CHAPTER I
INTRODUCTION
SECTION I
ETYMOLOGY OF SCIENCE

In our daily lives, many incidents take place. In every incident there is a science. Without science it is difficult for a man to continue with his life. Science is an organized knowledge that is a systematized body of knowledge and the man is a curious creature By nature. He has been engaged in the process of discovery by unveiling the mysteries of the nature since the dawn of civilization. This had led of an accumulation of the body of knowledge about the nature through experiments and reasoning called science. Science grows and develops due to research in every field of knowledge. Therefore the present age is the age of science, it is also the age of computer.

In order to solve problems, we need to take help of scientific principles, inferences and methods. These have promoted development at the personal levels and at the social, national and international levels. The social structure has undergone a change. It is, therefore, necessary to study science.

Science is an overall product of human activity in the form of systematic and organized body of knowledge. It is the product of all facts connected with our information concepts, generalization, laws and theories framed on the basis of vast fund of accumulated knowledge.

There are many branches of science. These branches are interrelated, science is related to other disciplines. It is necessary to all such relationship of science and effects on teaching it’s learning.
Etymologically, the word science is originated from a Latin word scientia which means ‘to know’ therefore, an originated effort to know about the things and happenings in the nature is science. Man has come to the conclusion there can’t be any event in nature without reason. There is universal laws of ‘cause and effect’ Thus, the function of science is search for cause of natural phenomena and other events in this process of search for knowledge and truth man has accumulated a vast store of knowledge known as science.

Science is referred as systematized body of knowledge. Many methods are used to acquire the knowledge of nature. Science includes the investigation of new phenomenon, analyzing ideas, comparing previous theories.

Science is an investigation of observation, identification, theoretical explanation of the phenomenon occurring in nature, investigation. Based on these components different workers have attempted to define the term science.

The word science makes us visualize the performance which is systematic and accurate. This means the concept of science is broad and all pervasive. We certainly know that science is a boon to man, and that human life has become happier, healthy and comfortable because of science, therefore, someone is bound to ask, “What is science?” Every individual provides different answer to this question according to his own experiences, his field of work, his intellectual ability and according to his needs. Science is no longer a school subject, it has become an inseparable part of human life. Science is the method for man to lead his life. Such is the intimate relationship between science and man life.
The word ‘Science’ is coined from the latin word ‘scientia’ which means knowledge. Science is the knowledge of all that is knowledge and understandable. Therefore, all agree that science means special knowledge.

There are various definitions of the word ‘Science’.
The method of investigating nature, that discovers reliable knowledge about it, is called as science. - Rene Decartes

‘An attempt to make the chaotic diversity of our sense experience correspond to logically uniform system of thought is called as science.

- Albert Eienstein

Science is the organization of our knowledge in such a way that it commands or makes possible the explanation of more of the hidden potentialities found in the environment - J.Bronowski

Science is the purest form in the simple extension of human curiosity.’ - Arthur Clarke

Science is an ordered knowledge of natural phenomena and the rational study of the relation between the concepts in which the phenomena are expressed - W.C.Dampier

Science is an accumulated and systematized learning in general usage restricted to natural phenomena. The progress of science is marked not only by an accumulation of fact by the emergence of scientific method and of the scientific attitude. - Columbia Encyclopedia.

By the analysis of definitions Science, following points can be identified as regards the nature of Science.
Nature of Science

Science is process as well as the product of the process. In its process form it suggests the ways and means of exploring the truth and in its product form it presents systematic and organized body of useful knowledge. The process form of the science is more important than its product form as the way of exploring the truth and acquiring knowledge is always given more preference in science than the mere memorization or gaining knowledge of accumulated facts. Science constantly remains in search for truth and what it gets in account of this search, can never be taken as absolutely and permanently true. The method or process adopted by science is known as scientific method and is characterized by qualities like validity, reliability, impartiality and objectivity in its procedure and approach.

Science develops scientific attitude among its readers by providing solution to day to day problems. The development of such attitude is known as Scientific attitude.

Thus, Science may be seen to discharge two types of responsibilities, namely

1. Investigation and exploration of the facts.

2. Building of a systematic and organized body of facts as a result of such explanation.

Human mind is always busy in the pursuit of exploring the unknown. Man by his keen observation and faculty of reasoning has come to the conclusion that there cannot be any event in nature without
any reason. In the process of search for knowledge and truth, man has accumulated a vast store of knowledge known as Science.

**Evolution of Science in India during Ancient, Medieval and Modern Period**

In India, the evolution of science can be traced back to the Indus Valley Civilization, which flourished 3000B.C. The process of evolution of science went on further during the ages of medieval and modern. Some of the landmarks in the process of evolution of science in India can be presented as follows.

**Science in Ancient Period**

The people of Indus valley civilization made use of the wheel plough, smelted elaborate fire and flood controls for their farms. They used standardized burnt bricks for their buildings. The people mastered wide ranging scientific skills which were directed towards social benefit. They constructed their towns, cities on scientific principles. They possessed high technical skill in construction. They not only used standardized burnt bricks for their building, but planned their cities with symmetrically arranged streets and an elaborate drainage system. That speaks of their sophisticated awareness of sanitation and hygiene. The streets were meeting at right angle to each other. The people of Indus valley civilization has a pictographic script and decimal numeral system.

**Science in Medieval India**

Even though the medieval period is recognized as Dark Age in the evolution of Science in medieval India. The education system in the medieval period was of religious type. The religion was the centre of the education system. Even though, the education was the typically religious
in nature, a number of kings contributed to the development of Science. From 6th century B.C. the technical skills began to develop the signs of excellence in iron metallurgy and steel, copper, bronze working, ceramic etc. The huge copper statue of Buddha at sultanganj in Bihar and famous iron pillar at Delhi show the extraordinary skills of the metalsmiths of medieval time.

The technology of engineering assumed new dimensions in the medieval period as evidenced by the impressive gamut of monuments. Some of them are noted for their extraordinary acaustical features such as the musical pillars of the temples at Hamphi and the whispering gallery and the multiple echoeffect in the GolGumba at Bijapur.

**Science in Modern India**

The colonization of India by British changed the future course of India’s Scientific Development. Due to this western science began to show its impact on the growth of India’s Science. The growth of Science in India under British was not systematic. British Government established a number of scientific institutions in India. These institutions acted to provide the required data for the colonial expansion and exploitation. Some of the institutes established were Botanical survey of India, Geological survey of India, Indian Marine Survey Department and Indian Coastal Survey. They also set up observations at Madras, Calcutta and Bombay.

**Historical Background of Science**

The developing countries today are struggling against three major problems that is population explosion, poverty and environmental pollution. The developmental efforts of these countries are hindered by uncontrolled population growth and growing poverty. If properly utilized
and geared towards the development processes, education can be one of the potent instruments. Science education play an important role in solving these problems.

There are various reasons for which modern science did not make significant headway in India during the British period. The new language made the process of assimilation in Indian culture difficult although the characters of Science was not radically different from the earlier scientific traditions.

Due to the language problem, the new knowledge and information on science couldn't reach the art sans and crafts men to make an impact on their trades and crafts. This did not help them to move out of their stagnation and to improve upon their old industries. This was no sufficient breakthrough in the scientific outlook of the people as the social and intellectual dialogue could not take place in a sufficiently large scale. The result was that India remained far behind in scientific and technological development as compared to countries in the West. The end of 18th century marked the neglect of the teaching of science by universities and it had no place in school curriculum. To study the development of Science education in India during the modern period, the history of science in the west is important because whatever happened in the west was followed in India though at a slower pace. The history of teaching Science commenced with the mechanics. According to the report of the Royal commissions of education it is found that none of the schools taught science as an independent subject and further reports that at Rugby, natural science was taught to boys who elected to study it instead of languages. They suggested that natural science should be taught and should include two main branches one comprising physics and chemistry and the other comparative physiology and natural history.
1837 Physics was introduced and in 1859 Botany, Chemistry and Geology were introduced at Rugby.

In 1854, three eminent scientists, T.H.Huxley, John Tyndall and Faraday urged the claims of science as an essential part of general education. Herbert Spencer (1861) believed that knowledge of life was the important knowledge for all "Moral and Physical".

T.H.Huxley was the most staunch advocate of teaching science in the sixties and seventies of that century. The way for the inclusion of science in the curriculum of secondary schools was paved by the start of natural science course in the universities of Oxford and Cambridge. In 1895, Devonshire commission report gave a full survey of position of science teaching in secondary schools.

The beginning of twentieth century saw adequate increase in the equipment and facilities for teaching science in schools. The modern world felt the importance of general science triggered the most outstanding contribution to the history of teaching science in the last quarter of nineteenth century was that of H.E. Armstrong Professor of chemistry in the Central Technical College, City of Guildes of London Institute. He was very much dissatisfied with the science work in schools and was critical of the teaching methods that were adopted.

The beginning of twentieth century saw adequate increase in the equipment and facilities for teaching science in schools.

**Contribution of Scientists**

The scientists from various countries have dedicated their whole life for the cause of social betterment through scientific research. They have worked in their areas of specialization and contributed to the
progress of society. Various problems facing to human race have been solved due to research carried out by scientists. Various diseases have been cured and the life span of man has been extended. The yield of food grains has been increased due to the advance technology used in the farming crops have been made resistant against disease by genetic engineering technique. The perennial problem of energy is being solved through various means. Thus scientist have worked to make human life more sophisticated.

Practical use of Science

It is a hard reality that Science has revolutionized our way of living to the extent that it is now termed as "modern living". Our thinking, our attitudes, our interests, our outlook have undergone tremendous change. Man's material environment has been radically transformed by the magic wind of science. The average span of human life has been doubled. The release of nuclear energy and green revolution are far reaching benefits of science. Such observations about the unique importance of science led the Kothari Commission (1964 - 66) to remark as under:

"The basic approach and philosophy underlying the reconstruction of education adopted by us in this report on our deep conviction that the progress, welfare and security of the nation, depend critically on a rapid, planned and sustained growth in the quality and extent of education and research in science and technology”.

Some of the significant gains of science upon our existing way of living are as under:

New techniques of Agriculture
The impact of Science through agriculture is vivid and clear to every one, since the 'Green Revolution' brought about by the mechanization of agriculture are before our eyes. Science has invented tools and implements as substitutes of manual labour. The agriculture process have been changed drastically. All agricultural works are being done quickly and expeditiously by machines.

The destruction of pests using pesticides and insecticides increased the crop yield. The present day agriculture is stressing on the use of biopesticides and biofertilisers to retain the natural properties of soil and sustain its productivity.

The radio broadcasts weather forecasts for the farmers. They thus, learn to take precautionary measures based on the Report. The information in insect - control, cattle disease, the use of manures and even health measures, help a farmer and his family. T.V. has been put into service of the farmers to spread scientific awareness in them.

Science and Health

There is more and more readiness to apply Science and technology in the third stage of demographic transition profounded by T.R.Mathus which is evident in modern days in the contribution of science. The use of various preventive techniques such as vaccination, inoculation, surgery have prevented to human society of contagious diseases and epidemics. The average life span of human has been doubled due to science as it has helped us in diagnosis, treatment and prevention of various diseases reducing death rate and increasing the longevity of an individual Science has made us health conscious through the development in fields of hygeine and sanitation, diet, biochemistry of life, physical exercises.
The readiness of the human beings to adopt modern and scientific method is nowhere more in response to the family planning programme.

Science and Industry

The ways and processes in industries have experienced drastic changes from the discoveries of Science. The different tasks in industrial process today are performed by machines and human beings are required only to operate the machines. Industries like textile, printing, radio and television, pharmaceuticals, agriculture are revolutionized by the development in Science. There could be many more of the type which need some technical skill. There are, polytechnics, industrial and engineering schools all over the country. In terms of Kothari Commission "The wealth and prosperity of a nation depends on the effective utilization of its human and material resources through industrialization. The use of human material for industrialization demands its education in Science and training in technical skills. Industry opens up possibilities of greater fulfillment for the individual.

Science and Education

Facilities for the study of engineering and medicine in different branches have grown steadily the number of students who are taking to the study of pure Science has risen phenomenally. In India in 1968, 33000 students were studying Physics, Chemistry, Biology at the graduate level and above. To facilitate the study of pure Science there are now more opportunities and financial aids. The Science talent search scheme run by National Council of Educational Research and Training, New Delhi,
enables the students to study Science from the high school level right up to doctorate level. There are other schemes to aid young men and women take scientific education in the field of agriculture and veterinary sciences. There is a high proportion of students who get scholarships. This investment in manpower yields adequate returns when the student goes back to village where he is able to apply the knowledge and skill to the farm, cattle breeding, poultry farming.

Science and Modern Civilization

The modern civilization can be called scientific civilization as it owes its existence to Science. Various advances in fields of agriculture, medicines, cosmetics, transport, communication have affected our way of living and behaviour. Science has helped us to get rid off the taboos of superstitions and removed illiteracy and ignorance. It has brought about a change in our attitude towards religion, birth control, sanitation, ways of living.

Science and Democracy

Very many qualities of a good citizen for democracy have been taught to us by Science. The capacity for clear thinking and receptivity to new ideas, intellectual integrity service to mankind, respect of other point of view etc. are the lessons of Science.
SECTION II

SCIENCE EDUCATION

Ancient man was living in caves and was wandering in forests for food in the form of roots, tubers and raw flesh of hunted animals. The man in this period had a primitive type of nervous system. Therefore human life in ancient days was a primitive one. The man in this stage was scientifically called as Homoerectus. During the later stage, the nervous system of the man was developed to its fall extent. There was notable change in the pattern of thinking of man. Thus human life was advanced. The man in this advanced state is called as Homosapiens The advancement of human life from a primitive life was due to education, particularly Science education.

There are two types of science education. Formal Science education and Non formal Science education.

In the formal type of Science education the syllabus to be taught gets fixed the activities of the teacher while teaching examples to be given, teaching aids to be presented while teaching and finally the methods to evaluate the students learning are also fixed.

When Science is taught through various media like Science club, Scientific hobbies, Science exhibitions and fairs, Science museums called as Non formal Science education.
Categories of Science education: The Science teaching is mainly divided into two main categories:

1. Biological Sciences/ life Sciences

2. Physical Sciences

I. Life Sciences

According to Sharma "life sciences is the new nomenclature by which Biology i.e. Botany and Zoology is referred to in the new set up and it is quite apt, that the Science of life and living things is so termed. It would be our endevour to try some of the new ways in the new ways, in the discipline of life sciences for a proper and utilitarian outlook in the teaching methods”.

II. Physical Sciences

Physical sciences group includes those branches of Science which are related with the study of non living material. Thus physical sciences includes mainly two subjects Physics and Chemistry.

1. Physics: It is the branch of Science which deals with nature and natural phenomena. It is the Science which explains the natural phenomenon or the behavior of a natural system on the basis of the established laws of nature. Physics is the study of the properties of matter and energy and concern both the macroscopic and microscopic state of the matter.

2. Chemistry - It is the branch of Science which deals with the study of material substances, particularly about their composition, properties and reactions that changes them into other substances. Chemistry is the study of the materials that makes up the universe and the
changes which these materials undergo. The development of Chemistry is based upon the systematic approach of the scientist in carrying out different experiments recording careful observations and making scientific inferences and generalizations.

According to Dictionary of Science, "Chemistry is the study of the composition of substances and of their effects upon one another”.

Science education in India and its development can be phased into three periods as ancient and medieval period, modern period and science education after independence. System was to be learnt in a foreign language i.e. English. Modern Science in India marks a radical change from a medieval and ancient sciences to newer branches of science. This was characterized by full fledged technique of acquiring information through experimentation. Scientific institutions had been developed and technology started making a decisive breakthrough.

**Development of Science Education in India after Independence**

In India the reviews issued by the Government of India in the years 1877 – 92 gave an insight to the state of Science teaching.

1. **Indian Science Congress**

   In the beginning of 20th century, Science was not a school subject in our country and it was only in name in the universities. Indian Science Congress was formed a few decades back but it also did not do any notable work towards the teaching of science in schools.

2. **The report of the Secondary Education Commission, 1953 –**

   It recommended the teaching of General Science as a compulsory subject in the high and higher secondary schools.
3. All India seminar on Teaching of Science

It was held at Taradevi in Shimla Hills, in 1956. The findings of this seminar were:
1) Evaluate the draft syllabus of Physics, Chemistry and Biology.
2) Examine the elementary science syllabus at primary and middle school stage.
3) To consider the various aspects of teaching such as equipment, apparatus, methods of examinations, Teaching aids in Science and other allied topics like text books, Science club. It had suggested an unique and uniform system of Science teaching for the entire country.

4. Indian Parliamentary and Scientific Committee (1961)

The Indian Parliamentary and Scientific Committee was appointed by Govt. of India, under the chairmanship of Late Shri. Lalbahadur Shastri. The main aim behind the appointment of this committee was, to bring the politicians, scientists, parliamentarians and schools on a single footing. The committee submitted its report to the Parliament under the title “Science education in schools” in 1962.

It also studied the allied problems of growth of school population, shortage of qualified teachers, accelerated achievements in Science, the demand for increase in technically trained manpower. Growing importance of Science in the affairs of mankind, changes the processes and goals of Science.

5. Indian Education Commission (1964-66)

The commission pointed out that our Science education is in bad shape and becomes worse if we fail to reckon with the explosion of knowledge. To meet this immediate upgrading school curricula by research in curriculum development, the revision of the text books and teaching learning material, the commission recommended that -
1) Science and Mathematics should be taught on a compulsory basis to all pupils.

2) In the lower primary classes Science teaching should be related to the child’s environment.

3) At the Higher primary stage, emphasis should be on the acquisition of knowledge and the ability to think logically, to given conclusions and to make decisions at higher level.

4) A Science corner in lower primary school and a laboratory cum lecture room in higher primary schools are minimum essential requirements.

5) At the lower secondary stage, Science should be developed as a discipline of the mind.

6) Science courses at an advanced level, may be provided for talented students in selected lower secondary school with necessary facilities of staff and laboratory.

7) Science teaching should be linked to agriculture in rural areas and to technology in urban areas.

8) The methods of teaching Science should be modernized.

9) The development of Science must derive its nourishment from our cultural and spiritual heritage and not bypass it.

10) At the university level, better conditions for research should be provided.

6. Ishwarbhai Patel Committee (1977)
This committee worked on curriculum aspect and the terms of reference were-

1. To review the stagewise and subjectwise objectives identified in the NCERT document. “The curriculum for the ten year school.”

2. To scrutinize NCERT syllabus and text books.

3. To review the scheme of studies and time allocated for various subjects.

4. To ensure that the teacher has adequate time for experimentation, creative work and remedial instruction.

5. To accommodate the needs of bright children for advanced level courses.

To review the situation of Indian education system, Government of India developed National Policy on Education in 1986. The policy stressed that Science and Mathematics should remain as compulsory subjects.

The statements in the regarding Science education are as -

1) Science and Mathematics will remain as core subjects in the First ten years of school education.

2) In order to develop Scientific temper and to attain other goals, it is necessary to define the objectives to be fulfilled through Science education.

3) Involvement of community, Non Government and voluntary
agencies is required to pool the resources by establishing networks among different institutions. Efforts should be made generate manpower at the grass root level that will spear head the implementation of ideas stated in the National Policy on Education.

4) Special programmes are needed for the educationally backward states and educationally backward schools of society.
5) Science education will be extended to the vast numbers who have remained outside of the formal education. This should be kept in mind while planning science education for non formal system.

6) Science and Mathematics curriculum will be designed for the secondary level for the conscious internalization of healthy work ethos.

Science education has traveled a long journey through various commission and committees. Science has been compulsory subject at primary and secondary stage.

Values of Science subject in everyday life

Apart from the reasons discussed above for making a case for the inclusion of science in school curriculum, it must satisfy the following utilitarian values for leading a successful and satisfying life in the modern world.

Science education is essential as it is of immense value in the student’s individual life and his life in society. In the present era of science, people are in pursuit of scientific knowledge. Science education has taken an important place influential values in intellectual, aesthetic, vocational, practical, moral, psychological, cultural, adjustment arena of an individual. The following areas testify to the importance and values of science in everyday life.
1) **Intellectual Value**

Science is a method of acquiring knowledge besides being a content of knowledge. Scientific knowledge helps to sharpen our intellect and promote intellectual honesty. It makes us systematic in our reasoning and helps to report an event or a thing without any prejudices.

The Science education helps one to develop positive attitude like open mindedness, reasoning, confidence, desire for the acquisition of correct knowledge. Such a positive attitude helps an individual to solve many social problems he faces in life.

2) **Aesthetic Values**

Knowledge of Science develops in man a passion for truth and thus he has a passion for beauty. Science is basically the process of unfolding the store of mysteries and beauties that the nature possesses. Thus Science education is essential for developing an aesthetic sense in an individual. The scientist feel an intrinsic charm and happiness by enjoying the aesthetic aspects of his discoveries and inventions.

3) **Vocational value**

There are a large number of vocations for which the study of science is a primary requirement like medicine, engineering, computers, paramedics, agriculture, biotechnology etc. In the present day we do not find any vocation that does not need the knowledge of science. It thus becomes quite clear that to enter any such vocational course, an individual must have a knowledge of science and so the science education must be included in the school curriculum.

4) **Practical Value**
Scientific principles and laws find a large number of applications in everyday life so for proper utility of such applications basic knowledge of Science is necessary. The application of science is found in electricity, communication, electronics, transport, information technology etc. The practical value of Science is felt in medicine and health. The sources of entertainment like television, radio, cinemas, internet are all contributions of Science which have tremendous utility in modern day life. Science has provided newer dimensions to hobby of an individual.

5) Moral Value

Truthfulness and reasoning are good qualities desirable in all human beings. This qualities make one’s life worth living although there is a erosion of moral values in present day due to over stressed materialistic greed of human.

6) Cultural Value

The knowledge of Science develops in as a capacity to critically examine facts and arrive at locate conclusions. A study of the past and the discoveries gives us an insight in to the life, sacrifice and adventures of great scientists and also the cultural heritage of the past.

7) Psychological value

Teaching of Science is essential for developing scientific attitudes and scientific temperament. The learning of science is based on the fundamental principles and maxims of learning. Science being an activity oriented subject helps to satisfy basic human desire of knowing about wonders of nature and satisfies human instinct like creativeness, self assertion curiosity.

8) Adjustment Value
Science helps us to develop scientific attitude and scientific method. Such a method prepares an individual to face problems of life and to solve such problems systematically and successfully. A person possessing scientific attitude is open minded and has the desire for accurate knowledge.

Such attempts provide us with systematic organized information comprising scientific facts, concepts, generalizations, laws and theories which may prove helpful to all of us not only in enhancing the span of our knowledge but also in finding the solution of our problems.

**Aims and objectives of curriculum**

1. It should draw out excite, cultivate and inspire the complete development of all the pupils.

2. It should bridge the gulf between the school subjects and the reach and varied activities that make up the warp and woof of life.

3. It should develop the character of pupils by developing in them the qualities of honesty, integrity, friendliness, goodwill, judgment and cooperation.

4. It should enable pupils to establish values through intimate contact with arts, religions, social sciences, natural sciences and humanities.

5. It should create a community of scholars who may advance the frontiers of research, enquiry and knowledge.

6. It should meet the needs of all types of pupils having different tastes, abilities, capacities, interests and aptitudes.

7. It should create an atmosphere where students may learn to think and develop their faculties of thinking reasoning and observing.
Defects in our Existing curriculum

The following defects pointed out by the Secondary Education Commission Report (1952-53) have still relevance even today.

1. The present curriculum is narrowly conceived.

2. It is bookish and theoretical.

3. It is over crowded, without providing rich and significant contents.

4. It makes inadequate provisions for practical and other kinds of activities which should reasonably find room in it, if it is educate to whole of the personality.

5. It doesn’t cater to the various needs and capacities of the adolescents.

6. It is dominated too much by examinations.

7. It does not include technical and vocational subjects which are so necessary for training the students to take part in the industrial and economic development of the country.

In spite of the above defects, the review of the present Science curriculum shows that it suffers from the following defects also:

1. It is examination ridden.

2. It is not in conformity with the aims and objectives of teaching science.
3. It is cut off from the real life outside and it is not in accordance with the needs of the pupils and the needs of the society.

4. It is devoid of scientific activities like science clubs, science fair and hobbies etc.

5. It is not flexible but on other hand, it is static and rigid. The same curriculum is suggested for both the Boys and Girls.

6. It outfits the different age groups. The capabilities, interests of different age groups is not taken in to account while framing the curriculum.

7. The depth of the subject is sacrificed at the expense of vastness of range of topics. It is better to study a few topics thoroughly than to complete so many topics in haphazard way.

8. It is subject centered and topical. The topics from different branches of Science are huddled together under the caption of General Science.

**Objectives of Science curriculum for Upper Primary Level**

*(Std VI to VIII)*

1. To introduce the students to the primary physical, biological and chemical principles.

2. To develop the skill and habit of accurate measurement.

3. To reinforce the skills of observation, classification and of drawing inferences.

4. To reinforce the skill of performing simple experiments.
5. To help the students to understand the cause effect relationships in natural incidents.

6. To inculcate Scientific attitude.

7. To create awareness about the necessity of balance in nature.

**Psychology of using Teaching aids**

Audio visual aids are those tools and devices by the use of which communication of ideas between persons and groups in various teaching training situation.

The audio visual aids help the teacher to win the interest and attention of the pupils. They motivate the students to physical and mental activity. They save time and make learning effective and durable.

**Characteristics of audio visual aids**

1. It helps in learning and understanding permanently.
2. It reduces verbalism.
3. It impacts knowledge through experience.
4. It gives knowledge through narration.
5. It gives flow of thoughts
6. The audio visual aids explain the intricate matters easily, precisely and develop the imaginative and thinking power of the students.
7. The lesson becomes interesting.

The audio visual aids can be classified in various manners.

a) Visual aids
b) Audio aids
c) Audio visual aids
Audio visual aids

The eyes and ears work together in the use of these aids. The child sees with his eyes and listens with his ears and tries to memorize the teaching points. The knowledge best owed by these aids a precise, real, thematic and comprehensive. The examples of audio visual aids are T.V., Video, C.D.’s, computer, internet.

The audio visual aids are very important for teaching science because they arouse interest and motivate the student to act and stimulate physical and mental activity, save time and the learning becomes more effective and long lasting, they reduce verbalism and contributes towards the clearness of the perception and accuracy in learning. These teaching aids bring variety in experiences in the classroom. They provide most natural and easiest way of learning with the help of these aids students are motivated to do work and they work for their own accord and not out of the fear of the teacher.

The film with sound and motion, television and computer are the best examples of audio visual teaching aids. Text based computer programmes with multimedia effects can be developed and used for better learning and teaching science in school.

To make the process of science teaching and learning more effective, the science teacher will have to be more creative and hardworking. He should develop a research mindset in himself and develop educational softwares based on his/ her subject matter, he should get acquainted himself with the knowledge of computers and multimedia as well as various other similar type of computer facilities like PowerPoint presentation.
Thus the use of computer and multimedia will certainly help to enrich the process of teaching and learning science more effective.

Role of Computer and Multimedia in Teaching Learning Process

Different audio-visual teaching aids are used to facilitate the process of teaching and learning science. Computer is an audio-visual teaching aid.

What is Computer?

A computer is a programmable machine designed to sequently and automatically carry out a sequence of arithmetic or logical operations. The particular sequence of operations can be changed readily allowing the computer to solve more than one kind of problem.

Conventionally, a computer consist of some form of memory for data storage, at least one element that carries out arithmetic and logic operations, and a sequencing and control element that can change the order of operations based on the information that is stored. Peripheral devices allow information to be entered from external source and allow the results of operations to be sent out.

A computer’s processing unit executes series of instructions that make it to be read, manipulate and then store data. Conditional instructions change the sequence of instructions as a function of the current state of machine or its environment.
Uses of Computer in Education field

Computers are used in various settings within the educational field. They can be used by guidance, counselor, administrators, webmasters, library media specialists, students, teachers, clerical workers and food service employees for many different reasons. Computers lend an organizational hand to schools and they also improve productivity in several areas. For these reasons computer technology has become an essential part of the educational system.

Educational clerical staff members use the computers to store and maintain student records at both the district and building level. Because student information need to be readily accessible at all times computers provide the means for teachers, parents and other school personnel to communicate and share information easily. Food service department in schools can use computers to monitor students lunch accounts. Guidance, counselor and social workers use computer technology to communicate with teachers and parents and they also use technology to keep and monitor students records. Additionally counselor use computers to monitor student academic transcripts and grades as well as report information to concerned authorities or departments.

School administrators at both the building and district level use computer to communicate electronically with other staff members and parents and they also use computers to generate letters and documents for parents send automated phone calls to parents or staff.

School administrators also use computers to administer computer based standardized test to students.

Teachers use computer for various reasons. They use computers to keep electronic grade books, maintain and update personal websites to
share information with families, communicate with other teachers, parents and administrators and use software to create classroom news letters. Teachers also use computers to assess information engage in video conferencing, research various topics and create and update lesson plans. Teachers use computers to design personalized web based learning programmes for students and they also allow teachers to design assignment requirement and web quests for student use. Teachers can use computer technology to generate and utilize electronic testing for their students.

In school setting students use computers to learn both with and from technology. Computers enable students to research a variety of subjects, create projects to demonstrate learning and sort and synthesize information students can also use computers to view assignment guidelines and requirements at home and communicate with teachers about assignment. Some students use computers to blog about what they have learned or communicate with other students around the world.

**Role of Computer in Education**

The computer technology has a deep impact on education. Computer education forms a part of the school and college curricula as it is important for every individual today to have basic knowledge of computers. The advantage of computers in education include an efficient storage and retention of information, quick information processing and very importantly the saving of paper.

Computer teaching plays a key role in the modern systems of education. Students find it easier to refer to the internet than searching for information in fat reference books. The process of learning has gone beyond learning from prescribed text books. Today; aspirers can satiate
their thirst for knowledge by means of the internet. It is easier to store information on computers than maintaining handwritten notes. The internet can be used to refer to information on various subjects to be taught to the students.

Gurukul System of Education was in vogue in India. The main characteristics of Gurukul System were dedicated and knowledgeable teachers, individualized and learner centre teaching, and self-motivated students eager to learn. This system changed due to increase in number of students. Consequently, the number of teachers increased. Some teachers are born but rests of them have to be given rigorous training so as to develop required competency to become a teacher. Teachers have been conscious about the quality of their teaching. To enhance the quality, some teachers use teaching aids, like charts, models – static & working, specimen, slides, etc. because teachers are given training both in preparation and use of Audio-visual Aids. It is a known fact that majority of schools do not have appropriate teaching aids related to the school content. So teachers have no facility to use A – V Aids during teaching. The use of A – V Aids get further restricted due to unmotivated persons becoming teachers. Central Government realized the need of improving quality of education through the use of Television wherein most competent teacher teaches the topic with the help of most appropriate teaching aids. This helped in improving the quality of teaching in schools having no teacher to teach the subject, less competent teacher, schools having poor or no facility of teaching aids, etc. Programmes offered through television were produced by different State Institute of Educational Technology (SIET) in different languages. Even the Video Instructional Materials were produced and made available to teachers; still majority of schools did not make use of them. Some of the reasons
were no facility of TV and VCR, no electricity, TV and VCR not in working condition, not incorporated in the time table, lack of initiation on the part of teacher and Principal, etc. Along with A – V Aids, the print media has to go a long way in improving the quality of teaching and learning. Format in which the textbooks were written was not beneficial for teachers and students. Researchers started thinking and using different Theories of Learning for developing Instructional Material. This gives birth to Programmed Learning Material based on Operant Conditioning Theory of Learning. Programmed Learning Materials were compared with that of Lecture Method or Conventional Method. Programmed Learning Material alone as well as in combination with other methods for teaching different subjects was found to be effective in terms of achievement of students (Bhushan, 1973; Dewal, 1974; Pandya, 1974; Shitore, 1976; Kuruvilla, 1977; Patel, 1977; Sodhi, 1977; Verma, 1977; Sansanwal, 1978; Mullick, 1979; Parlikar, 1979; Shah, 1979; Pandey, 1980; Seshadri, 1980; Shah, 1980; Trivedi, 1980; Inamdar, 1981; Man, 1981; Mavi, 1981; Suthar, 1981; Davies, 1982; Ravindranath, 1982; Menon, 1984; Choudhary, 1985; Gautam, 1986; Joshi, 1988; Thaker, 1993; Agashe, 1995; Shah, 2002; Pandit, 2003; Dubey, 2004 & Kaur, 2005). PLM was found to be as effective as Structured Lecture Method in terms of achievement of students (Chandrakala, 1976; Govinda, 1976). Lecture Method was found more effective than Demonstration Method and Programmed Learning Method (Ghetiya, 1999). Also students expressed favourable opinion towards PLM (Govinda, 1976; Chauhan, 1973; Kuruvilla, 1977; Sansanwal, 1978; Mavi, 1981; Davies, 1982; Menon, 1984; Agashe, 1995; Shah, 2002; and Kaur, 2005). In addition to it, the developed Instructional Material was found to be significantly effective in enhancing creativity (Sharma, 1995), in developing better understanding about environment (Sharma, 2005) and in enhancing
Reading Skills amongst students (Danikhel, 1998) and Reasoning amongst students (Suri, 2002). The findings of researches were in favour of Programmed Learning Material (PLM). The PLMs are no more in use because the development of PLM is tedious as well as costly and time consuming. The format of PLM has undergone a change along with name. Consequently, Modules were developed in particular format. At present, the Print Instructional Materials used in different Programmes offered by Open Universities are in Module format. All above mentioned efforts could not improve the quality of teaching to the level of satisfaction of teachers, students, parents and other stakeholders. Search is on for most effective tools to be used by teachers for quality education.

**Use of Computer**

The lust for quality is still on. This is the age of INFORMATION dominated by the Digital Technology. The Digital Technology has influenced all aspects of human life. Education is not an exception. Now the technology is in the process of change from Digital to Photon. Shortly Photonic Technology will be available for the use of the society. At present majority of devices are based on Digital Technology. One such device is Computer. The Computer is an electronic device that has the capacity to store, retrieve and process both qualitative and quantitative information fast and accurately. The computers were never developed for improving quality of teaching – learning process. But researchers started using Computers for teaching purpose. It gave birth to Computer Assisted Instruction (CAI), Computer Managed Instruction (CMI), Computer Based Instruction (CBI), etc. People started developing CAI for teaching different subjects at School as well as Higher Education level. The developed CAIs were compared with the Lecture Method / Traditional Method and found that the developed CAIs were significantly superior to
Lecture Method / Traditional Method in teaching different subjects (Hayes, 1987; Perkins, 1987; Cates, 1988; Cohen, 1988; Karvelis, 1988; Lawson, 1988; Yates, 1988; Bonk, 1989; Conlin, 1989; Drexell, 1989; Fillingim, 1989; Isler-Hamilies, 1989; Koza, 1989; and Prabhakar, 1995) Further, the Traditional method of Teaching was found to be more effective in comparison to CAI (Hulick, 1987; Oates, 1988; Cosmos, 1988; Benson, 1989; Park, 1990; and Clem, 1990). The Model of Supplemental CAI was found to be effective in improving educable mentally handicapped students’ achievement in Mathematics and Spelling (Ankney, 1987). Language Impaired Children benefited from written format, like, dialogue with a computer (Ward, 1987). Setting goals, following instructions, accessing information to accomplish the task, and evaluating performance benefited students with learning disabilities when they were engaged with CAI activities (McPherson, 1991). Older Adults successfully used the computer and were able to improve their knowledge about Health with a CAI lesson (McNeely, 1988). CAI was effective in Language acquisition (Edfelt, 1989) and teaching abbreviation (Edward, 1989). CAI had a positive impact on reading comprehension for average reader but not for learning disabled readers (Trahan, 1989). CAI, Tutorial Retrieval Text, and Programmed Lecture were equally effective in promoting learning (Whitakar, 1990). Use of software improved achievement in learning calculus and did not cause damaging effects when access was denied (Cunningham, 1991). CAI was found to be effective in terms of achievement of Science Process Skills (Vensel, 1988), in increasing Meta-cognitive Writing Skills (Bonk et al., 1989), in teaching reference skills to seventh grade students (Driscoll, 1990), in increasing the rate of the acquisition of School Readiness Skills of preschool children (Legenhausen, 1991) and in improving writing skill (Powell-Hart, 1992). In spite of benefit of CAI in different aspects of
learning, CAI has not entered into the Classrooms as most of the developed CAIs were not based on sound Theories of Learning. People involved in developing CAI were not having the sound base of Instructional Design. Secondly, the courses are changing, the schools also do not have sufficient computer facility, teachers are not trained in the use of CAI, etc. The use of Computers was not only for teaching but also for Psychological Testing, Evaluation; database Management, Library Management, etc.

**Information Technology**

Networking of computers gave birth to Information Technology (IT). UNESCO considered Information Technology as “Scientific, technological and engineering disciplines and management techniques used in information handling and processing, their application, computers and their interaction with men and machines, and associated social, economical and cultural matters”. According to Smith & Cambell (1982), a mosaic of technologies, products and techniques have combined to provide new electronic dimensions to information management. This mosaic is known by the name of Information Technology. OECD (1987) treated Information Technology as “a term – used to cover technologies used in the collection, processing and transmission of information. It includes micro-electronic and info-electronic based technologies incorporated in many products and production processes and increasingly affecting the service sector. It covers inter alias computers, electronic office equipment, telecommunication, industrial robot and computer controlled machine, electronic components and software products.”

Darnton and Giacoletto (1992) defined IT as the systematic study of artifacts that can be used to give form or description to facts in order to
provide meaning or support for decision making, and artifacts that can be used for the organization, processing, communication and application of information. Sansanwal (2000) defined IT as the use of hardware and software for efficient management of information, i.e storage, retrieval, processing, communication, diffusion and sharing of information for social, economical and cultural upliftment.

The Information Technology leads to development of Websites. Government, Corporate sector, educational institutions, etc. started uploading the information on their websites. It provides facilities for Chat, e-mail, surfing, etc. It opens up a new source of information which increased the limitation of access to information. Prior to IT, people were using only the print material for searching the information. It limited the search. This limitation has been overcome by the IT.

**Use of ICT in Teaching**

Teaching at School as well as Higher Education, mostly, concentrates on giving information which is not the sole objective of Teaching. Along with giving information, the other objectives are:

- developing understanding and application of the concepts
- developing expression power
- developing reasoning and thinking power
- development of judgment and decision making ability
- improving comprehension, speed and vocabulary
- developing self-concept and value clarification
- developing proper study habits
- developing tolerance and ambiguity, risk taking capacity, scientific temper, etc.
With the present infrastructure, class size, availability of teachers, quality of teachers, training of teachers, etc., it is difficult to achieve all the objectives. Further, most of the teachers use Lecture Method which does not have potentiality of achieving majority of above mentioned objectives. The objectives are multi-dimensional in nature, so for their achievement multiple methods should be used in an integrated fashion. At present ICT may be of some use. It is a well known fact that not a single teacher is capable of giving up to date and complete information in his own subject. The ICT can fill this gap because it can provide access to different sources of information. It will provide correct information as comprehensive as possible in different formats with different examples. ICT provides Online interaction facility. Students and teachers can exchange their ideas and views, and get clarification on any topic from different experts, practitioners, etc. It helps learners to broaden the information base. ICT provides variety in the presentation of content which helps learners in concentration, better understanding, and long retention of information which is not possible otherwise. The learners can get opportunity to work on any live project with learners and experts from other countries. The super highway and cyber space also help in qualitative improvement of Teaching – Learning Process. ICT provides flexibility to learners which is denied by the traditional process and method. Flexibility is a must for mastery learning and quality learning.

On INTERNET many websites are available freely which may be utilized by teachers and students for understanding different concepts, improving vocabulary, developing Reasoning & Thinking, etc. ICT can help in preparing students for SAT, GRE, TOEFL, etc.
Use of ICT in Developing Reasoning and Thinking

Web Based Instruction (WBI) can be developed with the help of ICT. According to WBT Information Centre (1997), Web Based Instruction (WBI) is an innovative approach to distance learning in which computer based training (CBT) is transformed by the technologies and methodologies of the World Wide Web (WWW), the Internet and Intranets. WBI presents content in a structure format that allowing self-directed, self-paced instruction on any topic. WBI is media rich learning fully capable of evaluation, adaptation and remediation, all independent of computer platform.

Ron Kurtus (1998) states that, in its strictest sense, Web Based Training (WBT) is the communication of information over the WWW or Web with the objective of instructing or training the user. WBT is actually is in the form of Computer Based Training (CBT) that uses the Web or company intranet as the delivery medium instead of using disks or CD-ROMs. Both CBT and WBT are part of a larger classification called Electronic Performance Support System (EPSS) that includes such communication forms as Online manuals and Windows Help.

Sansanwal and Nawayot (2001) defined Web Based Instruction as a hypermedia-based instructional programme that utilizes the attributes and resources of the WWW to create a meaningful learning environment where learning is fostered and supported.

Sansanwal and Nawayot (2001) developed WBI for facilitating the Reasoning ability of people. It was a website hosted for three weeks and 72 people belonging to countries, like, Australia, Africa, America, France, Germany, India, Japan, Laos, Malaysia, Nepal, Singapore, Thailand and UK visited the developed website. Out of 72 visitors, 55 took the pre-test
and 45 took both pre-test and post-test. The reason of not taking the test was that the WBI was in English and visiting people did not know English. So language can be the barrier in WBI. The WBI was found to be effective in facilitating Reasoning Ability amongst people belonging to different countries and age group. The WBI can be developed in other subjects too. It will provide variety of Instructional Material to students and they can choose that suits them best. This will improve the academic standard. The WBI for developing Reasoning and Thinking will be very helpful for human beings belonging to different countries and age. This is important in the present context as most of the Educational Institutions do not pay attention to development of Reasoning & Thinking. They do not have any period in the time table for Reasoning and Thinking. These abilities once develop can help individual for solving the day-to-day problems. On the whole it will improve the quality of life. Thus, ICT can be used for developing WBI for facilitating Reasoning and Thinking.

**Use of ICT in Developing Instructional Material**

At present there is a shortage of qualified and competent teachers in almost all subjects at all levels. Not only this, even the instructional material available in the print form is not of quality. This is because many authors have written on those topics that they have never read and / or done research. Sometime the information given in the books is also wrong. The book reading is not very enjoyable and does not help students in understanding the concepts and retaining the information. There are many teachers who are well known for the specific subject. Their lectures should be digitalized and made available to all the users. It will enhance the quality of instruction in the classrooms. The teacher can use them in the classrooms and can organize discussion after it wherein the new points can be added both by the teacher as well as students. It will make
the teaching effective, participatory and enjoyable. Sansanwal (2006) has done this. Sansanwal has developed digitalized lectures on Research Methodology and Statistics and has used it for teaching this subject at master’s level. Other researchers are also using it. Of course, digitalized lectures will have their limitations of revision and in-built interaction. These lectures can be uploaded on any website and students & teachers can access any lecture they like.

Another form of digitalized lectures is e–content. The CEC is making efforts to develop e–content material in different subjects for the benefit of diverse users. The competent teachers can develop e–content in their own areas of specialization. This has lots of potentiality to bring quality in teacher education. The ICT can be used in developing Instructional Material and e-Content.
SECTION III

ABOUT THE RESEARCH

Background of the Research

General Science is a compulsory subject up to secondary level. This has led to inculcation of Scientific temper, Scientific method, Scientific attitude among students in their various other activities in the curriculum: intellectual, vocational, cultural, moral and aesthetic.

To improve the Science teaching advanced methods should be used.

Science is taught and studied as an integrated whole now, the present research is the product oriented investigation. Researcher developed the Multimedia Software based on Chemistry related topics of VI, VII and VIII classes. For this General Science text book of VI, VII and VIII were analyzed and Multimedia Software was developed, researcher studied the effectiveness of the software.

Present research is the product oriented investigation. Researcher developed the Multimedia Software based on Chemistry related topics of VI, VII and VIII classes. For this General Science text book of VI, VII and VIII were analyzed. Now Science is studied as an integrated whole. But for the Ph.D. Research purpose only Chemistry related aspects of Science subject were covered; and multimedia software was developed; as this research work was involved development of computer software, researcher studied the effectiveness of software.
About the research

As this research involved the development of text based Multimedia Software and assessing its effectiveness; researcher used Experimental method. In this study investigator developed text based Computer Multimedia Software Packages related to Chemistry topics of the VI, VII and VIII standard Science textbooks used in the Maharashtra State Schools.

While preparing Multimedia Software Package researcher prepared story boards by using Chemistry related content and consultation of experts in the relevant fields; Science, Education, Computer Science, Electronics, Statistics and assistance of the computer professionals.

Statement of the Problem

Development of text-based Computer Multimedia Software Package for school students to enhance their academic achievement in Science and Chemistry in particular – A Study

Operational definitions of the terms and phrases used in the study

The different terms and phrases used in the statement of the problem are defined operationally for the sake of clarity indicating its scope and delimitations.

Development

Preparation of the Computer Software Package based on the textual matter related to Chemistry aspects in the General Science text books of VI, VII and VIII standards used in the English medium schools and trying out its effectiveness.
Text-based

Based on the matter of study of Chemistry in the Science text books prescribed by the Maharashtra State Government for standard VI, VII and VIII

Computer Multimedia Software Package

The textual matter of the Chemistry in the text books of standards VI, VII and VIII prescribed by the Maharashtra State Government is recorded on CDs The CDs are run on computer only. The content in the CDs are presented by text, sound, pictures and animation. Hence it is a software package.

School Student

Upper Primary School students (As per National policy of education, 1986 includes VI, VII and VIII standard) of English medium schools in Kolhapur city selected for this research study for the year 2010-2011.

Academic achievement in Science and Chemistry in particular

Achievement scores obtained by the students of VI, VII and VIII standards of English medium schools selected for this research study in Science in their annual examination as well as in the post-tests related to Chemistry.

Enhance

Enhance means increase. The enhancement measured in this study is between the Experimental group and Control group on the scores obtained in the post-tests as well as in the annual examination science marks, after the use of Computer Software Multimedia Package.
Science

The topics included in the school science text books of standards VI, VII and VIII of Maharashtra State Bureau Of Text Book Production and Research, Pune.

Chemistry

The content matter in Science text book of standards VI, VII and VIII related to substance, chemicals and reactions.

Objectives of the study

The present research was undertaken by keeping following objectives

1. To analyze the text books of standard VI, VII and VIII of Science and identify the topics of Chemistry on the basis of conceptual themes.

2. To find out the problems of learning Science and Chemistry components / aspects in particular of students at the Upper Primary School Level.

3. To find out from the teachers the problems they face while teaching Science and Chemistry in particular to Upper Primary School students.

4. To develop Computer Multimedia Software for Chemistry in the Science text books of standards VI, VII and VIII.

5. To test the effectiveness of the Computer Multimedia Software Package prepared for the study.

6. To compare the effectiveness of Computer Multimedia Software Package over the traditional method of teaching.
7. To enhance the academic achievement in Science and Chemistry in particular of Upper Primary Level school students with the help of Computer Multimedia Software Package.

8. To find out the school students view regarding the developed software.

9. To make appropriate suggestions to schools, Science teachers, parents, students and Government of Maharashtra.

**Delimitations of the study**

1. The research is restricted only to standards VI, VII and VIII which offering syllabus of Maharashtra State Bureau of Text book Production and Research, Pune.

2. The research is restricted to the students from English medium schools with computer facility in Kolhapur city.

3. The research is restricted to Chemistry part of Science text books of standard VI, VII and VIII.

**Limitations of the present study**

1. Only four English medium schools with computer facilities were chosen.

2. Only 312 students studying in VI, VII and VIII standards comprised the final sample of this study.

3. The research is restricted to Chemistry part of Science text books of Standard VI, VII and VIII.
Significance of the study

No such work (Ph.D level) has been undertaken by any researcher with particular reference to Chemistry in India. This Computer Software Package can be used by any student want to learn.

This study will beneficial to Upper Primary Level school students to enhance their educational achievement in Science and Chemistry in particular.

The results of this study will motivate the Science teacher to use CAI and teach more effectively.

The results obtained can be generalize for Upper Primary Level school students wherever these topics are taught.

The software prepared on Chemistry topic will help to develop interest in Science subject.

This research will motivate other subject teachers to prepare Computer Multimedia Software for Upper Primary Level school students.

This research will help Science teachers to develop new teaching strategies for teaching.

Scope of the study

The results obtained can be generalized for upper Primary level School Students in Maharashtra.

The results obtained can be applicable to the Upper Primary Level School Students in India where these topics are taught.
Research hypotheses

1. Upper Primary Level School Students (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Students (VI, VII, VIII) who learn through traditional method on achievement tests.

2. Upper Primary Level School Students (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Students (VI, VII, VIII) who learn through traditional method on annual examination.

3. Upper Primary Level School Boys (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Boys (VI, VII, VIII) who learn through traditional method on achievement tests.

4. Upper Primary Level School Boys (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Boys (VI, VII, VIII) who learn through traditional method on annual examination.

5. Upper Primary Level School Girls (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Girls (VI, VII, VIII) who learn through traditional method on achievement tests.

6. Upper Primary Level School Girls (VI, VII, VIII) who learn through Computer Multimedia Software will perform significantly better as compared to the Upper Primary Level School Girls (VI, VII, VIII) who learn through traditional method on annual examination.
Null hypotheses

Following null hypotheses were tested

1. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental groups of standard VI.

2. There is no significant difference in the mean post-test scores obtained by the Control and Experimental groups of standard VI.

3. There is no significant difference in the mean annual Science marks obtained by the Control and Experimental groups of standard VI.

4. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental groups of standard VI.

5. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental groups of standard VI.

6. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental groups of standard VI.

7. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental groups of standard VI.

8. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental groups of standard VI.

9. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental groups of standard VI.

10. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental groups of standard VII.

11. There is no significant difference in the mean post-test scores obtained by the Control and Experimental groups of standard VII.
12. There is no significant difference in the mean annual Science marks obtained by the Control and Experimental groups of standard VII.

13. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental groups of standard VII.

14. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental groups of standard VII.

15. There is no significant difference in mean the annual Science marks obtained by Boys of the Control and Experimental groups of standard VII.

16. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental groups of standard VII.

17. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental groups of standard VII.

18. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental groups of standard VII.

19. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental groups of std. VIII.

20. There is no significant difference in the mean post-test scores obtained by the Control and Experimental groups of standard VIII.

21. There is no significant difference in the mean annual Science marks obtained by the Control and Experimental groups of standard VIII.
22. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental groups of standard VIII.

23. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental groups of standard VIII.

24. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental groups of standard VIII.

25. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental groups of standard VIII.

26. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental groups of standard VIII.

27. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental groups of standard VIII.

28. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental groups of Upper Primary School Level students.

29. There is no significant difference in the mean post-test scores obtained by the Control and Experimental groups of Upper Primary School Level students.

30. There is no significant difference in the mean annual Science marks obtained by the Control and Experimental groups of Upper Primary School Level students.
31. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental groups of Upper Primary School Level students.

32. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental groups of Upper Primary School Level students.

33. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental groups of Upper Primary School Level students.

34. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental groups of Upper Primary School Level students.

35. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental groups of Upper Primary School Level students.

36. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental groups of Upper Primary School Level students.