Introduction
CHAPTER - I

INTRODUCTION

1.1 IMPORTANCE OF EDUCATION:

Education is an important social activity. It is as old as the human race. It is closely bound with the intellectual, economic, cultural, emotional, and social life of the human race. It is through education that man has improved his environments and consequently himself. He has never remained content with his lot and has been striving to improve upon his developing civilization. Education has made him more logical and scientific in attitude. He does not leave anything to chance, rather than with faith in his intelligence and capacities in the realisation of his desires and aspirations.

The importance of aims of education can not be over emphasized. Education with out clear thinking, comprehension and correct appreciation of its aim is definitely a contradiction in terms, goals or aims provide direction to all educational effort and help in improving the learning situation. There can be no educational activity without aim. Aims give a clear indication of the nature of education.
Education is a vital instrument of social reforms. It should aim at strengthening democracy and promoting the establishment of a secular and socialist society free from exploitation of any kind and contributing towards the sustained development of productive forces in society and the raising of standard of living by systematic application of modern scientific and technological achievements. It should promote national unity with a correct appreciation of the rich and challenging diversities in our culture. While preserving the basic values of Indian tradition and culture education should promote a scientific outlook and help accelerate modernisation of our society and inculcate moral and social values. The individual citizen should be so trained and fully equipped that he becomes capable of contributing to the achievement of those objectives.

Education is found to be an effective tool to bring the required, changes in the society. The Education Commission (1964-66) has emphasized that education is the one and the only instrument that can be used to bring about a change towards the social and economic betterment of India.

Character building and upholding dignity and human values are the first and foremost aspects to be expected from education of course productivity is one of the other aspects. Education plays an important role in the economic
and social development of the country, in the building of a truly democratic society, in the promotion of national integration and unity and above all in the transformation of the individual for the endless pursuit of excellence and perfection. Character building and upholding dignity and human values are the aspects to be expected from education.

Education is a never ending process intricately, interwoven with life, enriching the individual with a variety of experiences, kindling the flames of knowledge through constant probing in to the mysteries of life. The life adjustment approach is one of the priorities of education now popular with the modern professional educator, who advocates that the individual should fit snugly into the existing social set up. Looking at the situation today, teachers agree that a thorough examination of the philosophical postulates is necessary in the interest of restoring human values in education. Education has an immense effect on the political, economic and social development with the increasing recognition by all the countries. In developing nations like India, the main pioneering role to play in shaping the nation's future is the educational system.

Therefore, education should lead human minds and bodies towards the development, but that development which
encourages them to think as "the happier the world around us the happier we would be" and act according to it. We need such an education which inculcates the sense of cordial human relations among mankind for happier living.

1.2 NEED FOR SCIENCE EDUCATION:

Modern society is basically rooted in science. According to Jawaharlal Nehru "Science has developed at an ever increasing pace since the beginning of the century, so that the gap between the advanced and backward countries has widened more and more. It is only by adopting the most vigorous measures and by putting forward our utmost effort into the development of science that we can bridge the gap. It is an inherent obligation of a great country like India, with its tradition of scholarship and original thinking and its great cultural heritage to participate fully in the march of science which is probably mankind's greatest enterprise today.

The University Education Commission (1948-49) recommended that "as a part of general education for living, every step of education from primary school to the completion of under graduate university work should include teaching of science." The Commission felt that the aim of science course for the non-science student was not to make him a qualified scientist but to give him as much background
as to make his general reading and experience in the field, interesting and intelligent.

The Secondary Education Commission (1952-53) states that the science syllabus in the secondary schools is not directed to the production of scientists. Its aim is to give basic understanding and appreciation of scientific phenomena biological and physical - which may prepare the non-scientist for a fuller and more complete life. At the same time, the courses should give fundamental principles to those relatively few who will latter specialise in science.

The Education Commission (1964-66) took a pivotal stand on science education. It saw science as a basic component of education and culture. It was not only necessary to make science as an integral part of our education but also urgent to raise the quality of science teaching to promote an ever deepening understanding of basic principles, to develop problem solving and analytical skills and to foster the spirit of enquiry and experimentation. The scientific outlook has to become a part and parcel of our daily living. India should strive to bring science and the values of the spirit together and in harmony. "If science and ahimsa join together in creative synthesis of belief and action, mankind will attain to a new level of purposefulness, prosperity and spiritual insight."
The Indian Parliamentary and Scientific Committee (1962) recommended that at the high school stage science should be compulsory for all the students, but it has to take the form of separate subject as Mathematics, Physics, Chemistry, Biological Science etc., along with the other humanistic subjects." General science, compulsory for all at the lower stage to enable every citizen to understand the modern world.

1.3 HISTORICAL DEVELOPMENT OF SCIENCE EDUCATION:

Indian scientists and scholars did a great deal of pioneering work in the field of mathematics, medicine, astronomy, agriculture and architecture till about 600 A.D. The oldest Indian scripture, Rig-veda which was written about 4000 years age, refers to physicians and speaks of the healing powers of medicinal herbs. The concept of atom and the formation of the world as discussed in the Vaiseshika, one of the Upanishads. The Upa vedas or secondary vedas discuss various sciences. Ayurveda consists of six books, deals with surgery, Nasology, anatomy, therapeutics, Toxicology and a supplementary section of it deals with various local diseases.

From the point of view of methods and techniques of acquiring scientific knowledge there had been in our
land, considerable development and refinement of observation. The early universities of Taxila and Nalanda could be taken as a first giant steps towards institutionalization of teaching and acquiring knowledge.

Buddhism, in its normal cause and as a part of its tenets (before 750 AD to 1000 AD) discouraged further development of life sciences. Rules of caste became stricter and Brahmins, for fear that their blood would be contaminated withdraw from all practices of medicine. They even shrank from touching dead bodies and as a result the number of good physicians dwindled and public hospitals had to be closed. Later on, the gradual conquest of the country by invaders from West Asia and Central Asia also brought an element of discontinuity in the ancient Indian tradition. There is however, some evidence to suggest that many of the scientific ideas brought to India by foreigners during the medieval period.

The modern period represents another sharp break in the traditions of scientific thought and practices in India which arose with the conquest of the country by the British. Modern science was introduced in India with the coming of the British rule and it stood in some opposition to the earlier two traditions especially because the new system was to be learnt in a foreign language i.e., English.
Modern science came to India at a stage of its development which marks a radical change from the medieval and ancient sciences. Till the end of 18th century the universities sadly neglected the teaching of science and it had no place in the school curriculum.

In the early part of the nineteenth century a number of philosophical societies were at work for the spread of education. By the middle of nineteenth century however, there were very few schools which were imparting instructions in science.

The most outstanding contributions to the history of teaching science in the last quarter of nineteenth century. Since the beginning of the twentieth century there has been a substantial increase in the availability of equipments and facilities for teaching science in schools. In the year 1916 Sir J.J. Thomson had a committee which examined the position of Natural Science in the educational system. As a consequence of the findings of this committee known as the Thomson report many advanced courses in science were added in many schools. As a consequence of all this, the Education Act of 1944 came into force in April 1945 which has meant an increase in the amount of science taught though not to the extent to which it should have been.
The report of Secondary Education Commission (1953) recommended the teaching of General Science as a compulsory subject in the High and Higher Secondary schools. In the year 1956 the All India seminar on the Teaching of Science in Secondary Schools held at Taradevi dealt with almost all the problems facing the inclusion of general science as a core subject for the Higher Secondary classes. It was the first of its kind which touched almost all the aspects concerning the teaching of science in schools. It suggested a unique and uniform system of science teaching for the entire country, suited to its needs and resources. The Indian Parliamentary and Scientific Committee was set up in August, 1961 under the Chairmanship of Late Sri Lal Bahadur Shastri to study the problems of "Science Education in Schools" with a view to finding out the relation between the policies and decisions of the centre and the states in the matter of science courses attended in the schools.

In 1963 the USSR Experts of the UNESCO Planning Mission visited India to study the implementation of technical assistance projects in the country.

In the year 1964-66 the Indian Education Commission was set up under the chairmanship of Dr. Kothari for upgrading school curricula with researches on curriculum development, the revision of text books and teaching and
learning materials. The commission recommended that "Science teaching should be linked to agriculture in rural areas and to technology in urban areas.

The methods of teaching science should be modernized, stressing the investigatory approach and the understanding of the basic principles.

At the higher stage emphasis should be on the acquisition of knowledge and the ability to think logically, to draw conclusions and to make decisions at a higher level. A disciplined approach to the teaching of science was expected to be more effective than the general and instructions on scientific matters.

Today the developing countries have to struggle against three major problems viz., population explosion, environmental and habitational pollution and extreme poverty. All the developmental efforts of these countries such as India, are being nullified by uncontrolled population growth and growing poverty - education can be one of the potent instruments in the development processes, provided it is properly geared towards that end. The system of science education plays a vital role in solving the problems of a country by developing desirable understandings, skills, abilities and attitudes.
1.4 IMPORTANCE OF SCIENCE IN THE PRESENT DAY SOCIETY:

We are living in an age of rapid changes and science is playing a dominant part in bringing about these changes. Science has provided the spring board for all the progress in our world and man has been able to conquer time and distance with its help. It has enabled man to probe into the vast spaces beyond the sky. It is no exaggeration to say that at present, science dominates every field of our activities. Science has improved the conditions and quality of living and has saved mankind from excessive toil and boredom. The technological advances have sought to explore and multiply the possibilities of affording more effective and responsible methods of providing sustenance and comforts to living creation. Thus, from cradle to the grave, scientific discoveries and inventions have inextricably woven themselves into the fabric of human existence.

According to Ross and Stanley (1955) our environment to a great degree is influenced by science. The clothing we wear, the houses in which we live, the agricultural methods which produce our food and necessities, our automobiles our telephones, radios, the electrical appliances, which are used in home - all are based upon scientific information.
Science has a specific applications in many of our lives’ activities. It is in operation in the application of the statistical methods. Psychology is a science applied for securing information regarding the working of the mind and without advancement of technology we would not be, at present, having any industry worth the name. When one postulates into the contributions of science to the various branches of human progress one can only marvel at the advances made in medicine, astronomy, agriculture, engineering, oceanography, mountaineering, aeronautics, space travel, micro biology, nuclear biology and innumerable other branches of scientific study.

The explosion of scientific knowledge has been so rapid in our age, that with the paying of every decade, our stock of knowledge on any subject has tended to become double or more.

In such an age of rapid scientific advancement every body must have some knowledge of science. We require trained minds, capable of coping with more and more problems relating to basic and applied sciences. For ensuring welfare of the people, the country has to undertake many programmes for achieving increased agricultural production, industrialization, community development, including various social services, providing people with better nutrition,
better houses, proper clothing and improve health. For implementation of these programmes a very large number of scientists and technicians are required.

Scientific literacy is needed, first of all, be each member of a culture such as ours that is so thoroughly based upon technology and scientific endeavour. We believe that in order to make effective decisions in personal, civic and national affairs, the citizens must have some knowledge of processes and products by which he is fed and clothed, entertained and inspired and defended from enemies, foreign and domestic”.

1.5 THE PLACE OF SCIENCE IN SCHOOL CURRICULUM:

Science education in schools is more so emphasised as it improves concept development fosters higher cognitive abilities and skills besides promoting the spirit of enquiry and experimentation.

In the past decades, our science lessons were mainly reading text books and hearing the teacher’s talk. There was practically no ‘seeing and doing’. We never saw the various articles of science apparatus, except in the pictures given in the text books or the drawing on the black boards. But now conditions have greatly changed. The pupils
have more things to do and learn and to hear with the help of more number of audio-visual aids.

With respect to science and mathematics in past days it is observed that the time provided in the time table is not quite adequate, more number of periods were allotted to languages especially English language. But now the trend is changed. More number of periods were allotted to science and mathematics in the school time table with the other subjects.

The science courses in the past were mostly based on foreign books having no relevance or little relevance to the Indian science. But now the science courses were designed with the relevance of Indian conditions. It must address to the problems of Indian masses for example, energy, health, hygiene, disease, nutrition, conservation, pollutions etc.

The science courses of the past could not be very functional, because of lack of equipment, lack of teachers with proper attitudes, abilities and skills and the approach. But now most of the schools have well equipped laboratories and necessary science kits. These are helpful to teachers for demonstration as well as experimentation and gives the first hand experience to the students. The method
Science is a way of thinking, an attitude towards the solution of problems, a means of solving problems as well as the product of investigating of natural phenomena. Both the processes and product of scientific thinking inevitably affect the way of living. Science is enquiry and enquiry activity is a trial and error process. Science seeks unity in diversity. The unity of all science consists in its method, not in its materials.

Jawaharlal Nehru said "My preferences are all for science. The world is a narrow place now and there is little to discover init, so it seems. But that is not so, for science has opened up tremendous new vistas, which wait to be explored, and of adventure there is no lacking especially in India today."

Besides preparing, through development of scientific attitudes for adjustment to a fast changing world, science is needed by us in a more direct sense as well. As mentioned by the UNESCO Planning Commission (1964) in their report entitled Learning to be, "the ever growing importance of science and mathematics for the economy and culture of any country and the ever growing knowledge every year in the field of science have set the urgent task before
all countries of the world to provide modern science and mathematics education to the youth so as to prepare the young people for life for mastering technical, agricultural, medical and specialisations which are necessary for economic and cultural progress."

In Encyclopaedia of Britannica (1951) it is given that "Science became one of the human activities that man has created to gratify certain needs and desires. The search for truth became the dominant motive in the persecution of science".

The Scientific Policy Resolution of the Government of India (1958) stated "The dominating feature of the contemporary world is the intensive cultivation of science on a large scale and its application to meet the country’s requirements."

The Secondary Education Commission (1952-53) strongly recommended the strengthening of science education as an integral and compulsory element in schools. In its words, "Science education should aim at awakening the natural phenomena around them at developing their capacity for practical application of their knowledge, at appreciating the tremendous impact of modern science on all aspects of our life and at creating an interest in them in
the human side of scientific progress by introducing them to the lives of the great scientists."

Kothari Commission (1964-66) stated 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. Science is universal and so can be its benefits. Science represents a cumulative and cooperative activity of mankind and its rate of growth in extremely rapid. The knowledge of science is doubling in a period often to fifteen years."

In view of the emerging importance of science education an approach paper relating to curriculum for the ten year school issued by the NCERT which states "There is hardly any need today to justify the place of science in a scheme of general education for school children. Science in all pervasive. Modern societies exists on the basis of science. Science is intimately related to the means of production and means of communication."

It is time that the country's intellegentia, educational planners, educational administrators, educationists, politicians, teachers and parents should give some serious thought to what direction the country's educational system should go, and what should be the place
of science in the curriculum. To quote this the late Prime Minister of India, Morarji Desai, while addressing the members of the Review Committee on the curriculum for the ten year school at New Delhi stated "The books that I did carry in college are being carried by school students today. The students of science almost doubles every decade. We are to keep pace with this new development. Then the problems is how much knowledge in science should be given to a child at a particular level, so that he is not burdened".

National Policy on Education (1968) also recommended that "science and mathematics should be an integral part of general education till the end of class X; the quality of science teaching should be improved at all stages and scientific research should be promoted".

Thus science has now become a compulsory subject in the school curriculum because of its multifarious value to the individual as well as the society.

1.6 THE SCIENTIFIC APTITUDE AMONG SCHOOL CHILDREN:

Human efficiency is not as easily defined as that of a machine and it is not as easily measured. Generally speaking different persons in the society possess different types of aptitudes. For example, some possess markedly mechanical aptitude, some musical, some artistic, some
clerical and some for teaching or some other for learning. When we say a person possesses an aptitude for learning it assumed that he has a good proportion of traits required for becoming successful learner.

Many researchers indicate that intelligence and aptitudes in specified areas are two important determinants of school attainment and, therefore are potential predictors of success in all forms of performance in school subjects. During the early years of the mental measurement movement of the present century, intelligence was considered to be the sole determinant of successful academic achievement and its predictive efficiency has been unquestionably established. Later many psychologists and educationalists focussed their investigations on different aspects of its nature, measurement, its impact on success in vocational areas like teaching, engineering, nursing etc., and its efficiency in predicting academic achievement.

Those who studied science aptitude a complex of interacting hereditary and environmental determinant producing pre-disposition to science learning focussed on aspects such as its predictive efficiency, identification of its important correlates, group differences, aptitudes, treatment, interaction on instruction and the like. The usefulness of aptitude testing for the identification of the
potentially talented at the school level itself was highlighted by Robbins Report and the NCERT Annual Report. According to the later, science aptitude begins to germinate by about 12+ to 13+ of age and tends to be developed in full form by about 15+ and to 18+ of age. Studies by Berton and Perry, Joseph and Thamby revealed that science achievement can be predicted with the help of science aptitude methods of their respective sample. Science aptitude is a cognitive variable, the investigator made an attempt to explore the relative contributions of these variables on achievement.

1.7 ACADEMIC ACHIEVEMENT:

Academic achievement is of paramount importance, particularly in the present socio-economic and cultural contexts obviously in the school, great emphasis is placed on achievement right from the beginning of formal education. The school has its own systematic hierarchy which is largely based on achievement and performance rather than ascription or quality. Thus the school tends to emphasize achievement which facilitates, among other things, the process of role allocation for the social system. The school performs the function of selection and differentiation among students on the basis of their scholastic and other attainment and opens out avenues for advancement again, primarily in terms of achievement.
The student at school is trained to accept the hierarchy based on achievement. This helps him to be released from the family status in certain ways, his personal status is inevitably a direct function of the position he achieves, mainly in classroom setting. Acceptance of the system of hierarchy in terms of achievement helps also to integrate the school system in so far as there obtains a congruence between the values of a family and those of society.

A considerable number of students from school go to colleges and institutions of higher learning. It is very important to ensure that such students acquire the requisite competence so as to benefit more out of higher education. Setting the stage for achievement of the youth is thus a fundamental obligation of the educational system at the school stage.

Academic achievement is a multi dimensional phenomenon and is affected by two main types of factors. Subjective and objective factors. Subjective factors are related to the individual himself, intelligence, learning ability aptitude, self concept, perception of school, study methods, interest in activities, level of asperation, motivation, attitude towards teachers and courses and
adjustment with in the self and the society. Objective factors lie with in the environment. Socio-economic status, family traits and value system, educational system, system of evaluation, school situation and environment, number of students and size of the school.

The importance of scholastic or academic achievement has raised several important questions of educational researchers. What factors promote achievement in students? How far do the different factors contribute towards academic achievement. Many factors have been hypothesized and researched upon.

1.8 THE AREA OF THE PRESENT STUDY:

Scholastic achievement continues to be one of the most important values held in high esteem in all cultures, countries and times. Hence, the research related to the area of academic achievement is an ever growing concern of the researchers, educationists and administrators.

An enquiry into the previous works suggested that studies related to this area may be broadly classified into the following categories : (1) Studies with sociological base, (2) Studies with psychological base and (3) Studies relating to both sociological and psychological areas.
Some outstanding studies conducted by Curry (1962), Chopra (1964) Gupta (1968), Raymond (1976), Upamanyu (1978) have focussed their attention mainly on sociological factors related to academic achievement. The main emphasis in those studies were on the variables like socio/economic status, parental aspirations family environment of the child, sociometric status and so on.

In contrast, some of the prominent researches by Entwistle (1972), Kundu and others (1977), Panda (1978) have their own right on the psychological factors like personality, intelligence, adjustment, anxiety, self concept, motivation and so on in relation to academic achievement.

Though there are considerable number of studies related to socio, psychological factors at primary and secondary school level, very few studies were found particularly at high school level in science. The present investigation considered to strike at the combination of both socio-psychological factors in the prediction of academic achievement.

Another interesting feature observed was that majority of the studies in the area of academic achievement confined to simple correlational analysis between predictors and the criterion variables. Individual and cumulative
effects of several independent factors on academic achievement could be assessed more accurately by employing regression analysis. Therefore, the main aim of the study was to predict the multiple effect of the independent factors on academic achievement and further to suggest a suitable regression equation in the prediction of academic achievement.

It was also observed that many of the earlier studies have been conducted among college and primary school students but very few studies have been conducted at high school level in particular subject.

1.9 RESUME OF THE SUCCEEDING CHAPTERS:

The Chapter-II deals with a brief review of related research work done in this field.

Chapter-III deals with an account of the statement of the problem different hypotheses to be tested, brief description of the variables that are considered in this investigation.

Chapter-IV gives an account of methods of investigation, development of the data gathering instruments, pilot study, item analysis, reliability and validity of the instruments, final study and the sample of investigation.
Chapter-V deals with analysis of data with the results and discussions. It includes: (1) Description of the distribution of scores, (2) The influence of personal and demographic variables, (3) The influence of role expectations and scientific aptitude on achievement and (4) The prediction of achievement.

Chapter-VI deals with summary of the investigation, major findings of the study, educational implications of the study, and the suggestions for further research.