CHAPTER – I

INTRODUCTION

1.1 INTRODUCTION

Education is a unique and great investment in human capital for the present and the future. Education is an important factor for progress and the development of a country. It plays a vital role in economic and social development and national integration. The prime aim of education is the qualitative change of educand and the society. While being educated, man is also involved as an agent of change in the structure of education. The progress of education is the result of human endeavour. It is the rational being, who decides the standards and aims of education.

Education is positive when the teacher or the educator is able to produce specific effects by definite actions or when the acquisition of specific skills and a particular knowledge is the aim. It is education, which bridges the gulf between the origin nature of the immature child and the standards, customs and the demands of the society, which increases, with the growth of civilization. Education renews and rebuilds the social fabric and gives social consciousness.

India with its hard earned democracy has paved a long way in the field of education. Of the many tasks, which India faced immediately after the attainment of independence, one of the stupendous task was reconstruction and expansion of system of education. Government of India has committed to provide free and compulsory education to all upto the age of 14 years under article 45 of the Constitution. This has been a reiterated in the National Policy of Education, 1968 and 1986 as well as under RTE Act 2009.
Elementary education plays a vital role in making a child an educated individual. It is the most crucial period in the entire structure of education and has been recognized as an endeavour of paramount importance. It is at this level that the entire growth and the development of the mental and physical faculties of a child depend. It lays the foundation for the development of attitudes, habits, skills and other necessary qualities.

Childhood constitutes a very important part in the total life spectrum of human development. Education imparted at the early stages has an immense bearing on the personality of the child. Personality is moulded right from the time the person starts socializing and this takes place most importantly/prominently when the child enters school. The child of today is the citizen of tomorrow and the strength of a nation lies in the education of its citizens. Hence, properly organized elementary education is very important.

1.1.1 Science Concept and Nature

Science has occupied almost all spheres of human life. The wonderful achievements of science have glorified the modern world, transformed the modern civilization into a scientific civilization and illuminated the human creative potential.

“The aim of science teaching is not the acquisition of information and a few skills but to attain the understanding of the relationship which connects the answer to the problem”.

— W. Pauli (1985)

The National Policy on Education (1986) has emphasized the system of well planned and rigorously implemented programme of vocational education which is crucial in the proposed educational reorganization.

The relevance of science to the future of society is considerably more far-reaching than the influence it has had on human affairs in the past. Some of the
pressing problems of society today are related to the rapid decline in the quality of global environment, depletion of natural resources, increasing poverty, hunger and illiteracy in many countries and regions of the world. Solutions based on science and technologies are likely to provide remedial measures to some of these pressing problems, and yet science and technology as we understand today, are not available to a vast human population. A high percentage of the human population does not appreciate science or its utility and potential for economic and social development. Such an understanding is regarded today by the barriers impending the sharing and the use of scientific and other knowledge necessary to make decision and choices. They include poor education, lack of exposure to science in the formative years, inadequate grasp of science in the general public, non-availability of proper facilities for training, poorly endowed laboratories and teaching institutions (for those already trained) and isolation of scientists and teachers. Even in the advanced countries, science or specifically science education is facing difficulties, disenhancement or absence of excitement being one of the factors (Bajracharya, R.K., 1986).

“Science is a cumulative and endless series of empirical observations, which result in the formation of concepts and theories with both concepts and theories being subject to modification in the light of further empirical observations. Science is both a body of knowledge and the process of acquiring it”.

— Frideric (1960)

“Science as – An accumulated and systematized learning in general usage restricted to natural phenomena”.

— Columbia Encyclopaedia (1977)

“Science includes the methods by which man put limiting values on his preconceptions”.

— Niels Bohr (1977)
The goals and expectations of the science education change with time and with the curriculum. Science has a variety of facets. Important of them are the processes through which one can gather information, knowledge gathered through use of such processes and the attitude possessed by people who use scientific processes to gather knowledge.

Barman (1983) studied the origin and developments of modern science in pre-independent India while Sharma (1984) studied school science from 1947 to 1977. The journey has been from teaching science through the integrated or concept approach, shifting from general science to separate subjects and inclusion of environmental study programmes. These studies have highlighted the various shifts in the development of modern science curricula.

“Science based education in coherence with Indian culture and values can alone provide the foundation and also the instrument for the nation’s progress, security and culture”.

—Indian Education Commission (1964–1966)

1.1.2 Need for Teaching Science

Science, as a subject is universal and knows no boundaries. The claims of science of inclusion in the school curriculum came to be recognized after years of active and persistent efforts. Science almost revolutionaries human life and proved indispensable for existence of man.

Now supremacy of science has been established in every field. In fact, so great is its importance for man and society that the present day people live in an “age of science”. Canon Wilson, a famous educationalist in 1867, in support of inclusion of science as a school subject wrote, “science teaches what evidence is, what proof is”.

Science provides unique training in observation and reasoning. Science students reason from definitely ascertained facts and form clear concepts. It makes
one systematic and enables him to form an objective judgement. The discoveries have added to the prosperity of human race with vast increase of knowledge. Herbert Spencer in his “What knowledge is of Most Worth” gives information which study of science furnishes. According to him, science learning is incomparably more useful for our guidance in life. Professor H.E. Armstrong says’ that science is taught to provide training in and knowledge of scientific method, which is useful in the life pursuits. Science has its cultural value. It has a literature of its own. The scientific discoveries of Galileo, Newton, Faraday, Darwin, Pasteur, Kelvin, Bose, Armstrong and others are treasures of mankind. Modern knowledge of science provides great intellectual pleasure. Knowledge of the methods of observation and experiment in the different branches of science helps pupils to develop a logical mind, a critical judgement and a capacity for methodical organization. Science also provides discipline of mind. All these need a school base of science education.

The Secondary Education Commission (1953) has recommended that every secondary school pupil should study general science as a compulsory subject. Seminar on the teaching of science in secondary schools held at Tara Devi (Simla) in 1956 dealt with almost all the problems facing the inclusion of general science as a core subject for the higher secondary classes. One of the recommendations of Kothari Education Commission (1966) was that science should be made a compulsory subject in school curriculum. The recommendation was accepted and science was made compulsory in school.

1.1.3 Objectives of Learning Science

The objectives of Learning Science are the following.

- Children will demonstrate the ability to plan and execute experiments that demonstrate the use and understanding of modern instruments, accurate
quantitative measurements, appropriate recording skills, safe lab practices and appropriate use of computer applications.

- Children will develop a sense of community responsibility by becoming aware of scientific issues in the larger social context.
- Children will demonstrate interpretative skills including the ability to analyze data statistically, assess reliability, interpret results and draw reasonable conclusions.
- Children will become well grounded in laws and theories of science by demonstrating and applying the scientific method, developing a synthetic strategy.
- Children will develop standards of professional behaviour that include rules of ethics.

The general objectives of science education may be stated as follows.

- The child should be able to apply the knowledge of science in everyday life.
- The child should be able to investigate new knowledge in the field of science.
- The child should develop scientific attitude.
- The child should learn how to learn a part of scientific knowledge on his own.
- The child should be able to solve problems around him.
- To make the child creative.
- To train the child in science processes. (Sharma, R.C. & Shukla, C.S., 2002)

The goals and expectations of the science education change with time and with them the curriculum. Updating, revising, re-organising or adopting science curricula are not sufficient to reduce the present state of fragmentation and narrowness. What is necessary is the design of science programmes for the non-specialist, the common man.

Till the end of 18th century, science education has been neglected all over the world and it had no place in the school curriculum Chief Scientific discoveries were
made by amateurs such as Priestly, James Watt etc. A number of philosophical societies were started to fill the gap between the educational provision and social needs.

These societies did remarkable work of popularizing science among general public. An important event in the history of teaching science was commenced with the establishment of Mechanics institute of the early 19th century. Anderson (1987) was perhaps the first who attempted to give a course of lecture on experimental Physics. The modern civilization is scientific civilization. This is an age where the modern society is completely drawn into scientific environment and science has become an integral part of our life and living. Now we cannot think of a world without science.

Science is mankind’s rational attempt to organize and explain the perceived and events of the world. The role of instruction in science is promoting intellectual development is almost unique. Among school subjects no other subject provides potentials of rapid feedback. The greatly charging conditions of life and world events are demanding a new perspective in teaching science.

The major goal of science instruction is the development of science concepts. The field of science is wide, its fund of facts, concepts and theories are constantly growing. The student is no longer expected to learn by rote memory. In any branch of science, it is the teacher who holds the key to successful learning.

The task of teacher is to find ways of making it possible for students to make knowledge meaningful. Ausubel (1968) suggests, ‘Meaningful learning takes places if incoming information can be connected in a meaningful and non-arbitrary manner to the particular cognitive structures of the individual learner’.
1.1.4 Factors Influencing Teaching Learning Science

The teaching and learning science in schools is influenced by some factors. Some of the important factors which influence science learning are;

a) *Learning Environment* – Schools may offer students a positive learning environment including the use of technology in the classroom and a quality library, give students an edge in mastering science. Up to date textbooks and other materials to use during lectures and other teacher presentations are also important.

b) *Innovative Teachers* – Teachers who are good at sparking the imagination of students through hands on learning activities or other creative approaches draw students into the joy of learning. These students no longer see new ideas as something to dread. Educators like Jaine Escalante, a math teacher portrayed in the movie “Stand and Deliver”, show that regardless of the economic disadvantages of many students and school districts, a teacher who uses a creative approach can make a difference.

c) *Student Behaviour* – Managing student behavior and maintaining discipline in the classroom is vital to create a learning environment where each student feels he can share his thoughts and ideas with teacher and with his peers. It also helps teacher to stay on track in presenting materials on schedule. This enables the teacher to fulfill the required curriculum for that academic year, semester or quarter.

d) *Appropriate Training* – Having appropriate training to teach a specific subject is an important factor in being able to teach that class effectively.

e) *Clear and Concise* – Good communication skills are a must in order to effectively teach. Teacher must be able to project in a clear way. If students cannot keep up with teacher or have a hard time hearing teacher, they may also have a hard time understanding the ideas or concepts they need to master to do well on learning process.
1.1.5 Methods of Teaching Science

There are different methods for teaching science. Some important methods for teaching science at school level are explained below.

a) *Conventional methods of teaching science* – In the early periods, the science learning was directed to the mastery of facts. In recent year there has been an increasing tendency to direct learning science toward its principles and broader generalizations. These trends are encouraging as they lead to a kind of learning which makes content more useful for the student as the faces problems of adjustment in everyday living.

b) *The lecture method* – In this method the teacher develops a topic in science more or less from a logical organization. It is now very common when this method is used to supplement the lecture with demonstrations and visual aids. The chief advantage of lecture method is that it provides an efficient means of covering subject matter and the disadvantage is that the lecturer is only active while the student is a passive recipient of information.

c) *The Demonstration and laboratory methods* – Demonstration is advice for illustration or application, while the experiments in the laboratory is a situation where elements are varied and controlled under various condition. The demonstration may be used without much thought of control or variable factors, where these are the very essence of true experiment.

d) *The text book method* – Properly used the text book may become a very important part of a course in science. In recent years the various science text books are there based on problems. Here, many activities are suggested for aiding in the solution of the problems and references are given to other books dealing with the same problem.
e) *The Individual method* – In this method, science teachers along with others have been active in devising schemes which would permit a student to progress through the work at his own rate.

f) *Problem solving techniques* – This include setting the problem, collecting information bearing on solution of a problem etc. children learn problem solving techniques by solving the problem. In the solution of the problem, the most important step is the collection of data or evidence.

Scientific research in the past few decades have led to a deeper understanding and more realistic approach to creativity, giving educationists the knowledge that all are born with creative potential and given proper environment and technique, this potential can be recognized, nurtured and measured.

The public perception of science is generally idealistic and corresponds to as ‘Wory tower’ image. But times are changing sciences is coming under critical attention of public. In the last few years, the question about objectivity in science has flared up again, some social scientists and philosophers are questioning the scientists claim that the scientific method is the most objective of narrating the truth about nature. They say that scientists and science are very much the product of the process of society and ‘facts’ cannot be separated from ‘values’ that the world of science, for from being clinical and objective in as much valuable to objectivity, social context, personal rivalries, and passion as any other social science disciplines.

So science is no longer confined to a few seriously devoted persons. Living in the present world inevitably warrants the knowledge of scientific facts and laws. Science has become an unavoidable part of general education. Science refers to the system of acquiring knowledge based on empiricism, experimentation and methodological naturalism. The term science also refers to the organized body of
knowledge humans have gained by such research. The American Heritage Dictionary of the English Language defines science as “the observation, identification, description, experimental investigation, and theoretical explanation of natural “phenomena”. The Mudaliar Commission (1953-55) recommended teaching of general science as a compulsory subject at the secondary school level. According to Kothari (1998) at the upper primary stage, the teaching of science at this stage should emphasize on the acquisition of knowledge along with the ability of logical thinking and drawing conclusions for taking decisions at a higher level. At this stage a disciplinary approach of teaching science is favoured instead of an integrated science teaching. The teaching of physics, chemistry, botany etc., is likely to develop more effective scientific base (Yadav, 2004). There are a lot of educational problems related to science. If they are not solved properly by educationists, teachers etc. they become the victims of wastage and stagnation or those pupils tend to dislike science subject. According to Prof. V.N. Rajasekharan Pillai (1996) “Classical Disciplines like Botany and Zoology are slowly disappearing from the Collegiate Education Scenario”. The root cause was traced into the Upper Primary Level, where student cannot understand abstract concepts from science related topics by just listening and reading the concepts. Karuna Misra (2001) states that students may avoid studying advanced science courses at high school stage. This occurs when they find their courses uninteresting or if they get low scores. Other factors like difficulty of courses, un-inspirational teaching, lack of adequate facilities, lack of trained teachers, option of inappropriate teaching strategies, intelligence level, level of aspiration, cognitive preferences and learning style, may also be responsible for this behavior of students. Students of developing countries are not happy to choose the life science stream which has developed as a result of the way of studying science at the primary level.
The reflection of this situation results into the exploitation of natural wealth. The rate of exploitation of natural wealth is very high in developing countries than the developed countries. Therefore science has a unique place in elementary education.

There are different approaches to teach science. One is teacher centered approach and other is pupil centered approach. Pupil centered approach are widely advised for teaching science in the school, but the situation is reverse.

Most teachers opt the traditional approach to teach science in the schools which has its own limitation. Therefore, Indian school education is falling short in meeting the challenges of modern world. It has to be lamented however that teaching of science in particular in elementary classrooms continues to be dominated by teacher’s talk, minimum class room participation of the students and teachers control as evidenced by a number of research studies. Traditional lecture method continues to be quite popular among secondary school teachers (Nayar & Puspam (2000). Therefore, there is a need to change teacher centered methods of teaching to the pupil centered teaching. According to Kelly J.A. (1989), “teaching is the heart of education and single most important action that earlier can take to improve school is to strengthen teaching”. Good teaching almost always occurs only when we have good feedback from the learner. This indicates that if we want to improve the quality of education we need to focus on the pupil centered learning.

In the words of Gaben and Bunce (1994) “Many of the goals of Science Education will be realized once the teacher orient their teaching towards understanding of concepts”. Multimedia Approach in science offer tremendous possibilities for making use of diverse, alternative learning resources and learning strategies in the class room. Use of multimedia approach in teaching science topics provides scope for direct learning experience, whole class room participations and
interactive class room environments. Such class room environment are ideal for cultivating learning skills, scientific temper and arising curiosity and instilling motivation. Lehrer’s (1997) studies support distinctive difference in ways students retain information gathered and applied using multimedia versus traditional modes of instruction. In a study conducted with VII graders he also found that students who learned about the civil war using multimedia had made long lasting connections with the materials while students who learned traditionally had little to no retention of the materials on year later. It was also noted that the level of students engagement was significantly higher amongst students with both high and low abilities. Okolo and Ferretti (1998) showed that students composition representing idea simultaneously through test, audio, video and sound increased the likelihood that students will acquire an understanding of complex information.

1.2 MULTIMEDIA

The term (from Latin Multum “Many” + Media) appeared in international encyclopedia publication in the 1970s that designated the methods for the processing and presentation of video, audio and printing information. Multimedia is special type of computer technology that combines both traditional static visual information (text and graphics) and dynamic information. i.e., speech, music, video fragments, animation etc. So multimedia technologies which allow the real integration of computer, audio, video and television techniques with various information technologies, are considered by many researchers as priority technologies.

Multimedia is an infrastructure technology characterized by the ability to handle very diverse data. In Multimedia the information is delivered by the use of text, picture, audio and video, Multimedia combined with movies, music, lighting, CD-ROMs and the internet is very effective for educating pupils.
Weideng Xhang (2003) says that multimedia is a hot topic in education because it represents the latest technology and introduces into the classroom while new ways of thinking about curriculum, interaction with student and even the nature of learning itself.

Multimedia has various components. They are: i) Text ii) Graphics iii) Photographs iv. Sound v. Animation vi. Video vii. Interactivity. Their description is as follows.

i) Text

The term text has been defined as “The data composed only of standard characters, without any formatting characters.

The text is an effective medium of providing information. It requires sufficiently more time for Multimedia presentations but when we are falling short of time, then we face many limitations to use the text. During presentation program, the text is used to make the titles and indexes more effective.

ii) Graphics

The term graphics has been defined as in personal computing, the creation, modification and printing of picture as opposed to text is called as graphics. The two basic types of computer produced graphics are

a) Object oriented graphics/victor graphics

b) Roister graphics/bitmapped graphics

a) Object oriented graphics/victor graphics: these graphics programs are usually called a draw programs. They store graphics image in the form of mathematical representation which can be scaled as sized without distortion. This program is well suited for architecture, interior designs and other applications in which precision and seating capability are more important.
b) Roster graphics/Bitmapped graphics: These are often called as paint programs, these graphics store graphics images in the form of patterns of screen pixels. Unlike draw programs, paint programs can create delicate patterns of shading that convey an artistic touch, but any attempt to resize or scale the graphics may result in unacceptable distortions.

iii) Photographs

The photographs are nothing but the picture taken with an ordinary 35 mm cameras and developed the film on to the appropriate paper. An effective photograph of the product helps to increase the quick grasp and is very useful in the multimedia presentation.

iv) Sound

This is the important components of the presentation program. Sound has got tremendous power to attract the concentration of spectators. The use of various sound effects helps to promote the effect of presentations.

Sound data and live synthesized sound are two basic kinds of sounds which used in multimedia presentation.

v) Animation

The term animation is defined as “creating the illusion of movement by saving a series of images that show slight changes in the position of the displayed objects and then displaying these images back fast enough that the eye perceives smooth movement. The illusion is convincing only if the frame rate is sufficiently fast to trick the eye into seeing continuous motions”.

The effect of action and motion is animated movies, cartoons are created by projecting still pictures called cells. One after @ 30/sec when the cells are projected fast enough, the illusion is of smooth enough. Computer animation is done by projecting a series of still images called the frames.
vi) Video

Video is ever more widely used in multimedia in spite computer images tending to be small, grainy and even jerky because of the large file size and the time it takes to transmit these files.

To display movies or videos on a computer, they must first be digitized. The resulting file sizes enormous. A digitized feature length film can take up to 100 crb of disc space. To make it possible to store video and to play it back at a visible rate, files are heavily compressed using video compressor – de-compressor.

vii) Interactivity

Due to the faculty of interactivity the user can go and for in hrs multimedia presentations. He can switch from one topic to the another topic of his own choice. In this way due to the interactivity the user can use the multimedia applications according to his own convenience and interest. He gets an opportunity to active participation. Due to this, the boundaries of computers have been extended. Now a days motion images, audios, interactive white boards are frequently used.

When we allow an end user to control what and when the elements are delivered, it is called interactive Multimedia. Interactive multimedia allows the students or end user to participate and control information. The term interactive multimedia is used to indicate the use of variety of medias for retrieving and transferring the relevant information to the learner which includes print material, computer, internet and teleconferencing. However essentially the term describe the presentation of information using a combination of communication elements such as learning packages consisting of printing materials, slides, audio tapes and so on. Now the terms refers to a class computer driven interactive communication which create, store, transmit and retrieve textual graphics and auditory network of information.
(Arulsamy and Siva Kumar, 2004). This in interactive multimedia wide variety of media options can be used simultaneously to make learning move exciting, interactive and entertaining.

1.2.1 Use of Multimedia in School Education

Multimedia is used to deliver lecture in class room. The different components of Multimedia including visual and audio helps the student to understand better. The other uses of Multimedia are the following:

- Multimedia provides students with opportunities to represent and express their previous knowledge.
- Empower students to create and design rather than absorbing representations created by others.
- Multimedia applications engage students and provide valuable learning opportunities.
- Encourages deep reflective thinking.
- Allows students to function as designers, using tools for analyzing the world, accessing and interpreting information, organizing their personal knowledge and representing what they know to others.

Studies support distinctive differences in ways students retain information gathered and applied using multimedia versus traditional modes of instruction. In a study conducted with eight graders, R. Lehrer (1997) found that students who learned about the civil war using Multimedia had made long lasting connections with the materials while students who learned traditionally had little to no retention of the material on year later. It was also noted that the level of student engagement was significantly higher amongst students with both high and low abilities.
An appropriate educational technology in the hand of competent teacher can ensure better teacher learning process. At present the role of the teacher in educating the children has gained paramount importance. The classrooms are over crowded, with heavy amount of syllabi, the pupils are expected to gain knowledge. To improve the level of understanding, develop the interest of pupils, enrich meaningful development of independent study habits and create purposeful development of self confidence. In learning, an alternative process of teaching has to be adopted.

Moreover in the fast developing world, where knowledge explosion is taking place in every sphere, it is unreasonable to expect the spoken or written words alone to convey the volume of relevant information to the learner.

In that sense, Multimedia is a unique medium with features of graphics, audio, visual recording and instant feedback. It can be conveniently used to convey well designed information with varying with special effects. Multimedia has various components like, Text, Graphics, Photographs, Animation, Interactivity, Sound and Video.

The use of such technology in the institutions will motivate the teaching community and create better learning conditions. Further the involvement of the teacher in the process of production reduces the dependency of teachers on technology experts who are not in general academicians. In this study the investigator tries to compare the conventional method with multimedia method. This will be beneficial to the teachers, the students and the educational institutions. Hence keeping all these in view, the investigator attempts to study the effect of Multimedia Approach in developing knowledge and skills in and attitude towards science at upper primary level.
1.3 THEORETICAL BACKGROUND

This study is mainly based on constructivist theories by Piaget and Vygotsky.

According to Piaget’s constructivist theory, students need to explore, to manipulate, to experiment, to question and to search out answers for themselves – activity is essential. By doing so, the intelligence level will increase and the teachers are able to assess the cognitive level their strength and weaknesses.

Laboratories, workshops and technologies that encourage interactively like multimedia and virtual reality fit in with Piagetian thought.

According to Vygotsky’s social constructivist theory, learning is a social and communicative process whereby knowledge is shared and understandings are constructed in culturally formed social settings.

According to Vygotsky’s (1978) Social Constructivism, the knowledge is first constructed in a social context and then appropriated by individuals. Here, learning is an active process where learners should learn to discover principles, concepts and facts for themselves. Vygotsky also highlighted the convergence of the social and practical elements in learning by saying that the most significant moment in course of intellectual development occurs when speech and practical activity, two previously completely independent lines of development, converge. Through practical activity a child constructs meaning on an intrapersonal level, while speech connects this meaning with the interpersonal world shared by the child and her/his culture.

The role of facilitator here is that the instructor and the learners are equally involved in learning from each other as well (Holt and Willard Holt 2000) Yelon and Weinstein (1977) have pointed out that “guided discovery learning retains the thrill of insight without allowing the impulsive youngsters to leap incorrect answers and faulty generalizations.
NCF (2005) observes that information and Communication Technology is an important tool for bridging social divides. It should be used in such a way that it becomes an opportunity by providing information, communication and computing resources in remote areas. Information Technology is used for connecting children and teachers with scientists working in universities and research institutions would also help in demystifying scientists and their work.

While using the Multimedia and classroom activities, the students will get such a social environment which helps in the enhancement of learning process

1.3.1 Theory Related to Science Education

The important theory related to science education is Howard Gardners Multiple Intelligence Theory.

Multiple Intelligence Theory

Howard Gardner and others assert that there are multiple intelligences and that no single score can accurately reflect a person’s intelligence. This theory implies that people learning more better through certain modalities than others and that science teacher should design curriculum to address as many modalities as possible. Gardner identified seven intelligences. They are,

a) Linguistics/Language Intelligence - It includes words and language, written and spoken. Retention, interpretation and explanation of ideas and information through language and understands relationship between communication are a part of language intelligence.

b) Logical/Mathematical Intelligence – It includes logical thinking, detecting patterns, scientific reasoning and deduction, analyse problems, perform mathematical calculations, understands relationship between cause and effect towards a tangible outcome of result.
c) **Musical Intelligence** – Musical ability, awareness, appreciation and use of sound; recognition of tonal and rhythmic patterns, understands relationship between sound and feeling are come under musical intelligence.

d) **Bodily – Kinesthetic Intelligence** – It includes body movement and control, manual dexterity, physical ability and balance; eye and body coordination.

e) **Spatial – Visual Intelligence** – Visual and spatial perception, interpretation and creation of visual images, pictorial imagination and expression, understands relationship between images and meanings, and between space and effect are the different areas of this intelligence.

f) **Interpersonal Intelligence** – It includes perception of other peoples feeling, ability to relate to others, interpretation of behavior and communication, understands the relationships between people and their situations, including other people.

g) **Intrapersonal Intelligence** – It includes self awareness, personal cognizance, personal objectivity, the capability to understand oneself, one’s relationship to others and the world, and one’s own need for and reaction to change.

### 1.3.2 Theories Related to Multimedia

There are some theories related to Multimedia. The important theories are the following;

1) **A Cognitive Load Theory (CLT)** is concerned with providing a framework for instruction based on the assumption that the working memory’s storage capacity is limited. Working memory is the area in which learners process and briefly store new information. Because working memory has a limited capacity, CLT proponents support instructional design that immunizes working memory load and utilizes the greater capacity of long term memory. CLT instructional design approaches include, eliminating information that is not directly related to the
learning task and utilizing both processing channels in working memory in order to increase working memory storage.

2) **Cognitive Theory of Multimedia Learning (Mayer)**

   This theory proposes three main assumptions:

1. There are two separate channels (auditory and visual) for processing information (sometimes refused as Dual-coding theory)
2. Each channel has a limited capacity.
3. Learning is an active process of filtering, selecting, organizing and integrating information based upon prior knowledge.

   Mayer’s Cognitive Theory of Multimedia Learning presents the idea that the brain does not interpret a multimedia presentation of words, pictures, and auditory information in a mutually exclusive fashion, rather, these elements are selected and organized dynamically to produce logical mental constructs.

1.4 **PRESENT STATUS OF SCIENCE EDUCATION IN SCHOOL**

   In majority of the schools today, instruction is dominated by the verbalism and therefore dull and uninspiring. Teaching is more than the presentation of facts. Teaching is the development of new ways of thinking – a development that reveals itself in increased skills with problems of life, in new habits of action, in more desirable attitudes in a benefited personality and in an improved character not by the number of text book pages read or the percentage of a syllabus covered. Science can justify its place in the curriculum only when it produces important changes in young people – changes in their way of thinking, in their habits of action and in the values they assign to what they have and what they do.

   As a result of science education, students should habitually and fully employ sound thinking habits in meeting problem situations in daily walks of life. They
should exhibit reasonable, mature attitudes related to tolerance, curiosity, honest doubt and the like. To do this, young people must have an understanding of faith in and direct practice of sound methods and attitudes of thought.

NCF 2005 remarks that in India, science education has tended to be dominated by chalk and talk methods. Children are naturally curious. Given the freedom, they often interact and experiment with things around them for extended periods. The learning experiences are essential for imbibing the spirit of scientific inquiry, but may not always conform to adult expectations.

One of the major structural problems that NCF (2005) observed that science education at elementary level lacks experimental facilities. Children of these classes usually have no access to any equipment, even if the school has functional laboratories. At this stage children should engage with the processes of science: observing things closely, recording observations, tabulation, drawing, plotting graphs and of course, drawing inferences from what they observe.

But today there is a huge gap between this prescription and practice of science curriculum. Most of the time, the science classrooms are pre-occupied with routine teaching and not much time is devoted to the ‘learning by doing’ principle in science.

1.5 NEED AND SIGNIFICANCE OF THE STUDY

The nature of education demands that researches in its various areas are essential as this century is characterized by intense application of science of technology.

The period of Upper Primary School (class 1 to class VIII) is even now recognized as the period of compulsory schooling, vide the Constitutional amendment, making education a fundamental right.
The National Curriculum Framework (2005) again recommends that curriculum should help learners to become constructors of knowledge and emphasizes the active role of teachers in relation to the process of knowledge construction. Learners construct knowledge while engaged in the process of learning and the teacher’s role is to engage the process of learning through well chosen tasks and questions. Schools must provide opportunities to question, enquiry, reflect and arrive at concepts of create new ideas.

In the words of Mahatma Gandhi, “True education is that which draws out and stimulates the spiritual, intellectual and physical faculties of the children”. So the major objective of science education is to transform individuals and societies with knowledge about world around them. Science can play a truly liberating role, helping people out of vicious circle of poverty, ignorance and superstition.

Science, tempered with wisdom, is the surest and only way to human welfare (NCF 2005).

Begum K.H. (1990) studied the problems of teaching new science syllabus for standard VII in Andhra Pradesh and their impact on pupils achievement. Her study revealed that more than 60 percentage of the teachers found the content in the recent syllabus new as it is overloaded. Dictation of notes by teachers was the dominant method of getting exercises done by the students. Lack of facilities for science teaching continued to bother teacher a lot. It was observed that achievement in science favoured significantly those students whose teachers had attended an in service education programme. It is proposed that the school conditions need to be improved through supply of science kits and hand books for teachers so that pupils may participate in the teaching learning process by practicing processes pf science such as classifying, inquiring and experimenting.
This study reveals the need for the new method of teaching science in all levels of schools. Teachers are adopting the traditional methods of teaching in science class rooms which is not effective in science subject. The students will get bored with the teacher dominating method and the students of Upper Primary Level may not be in a position to understand the content materials clearly with that method. The investigator could find only very few studies at the elementary education related to science education.

Diana Laulillard (1995) conducted research on Multimedia and the changing experience of the learner through guided Discovery learning which shows that the Discovery learning with Multimedia was very effective in the higher level students.

At the Upper Primary level the science education provides a gradual transition from environmental studies to elements of science and technology. During this stage, there is a need to take up innovative programmes on science teaching in schools as there perceived the gap between recommendations of various commissions and committees and actual practice. A reform of science teaching should aim to comprehensively address all factors that affect the teaching learning process. Science teaching in schools can be improved significantly with some informal activities including science melas, science clubs and libraries. All these programmes can make the classroom more participative, less authoritarian teachers and give children greater freedom and facilitate learning rather than dictate learning.

The science education should enable the learner to know the facts and principles of science and its application, consistent with the stage of cognitive development. It helps to acquire the skills and understand the methods and processes that lead to generation and validation of science knowledge and to development a
historical and developmental perspective of science. Science education also enables the learner to nurture the natural curiosity, aesthetic sense and creativity in science and technology and cultivate scientific ‘temper’ - objectivity, critical thinking and freedom from fear and prejudice.

Kumar U.S. (1991) conducted research on the teaching of general science and the development of scientific attitude in secondary school students in relation to achievement in general science. It was observed that there was a significant difference between the mean scores of boys in the average effective grouping with respect of perception of teaching of science.

Hennessy, Sara and et al. (2007) studied pedagogical approach technology-integrated science teaching through two separate projects described was examined how teachers exploit computer based technologies in supporting learning of science at secondary level.

The effectiveness of multimedia approach for instruction of secondary level pupil was experimentally studied by Siemankowsky (1969) and Vasanthakumari (1986). The studies showed that multimedia approach is found to be effective in improving competency of students. This approach seemed to benefit both high and low achievers and it tends to increase the interest of learners. The rate of achievement also seemed to be higher than that of teaching through traditional methods.

Ludlow and Barbara (1998) developed an interactive multimedia module to train rural specific education personnel. Multimedia instructional materials represent an important resource for teacher education programs in special education. They enable prospective special educators to observe and study important aspects of professional practice without the time and expense of actual field experiences.
Computer assisted multimedia is especially appropriate for the design of self-instructional modules.

Review of related literature shows that there are various factors influencing achievement in science. Studies have shown that a positive attitude towards science would help in improving achievement in science. Constructivist pedagogy has brought about a revolution in the area of teaching learning, role of teacher and student and classroom atmosphere. Review again shows that strategies which differ from conventional ones especially those involving audio visual aids, computers, programmed instruction, learning by doing etc. have made a positive influence on achievement in science Skills.

 Though many studies have been conducted on achievement in science using Multimedia Approach they do not throw light on the extent to which they improve the science learning by developing knowledge and skills in and attitude towards science. The effects of various strategies on achievement in science have been taken up for research studies. There observed a very few studies related to Multimedia and Science Education. But the investigator could not trace studies on effect of Multimedia Approach on Knowledge and Skills in and Attitude of students towards science at Upper Primary Level. No handbooks or instructional materials based on Multimedia Approach for developing Knowledge, Skills and Attitude towards science are currently available for the teachers. So teachers do not have a clear idea about Multimedia Approach in developing Knowledge and Skills in and Attitude towards science. This prompted the investigator to think on formulating Multimedia Approach which is mainly pupil centered and find its usefulness to the students. Therefore, the investigator has proposed to take up the present study.
1.6 TITLE OF THE STUDY

The title of the Study is “EFFECT OF MULTIMEDIA APPROACH ON KNOWLEDGE AND SKILLS IN AND ATTITUDE OF STUDENTS TOWARDS SCIENCE AT UPPER PRIMARY LEVEL”.

1.7 OPERATIONAL DEFINITION OF KEY TERMS

1.7.1 Multimedia Approach

Multimedia Approach is operationally defined as the mode of instruction in science followed by the teacher using the components of multimedia like text, graphics, photographs, audio, video and animation and activities appropriate to the content of selected lessons.

1.7.2 Knowledge

Knowledge is operationally defined as an understanding of terms, facts, concepts, principles and procedures on selected lessons in science.

1.7.3 Skill

Skill is operationally defined as the attainment of skills like observing, identifying, defining, explaining and measuring.

1.7.4 Attitude

Attitude is operationally defined as students’ mental predisposition in the form of likes and dislikes towards developing self concept, interest in learning, doing practical work, knowing the importance, science outside the school and future participation in science.
1.8 VARIABLES

Variables are the conditions or characteristics that the investigator manipulates, controls or desires. The proposed study involves independent and dependent variables.

1.8.1 Independent Variable

- Multimedia Approach (MMA)

1.8.2 Dependent Variables

- Achievement of Knowledge in science
- Attainment of Skills in science
- Attitude towards science

1.9 OBJECTIVES OF THE STUDY

The objectives of the study are the following.

1. To develop Instructional Material based on Multimedia Approach in Science at Upper Primary Level for developing Knowledge, Skills and Attitude.

2. To study the effectiveness of Multimedia Approach over the Conventional method in science at Upper Primary Level for developing Knowledge, Skills and Attitude.

3. To Study the gender differential effectiveness of Multimedia Approach and Conventional Method in science at Upper Primary Level for developing Knowledge, Skills and Attitude.

1.10 HYPOTHESES OF THE STUDY

The hypotheses of the study are the following.

1. The students exposed to MMA will have greater achievement in science than the Conventional method at Upper Primary Level in terms of Knowledge.

2. The students exposed to MMA will have greater achievement in science than the Conventional method at Upper Primary Level in terms of Skills.
3. The students exposed to MMA will have greater Attitude towards science than the Conventional method at Upper Primary Level.

4. The effect of MMA and Conventional method in science will be different on boys and girls at Upper Primary Level in terms of development of Knowledge.

5. The effect of MMA and Conventional method in science will be different on boys and girls at Upper Primary Level in terms of development of Skills.

6. The effect of MMA and Conventional method will be different among boys and girls at Upper Primary Level with respect to Attitude towards science.

1.11 SAMPLE

The sample selected for the experimental study consisted of two intact groups of 50 students of VII Standard from one of the CBSE schools of Kerala state. The school selected was Kunnamangalam Higher Secondary School, Kunnamangalam, Kozhikode District, Kerala. Randomly one section was considered as the Experimental and the Control groups.

1.12 TOOLS USED FOR THE STUDY

Tools used for the experimental and control groups are the following.

- A pre test/post test on achievement of Knowledge in science developed by the investigator.
- A pre/post test on attainment of Skills in science developed by the investigator.
- MMA developed by the investigator.
- Attitude Scale in Science developed by the investigator.

1.13 STATISTICAL TECHNIQUES USED

- Descriptive statistics such as mean and SD.
- t-test to compare the achievement of Experimental group and Control group.
1.14 MAJOR STEPS INVOLVED IN THE STUDY

- Analysis of the text books and syllabi of VII Standard.
- Study of theoretical aspects and principles adopted for the development of MMA.
- Preparation of MMA on selected six chapters in science of VII Standard.
- Description of the MMA developed by the investigator.
- Validating the developed MMA and ascertaining its effectiveness.
- The efficacy of the MMA is tested by conducting an experimental study.

1.15 SCOPE OF THE STUDY

At the end of the social and educational spectrum, children are subjected to extreme competitive pressures from a very early age in order to equip themselves to the demanding world and excel in an environment of tough competition. Exposing children to interesting sources of information for very brief periods each day actually stimulates development of the brain cells during early years and fosters a spontaneous curiosity and natural love of learning in children. Keeping this in view the MMA was prepared. Further, the level of language used for presentation, adequate examples, pictures, video clippings, etc., have been considered in the development of MMA. It is hoped that this MMA would be beneficial and useful not only to the students but also to teachers handling evaluations at the Upper Primary Level.

1.16 DELIMITATIONS OF THE STUDY

The delimitations of the present study are the following.

1. The CBSE syllabus alone was considered while preparing the MMA.

2. The experiment was limited to 100 VII Standard students. This restriction was in view of the very nature of the experimental study.

3. The MMA was prepared considering a limited number of chapters in science.

4. The two divisions of the same school was taken for the present study.
1.17 ORGANISATION OF THE REPORT

The thesis is organized in five chapters.

The first chapter includes an Introduction, Need and Significance of the study, Statement of the Problem, Definition of Key Terms, Objectives, Hypotheses of the study, Variables, Samples, Tools Selected, Statistical Techniques Used, Major Steps involved in the Study, Scope and Limitation and Organisation of the Report.

The second chapter consists of Review of Related Literature which includes various studies related to Multimedia, Achievement in science and Attitude towards science.

The third chapter deals with the Methodology of the study.

The fourth chapter contains the detailed statistical analysis of the data and discussion of the results.

The fifth chapter enlists the conclusions arrived at from the study and suggestions for further research.