ ভালো হচ্ছে না □ খারাপ হচ্ছে

৩৮. চিহ্নত করো সেই বিষয়গুলো যেগুলো তুমি মনে করো ডিজিটাল কনটেন্টের মাধ্যমে শিক্ষা ক্ষেত্রে কার্যকর –

□ বেশি করে জানা যায় □ বিষয়টি নিয়ে বেশি আলাপ আলোচনার সুবিধা হয় □ মনে রাখতে বেশি সাহায্য করে
□ তাৎক্ষণিকভাবে বুঝতে পারি, আমি ঠিক না ভুল

৩৯. কোন কোন জায়গায় তোমার মনে হয় কম্পিউটারের প্রয়োগ বেশি হলে ভালো হবে?

□ কম্পিউটারের মাধ্যমে সব বিষয়গুলো পড়ানো □ মতামত আদান প্রদানের জন্য বেশি সময়

□ বিষয় ভিত্তিক বেশি ইন্টারনেট ব্যবহারের সুযোগ □ অন্যান্য

৪০. আইসিটির উপকরণ হিসেবে তোমার স্কুলে কি টেলিভিশন ব্যবহার করা হয়?

□ সব সময় □ মাঝে মাঝে □ বছর এক'দু বার □ কখনই না

Appendix B

Questionnaire for Control Schools : ICT for Education Development in Rural Bangladesh – The Current Scenario

Date: Code :

Identification of the student :		
নাম :	শ্রেনী :	বিভাগ :
বিদ্যালয়ের নাম :	বিদ্যালয়ের ঠিকানা :	
বিদ্যালয়ের ধরন: □ সরকারি □ বেসরকারি □ আধাসরকারি □ অন্যান্য	লিঙ্গ :	
অর্ধবার্ষিক পরীক্ষায় বিজ্ঞান বিষয়ে প্রাপ্ত নম্বর :	জেএসসি পরীক্ষায় বিজ্ঞান বিষয়ে প্রাপ্ত গ্রেড :	

ব্যক্তিগত তথ্য :									
নাম	বয়স	লিঙ্গ	পারিবারিক প্রধানের সঙ্গে সম্পর্ক	বছর হিসেবে শিক্ষালাভ	বৈবাহিক অবস্থা ০১ বিবাহিত ০২ অবিবাহিত ০৩ বিধবা ০৪ বিপত্নিক ০৫ বিচ্ছিন্ন ০৬ তালাকপ্রাপ্ত	প্রধান পেশা	প্রধান পেশায় ভূমিকা		
							নিজে করে	অন্যকে দিয়ে করায়	নিজে করে এবং অন্যকে দিয়ে করায়

১. তোমাদের পরিবারে প্রথম প্রথাগত শিক্ষায় শিক্ষিত ব্যক্তি কে?

□ দাদা □ দাদি □ নানা □ নানি □ বাবা □ মা □কাকা

□ মামা □ বড়ভাই □ বড়বোন □আমি নিজে

২. তোমার লেখাপড়া করতে কেমন লাগে?

□ খুব ভালো লাগে □ ভালো লাগে □ মোটামুটি □ ভাল লাগে না □ পড়তে মন লাগে না

□ উত্তর নেই

৩. কোন বিষয়টি পড়তে তুমি সবচেয়ে বেশি পছন্দ করো?

□ বাংলা □ ইংরেজি □ গণিত □ বিজ্ঞান □ ভূগোল □ ইতিহাস

□ কম্পিউটার □ গল্পের বই □ কোনোটাই না

Home Environment:

৪. নিচের কোন কোন জিনিষ তোমার বাড়িতে ব্যবহার করা হয়?

□ টিভি □ ভিসিডি/ডিভিডি □ ইন্টারনেটসহ মোবাইলফোন □ ডেস্কটপ কম্পিউটার

□ ল্যাপটপ □ প্রিন্টার □ ডিজিটাল ক্যামেরা □ ট্যাব □ রেডিও

□ অন্যান্য_____

৫. স্কুলের বাইরে লেখাপড়ায় কে তোমাকে সাহায্য করে?

□ বাবা □ মা □ ভাই/বোন □ আত্মীয় □ গৃহশিক্ষক □ কোচিং সেন্টার

□ অন্যান্য_____

৬. তোমার কি সবসময়ের জন্য গৃহশিক্ষক আছেন?

□ সবসময় □ মাঝে মাঝে □ পরীক্ষার আগে □ নেই

৭. বাড়িতে তুমি কতটা সময় লেখাপড়া করো?

□ এক ঘন্টা □ দুই ঘন্টা □ তিন ঘন্টা □ চার ঘন্টা □ পাঁচ ঘন্টা □ আরো বেশি □ করি না

৮. পড়ালেখা করতে তুমি প্রধানত কোন বিষয়গুলোর সাহায্য নাও?

□ পাঠ্যপুস্তক □ নোটবই/গাইডবই □ শিক্ষক/বড়দের তৈরি করা নোট □ অন্যান্য সহায়ক বই

□ ওয়েবপেজ □ অন্যান্য_____

৯. পড়ালেখার কাজে তুমি কি কম্পিউটার ব্যবহার করো?

□ কখনই না □ মাঝেমধ্যে □ বেশিরভাগ সময় □ সবসময়

১০. তোমার বাড়িতে কি কম্পিউটার আছে?

□ আছে □ আছে কিন্তু নষ্ট □ নেই

১১. তোমার বাড়িতে যদি কম্পিউটার না থাকে, তাহলে তুমি কি লেখাপড়ার কাজে তোমার বন্ধু বা আত্মীয়ের বাড়িতে কম্পিউটার ব্যবহার করে থাকো?

□ অবশ্যই করি □ মাঝে মাঝে করি □ করি না

১২. লেখাপড়ার কাজে কতটা সময় তুমি কম্পিউটার ব্যবহার করে থাকো?

□ এক ঘন্টা □ দুই ঘন্টা □ তিন ঘন্টা □ চার ঘন্টা □ চার ঘন্টার বেশি □প্রযোজ্য নয়

১৩. অষ্টম শ্রেণীতে তোমার পড়ালোখার জন্য তুমি কি ইন্টারনেট ব্যবহার করেছিলে?

□ দরকার হলেই ব্যবহার করতাম □ মাঝে মাঝে করতাম □ ব্যবহারের সুযোগ পেতাম না

□ না করিনি

১৪. অষ্টম শ্রেণীতে তুমি কতটা সময় ইন্টারনেট ব্যবহার করতে?

□ প্রতিদিন □ সপ্তায় একদিন □ মাসে দু'একদিন □ খুব কম □ কখনই না

১৫. অষ্টম শ্রেণীতে লেখাপড়ায় সহায়তার জন্য তোমার গৃহশিক্ষক কি ইন্টারনেট ব্যবহার করতেন?

□ সবসময় করতেন □ মাঝে মাঝে করতেন □ কখনই করতেন না □ সঠিকভাবে জানি না

১৬. তুমি টিভিতে কোন্ অনুষ্ঠান দেখো?

□ নাটক □ খবর □ খেলাধুলা □ কার্টুন □ পড়াশোনার বিষয় □ পশুপাখির অনুষ্ঠান

□ বিজ্ঞান সংক্রান্ত অনুষ্ঠান

১৭. তুমি দিনে কতটা সময় টিভি দেখো?

□ এক ঘন্টা □ দুই ঘন্টা □ তিন ঘন্টা □ চার ঘন্টা □ পাঁচ ঘন্টা

□ পাঁচ ঘন্টার বেশি

School Environment :

১৮. স্কুল তোমার কাছে কেমন লাগে?

□ খুব ভালো লাগে □ ভালো লাগে □ মোটামুটি □ ভালো লাগে না □ উত্তর নেই

১৯. তুমি শিক্ষক-শিক্ষিকার প্রশ্নের উত্তর দিতে না পারলে শিক্ষক/শিক্ষিকা তোমাকে

□ শাস্তি দেন □ বুঝিয়ে বলেন □ বকা দেন □ অন্যান্য

২০. তুমি স্কুলে নিয়ম ভঙ্গ করলে শিক্ষক/শিক্ষিকা তোমাকে

□ শাস্তিদেন □ বুঝিয়ে বলেন □ বকা দেন □ বুঝিয়ে বলেন □ অন্যান্য

School Input

২১. স্কুলে কোথায় তুমি কম্পিউটার ব্যবহার করো?

□ শ্রেণীকক্ষে □ ল্যাবরেটরিতে □ কোথাও না □ অন্যান্য

২২. অষ্টম শ্রেণীতে স্কুলে কোন কোন জিনিষ তুমি ব্যবহার করেছিলে?

□ ভিসিডি/ডিভিডি □ টিভি □ এমপিথ্রি প্লেয়ার □ ডেস্কটপ কম্পিউটার □ ল্যাপটপ □ প্রজেক্টর

□ প্রিন্টার □ ওপরের কোনোটাই না □ অন্যান্য

২৩. স্কুলে তুমি কি তোমার লেখাপড়ার জন্য কম্পিউটার ব্যবহার করতে পারো? (IT বিষয় ব্যতিত)

□ ভালই ব্যবহার করতে পারি □ মাঝে মাঝে ব্যবহার করতে পারি □ খুব কম সময় ব্যবহার করতে পারি

□ একেবারেই ব্যবহার করতে পারি না

২৪. আইসিটির উপকরণ হিসেবে তোমার স্কুলে কি টেলিভিশন ব্যবহার করা হয়?

□ সব সময় □ মাঝে মাঝে □ বছর এক'দু বার □ কখনই না

২৫. চিহ্নত করো সেই বিষয়গুলো যেগুলো তুমি মনে করো ডিজিটাল কনটেন্টের মাধ্যমে শিক্ষা ক্ষেত্রে কার্যকর –

□ বেশি করে জানা যায় □ বিষয়টি নিয়ে বেশি আলাপ আলোচনার সুবিধা হয় □ মনে রাখতে বেশি সাহায্য করে

□ তাৎক্ষণিকভাবে বুঝতে পারি, আমি ঠিক না ভুল

Appendix C

Post Test Question Paper For Experimental and Control Group

Post Test paper Date:

School name: Code:

Student name: Test Score:

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১. কোনো পেন্সিলকে পানিতে ডোবালে পেন্সিলের পানির নিচের অংশটুকু কেমন দেখাবে?

o লম্বা o সোজা o মোটা

o সাদা o উত্তর নেই

২. পৃথিবী থেকে কৃত্রিম উপগ্রহের উচ্চতা বেশি হলে দ্রুতি কেমন হবে?

o একই o কম o বেশি

oভরের ওপর নির্ভরশীল o উত্তর নেই

৩. রাদারফোর্ডের মতে- পরমাণুর বেশিরভাগ জায়গা-

o ফাঁকা o ইলেকট্রণপূর্ণ o ঋণাত্মক চার্জযুক্ত o চার্জবিহীন

o উত্তর নেই

৪. প্রতিসরণের সূত্র অনুযায়ী আপতিত রশ্মি, প্রতিসরিত রশ্মির সাথে নিচের কোনটি একই সমতলে থাকে?

o আলোর বেগ oঅভিলম্ব o নির্গত কোণ

o আপতণ বিন্দু o উত্তর নেই

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৫. মহাকাশ ধ্বংসাবশেষ হিসেবে পৃথিবীকে প্রদক্ষিণ করছে–

o গ্রহ o উপগ্রহ o প্রাকৃতিক উপগ্রহ

o অব্যবহৃত কৃত্রিম উপগ্রহ o উত্তর নেই

৬. পরমাণুর কেন্দ্রে নিচের কোনটি উপস্থিত?

o নিউট্রন o পজিট্রন o ইলেকট্রন o বিটাট্রন

o উত্তর নেই

৭. আলোকরশ্মি হালকা থেকে ঘন মাধ্যমে প্রবেশ করলে কী হয়?

o অভিলম্বের দিকে সরে যায় o অভিলম্ব থেকে দুরে সরে যায়

o আলোর গতি বৃদ্ধি পায় o আলোর দিক স্পষ্ট হয়

o উত্তর নেই

৮. অণু গঠনের জন্য প্রয়োজনীয় পরমাণুর সংখ্যা–

o ১টি o ২টি o ৩টি o একাধিক o উত্তর নেই

৯. প্রাকৃতিক উপগ্রহের সৃষ্টি হয়েছে–

o উল্কাপিণ্ড থেকে o ধূমকেতু থেকে

o মহাজাগতিক মেঘ থেকে o পৃথিবী থেকে o উত্তর নেই

১০. কীসের প্রভাবে উপগ্রহগুলো গ্রহের চারদিকে ঘুরছে?

o মাধ্যাকর্ষণ বলের o অভিকর্ষ বলের o কেন্দ্রাবিমুখী বলের

o ভরমুখী বলের o উত্তর নেই

১১. কীভাবে আলো একমাধ্যম থেকে অন্য মাধ্যমে যাবার সময় গতিপথের দিক পরিবর্তিত হয়?

o ৯০^{o} কোণে o ৭০^{o} কোণে o ৪৫^{o} কোণে
o ১২০^{o} কোণে o উত্তর নেই

১২. কোন গ্রহের ৬৩টি উপগ্রহ রয়েছে?

o মঙ্গল o বুধ o বৃহষ্পতি o নেপচুন
o উত্তর নেই

১৩. মরীচিকায় কোন ঘটনা ঘটে?

o আলোর প্রতিফলন o আলোর পূর্ণ অভ্যন্তরীণ প্রতিসরণ
o আলোর বিষ্ফুরণ o আলোর পোলারন o উত্তর নেই

১৪. আমরা যে গ্যালাক্সিতে বাস করি তার নাম কি?

o পৃথিবী o ছায়াপথ o শুক্র oইউরেনাস o উত্তর নেই

১৫. নিচের কোন মাধ্যমের গাঢ়ত্ব সবচেয়ে বেশি?

o পানি o তেল o পারদ o বায়ূ o উত্তর নেই

১৬. কে প্রথম বলেন, পদার্থ ক্ষুদ্র ক্ষুদ্র অবিভাজ্য কণা দ্বারা গঠিত?

o মেন্ডেলিফ o ডাল্টন o লিউয়েন হুক
o ডেমোক্রিটাস o উত্তর নেই

১৭. প্রতিসরণ কোণ কখন আপতন কোণের চেয়ে বেশি হয়?

o আপতিত রশ্মি অভিলম্ব বরাবর হলে

o আলো স্বচ্ছ থেকে অস্বচ্ছ মাধ্যমে প্রবেশ কালে

o আলো হালকা থেকে ঘন মাধ্যমে প্রবেশ করলে

o আলো ঘন থেকে হালকা মাধ্যমে প্রবেশ করলে o উত্তর নেই

১৮. পদার্থের ক্ষুদ্র কণা কত প্রকার?

o দুই প্রকার o তিন প্রকার o চার প্রকার o পাঁচ প্রকার

o উত্তর নেই

১৯. কৃত্রিম উপগ্রহকে পৃথিবীর চারদিকে ঘোরার জন্য কোনটি প্রয়োজন?

o মহাকর্ষ বল o অভিকর্ষ বল o কেন্দ্রীয় বল

o কেন্দ্রবিমুখী বল o উত্তর নেই

২০. পরমাণুতে নিচের কোন কণাটি উপস্থিত?

o ইলেকট্রন o প্রোটন o নিউট্রন o সবগুলো

o উত্তর নেই