CHAPTER I

INTRODUCTION
Science is no longer the quintessence of knowledge and of what is worth knowing, but a way. It is a way of penetrating into unexplored and unmastered realms. From its inception in the early years of ancient Greek civilization, science has been devoted to the quest for a better understanding of nature. Throughout most of history, however, scientific enquiry was neither widely practiced nor perceived as a potential source of human benefit. Rather it was more or less an elite, intellectual activity indulged in by a few people whose social position provides the learning and leisure time for such pursuits. That perception prevailed until the latter part of the renaissance, when a revolutionary new concept of the nature and social relevance of science emerged. That era of history is distinguished as ‘the scientific revolution’ which is generally dated from the early 1500’s to around 1700 A.D. During that brief period, a concept of natural phenomenon developed that resulted in a new scientific outlook and a fundamental redefinition of what constitutes meaningful scientific enquiry. The dependence on plants and animals and the natural curiosity of the man to know about the things around him led him to examine the living and non-living world. He started examining the world in order to discover which could be utilized for food, shelter and clothing. Slowly these activities formed a culture and such cultures came into existence.

Never before in the history of mankind has a society been as dependent upon scientific knowledge as it is today. Science has now become synonymous with survival. It would not be an exaggeration if we say that we live in the age of science, engineering and technology. The reason is that, there is hardly a village of significance over the globe where the fruits or products of science in one form or another have not yet entered. Distance and time stand fully annihilated. Death rate has been decreased.

Some speak of looming space age, information age, electronic era, global village or a complete scientific and technological revolution. The world is facing daunting problems today such as: racial, religious and ethnic prejudices and conflicts, war, rapid population growth, violent crime, economic stagnation and economic disparities among and within nations. These problems have a direct or indirect bearing on peace and development. Atom, electron, nuclear fission, synthetic fibers, computer, communication satellites, microscopes, telescopes, electronic devices, space travels and stations have become household words. People are trying to enhance not only the quality of life but also the economic development of their countries at an accelerated rate. The labour costs and
raw materials have become cheaper in the developing countries. The field of science is unlimited, its material is endless, every group of natural phenomenon, every phase of social life, every stage of past and present development is science.

The charming gifts of science have also turned life of man into hell e.g. rapidly increasing multiple pollutants at all levels have caused much harm than to help it. Continually magnified noise level has turned many ears deaf and put more resting minds under unwanted strain. Incessant smoke from industry has caused harmful smog in the atmosphere resulting in deadly respiratory diseases and is also responsible for acid rain. Chemical industry has turned vast area of land unfit for human inhabitance and cultivation. The sea is also not untouched with the havocs of science where the periodically constant oil slicks have caused deaths of thousands of sea animals like fish and penguins. Coming to crops, where pesticides which are believed to have increased the per acre harvest of crops have on the other hand caused the death of numerous consumers and attack many more with poison and deadly diseases. Nothing pure is available in the market not even the milk food for human infant.

Medicines are also contaminated. Drug dependence amongst youth has become a menace and its unchecked increase is causing more harm than to help. The much pending fear of ultimate nuclear war at the world level is the cause of constant panic even to big super powers of the world. The greed of man has increased with inflow of new models and varieties of various articles of domestic use and transportation. The fast foods, canned foods contaminated with chemical colours have done much harm to health.

Speed/hurry or fret of modern life has become a psychological killer. The ledger philosophy, based on calculations of profit and loss has pushed man to cut throat competitions and towards a life full of tension and unrest. Machines have generated large scale unemployment. Man in modern scientific age is mad after the material goods of life; he is not at all bothered about the finer values of life like truth, honesty, beauty and goodness. Physically the modern man is a giant but spiritually he is not even a dwarf. He is leading a soulless life.

In other words, in order to fulfill country needs a sound scientific and technological manpower is the pivotal element in this base. With the help of science and technology, it has been possible to cut down the shackles of poverty, ignorance,
superstition and dogmatism. Science and technology have been instrumental in bringing efficiency and improvement in the process and progress of human work. Every citizen of the present modern world sees the countless manifestations of science all around him. Today there is no aspect of man’s life which has not been influenced by science in one way or the other. This is because we live in the age of scientific culture. Science has shrunk the world and totally changed the human outlook. In fact, science now has all pervading influence on every sphere of human activity.

Science learning is not only important for two reasons i.e. one’s individual development and also helps the learner to contribute significantly for the development of nation. In fact it is also considered as a symbol for recognition of learner in his/her surrounding environment i.e. school, home and society. (Ganguly and Vashistha, 1991)

Science explains the world as it is. Thus if an explanation or description of some phenomena is required a scientist would be consulted. Technology on the other hand, remakes the world to fulfill some human needs and solve problems. Science and technology have radically transformed man’s material environment. Science is universal and so can be its benefits. The charming gifts of science have also turned the life of man into a hell of rapidly increasing multiple pollutants which have caused much harm to humanity. Continually magnified noise level, incessant smoke from industry, pesticides, contaminated food products and drug dependence amongst youth has become a menace.

The word Science is derived from Latin word ‘Scientia ‘or ‘Scire’ which means learning or knowledge but the science means more than that. It is defined as systematized body of knowledge which has been secured in a unique manner and used to predict future events. It is that human endeavour that seeks to describe with ever increasing accuracy the events and circumstances which occur or exist with in our natural environment. The prosperity and strength of a country these days are directly dependent on the level of science and technical knowledge cultivated in the country and on its capacity to make use of that knowledge to serve practical ends. (Kothari,1991 as in Rao,2004 )

Science, as something existing and complete, is the most objective thing known to man. But science in the making, as an end to be pursued, is as subjective and psychologically conditioned as any other branch of human endeavour. It is of course, universally agreed that science has to establish connections between facts of experience of
such a kind that we can predict further occurrences from those already experienced. Indeed, according to many positivists, the complete accomplishment of this task is the only end of science.

Science has no longer devoted to a few seriously devoted persons. Since life in the present world invariably warrants to variable degrees, knowledge of scientific facts and laws, science has now become an unavoidable part of general education. Nobody questions its inclusion as a subject in the school curriculum. Science learning provides training in scientific method and also helps to develop a scientific attitude in the mind of the learner. The qualities imbibed by the learner through learning science are of great importance for a citizen living in the society.

Science teaching in schools can make a difference in the lives of children and the difference should be on the positive side of the educational ladder. In a free society, scientific advancements has been dependent upon the will of the people, their will as decision making citizens to support it and their will as individuals to become scientists. Therefore, liberally educated people in a free society should understand the nature of scientific enterprise, the social, economic and political factors that effect its development and the personal satisfaction that comes to one who pursues a career in it.

Science has been referred to a as a self-corrective process of finding out. Or as Niels Bohr (1969) expressed it, ‘Science includes the methods by which man puts limiting values on his pre-conceptions or as Percy Bridgeman (1973) expressed it, ‘The methods of science consist of doing your demands to get the answer with no holds barred’. Regardless of whether we refer to them as the methods of science, as problem solving, as inquiry or as discovery, there are processes of investigation in science that have been found to be effective in advancing our understanding of natural phenomena. Elements of the process have been defined in various ways and research has clearly indicated that pupils can be taught how to perform their own investigations. Furthermore as they learn to perform the process, they become more independent or self-directive in their learning. To become independent in these ways meets a basic need of all children and thus represents a kind of satisfaction that can be achieved in no other way. If properly taught, science can help all children learn how to learn.
Since, Nature is an inexhaustible source of knowledge, science as a subject, offers the widest range of knowledge to the learners. It has exposed mankind to infinite avenues of knowledge in nature- living and non living, about the world we perceive and also about the world beyond human perception and thereby it makes us conscious of the unknown to be exposed.

Science, besides satisfying the intellectual curiosity of man and providing materials and media for intellectual exercise, has disciplinary effect on the minds of individuals. Since, science covers the widest range of knowledge, the learner wonders at intricacies and mysteries of the universe, the known and the unknown. These tend to create a broader outlook in the life of the learner.

Furthermore, science is universal in character; it has no barrier of any kind. The scientific revolution began in Western Europe where modern science was born but its home is now the whole world. The fruits of scientific discoveries in one country are enjoyed by the people all over the world. Science is neither concerned with caste, creed or colour nor recognizes territorial barriers. Such a pattern inherent in science will definitely have an impact on the minds of the learners and is expected to help to develop broad-mindedness in them.

The importance of education in building the destiny of the nation can hardly be over emphasized. If only the system of education is properly organized it will cater to the demands of the process of modernization. Education is not merely the ingredient and an instrument of human resource development, but rather the most powerful means by which social, political and economic changes can be brought about in national life. Hence it is the only instrument by which a nation transforms itself from what it is, into what it hopes to be.

The study of science has several other disciplinary values. For instance, science is an interest awakening subject; its pursuit demands persistent efforts, diligence and patience. There is no place for prejudice or bias in science. Scientific pursuits warrant objective observation and impartial judgement. In science, we do not conclude or predict anything on the basis of superstition, traditional belief or hearsay, unless the facts are based on proof. In science there is no place for sentiment or emotion except rationality. A scientific result to be acceptable must be valid for all cases.
The thinking, feeling and actions of a modern man are practically guided by the effects of science. There is an involvement of science, direct or indirect in all works as well as leisure of a modern man. Science gives opportunity for creative thinking and constructive imagination. The learner develops the habit of searching for the truth. The significant aspect of science is that whatever the student learns has immediate application in the world around him.

In society, there will always be problems to be solved. One of the very useful outcomes of learning science is the development of problem solving skills. One of the aims of modern education is to provide means for utilization of leisure time especially in the industrialized societies. There is no end to interesting pursuits in science, intellectual or otherwise. Scientific activities provide the best hobbies and pass times for proper utilization of leisure. Science learners can be provided the opportunity for literary expression by being asked to write the details of their observations, procedures and conclusions of scientific experiments they perform.

As the science is based on facts and figures it helps to cause curiosity in the environment, has reduced the magnitude of superstitions and has made man open minded and free from biases. It helps to identify, to develop, to train and to prepare for a career in relation to society. Science is an exact knowledge or verified human experience based on facts and data. It deals with domain of positive knowledge in the field of nature and universe, man and society. All civilizations are a direct result of the efforts of a scientific mind. Science now dominates almost in every field of our activities. Every country is trying to exceed other in providing new ways of life, which serves as a timely warning to our country to reorient. Science education in our school and college is the shortest possible means so that we can attain a status of equality and face the world with confidence and dignity.

The study of science brings behavioral change in the learner and enriches his character and personality. Science gives opportunities for creative thinking and constructive imagination. Moreover, science is a subject where ideas can be experimented upon & verified. Hence, one of the useful outcomes of learning science is the development of the problem solving skill.
Science has made a tremendous impact on the cultural life of the present day society. There is an involvement of science direct or indirect, in all works as well as leisure of modern man. Habits and aptitudes have been affected by science. Moreover science has only, been acclaimed as an ‘Angel of creative ideals’. Science has opened innumerable avenues for pursuing different vocation. A student can pursue his studies in the fields of engineering, technology, agriculture, medicine or any other subject and make career in that vocation. The wonderful achievement of it has glorified the modern world, transformed the modern civilization into a scientific civilization and illuminated the human creative potential. It besides satisfying the intellectual exercises has disciplinary effect on the minds of the individuals. Science therefore gives opportunities for career making, pursuing professions and vocations. The main aim of education is to prepare an individual for future and then science subject is rightly serving this purpose.

Education makes man a right thinker and a correct decision maker. It achieves this by bringing him knowledge from the external world, teaching him to reason and acquainting him with past history, so that he may be a better judge of the present. Without education, man, as it were, is shut up in a windowless room. With education, he finds himself in a room with all its windows open to the outside world. Education is the process of instruction aimed at all round development of boys and girls. Education dispels ignorance. It is the only wealth that cannot be robbed.

The desire to achieve something of excellence is inherent in all human beings. It refers to the ability of an individual who strives to accomplish something, to do his best, to excel over each other in performance. The word ‘achievement’ implies the act of attaining a desired end or aim or level. Achievement is the psychological necessity of man. He needs it not only to establish himself in the eyes of others but also for self satisfaction. The word achievement is generally applied to the academic achievement of a child in different subjects or as a whole. Academic achievement refers to the degree or level of success or proficiency attained in some specific area concerning the scholastic and academic work.

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 the school education. Achievement is regarded as the end product of all the educational endeavours. (Balasubramanyan, 1997).

The term academic is made up of the word ‘aca’ which would mean any activity or action which is scholastic in nature. The area of academic achievement has not only aroused the curiosity of modern educationists but the educationists and philosophers of past years had shown their ingenuity in choosing various methods and techniques assessing knowledge of their disciples. Most psychologists agree that it is the people’s need for achievement as actual performance; it is what a person does, regardless of his capabilities. The need for achievement motivates people to strive for bigger and better accomplishments. So, achievement is a psychogenic motive that enables a person to master difficulties & be successful (Lefton, 1985). No wonder the achievement has been defined by almost all psychologists and attended to by all involved in the teaching-learning process i.e. education. Achievement refers to performance in school or college in a standardized series of educational test (Taneja, 1991). The term is used more generally to describe performance in the subjects of the curriculum. It can also be defined as the attained ability or degree of competence in school tests, usually measured by standardized test and expressed in grades or units based on norms, derived from a wide sampling of pupils’ performance.

Academic achievement is conceptualized as “that encompasses the student’s ability and performance; it is multidimensional; it is intricately related to human growth and cognitive, emotional, social and physical development, it reflects the whole child; it is not related to a single instance, but occurs across time and levels, through a students’ life in public school and on to past secondary years and working life”. (Steinberger, 1993)

The reason for deeper interest in measurement of educational attainment is that the scores obtained in achievement tests are the index of ones’ mental ability. Therefore, these scores form the basis for the award of degrees, prizes and scholarships. These tests are used by schools and colleges for deciding policies for failure and promotion to next class. These tests scores are predictive of job satisfaction. Generally the Indian schools are bifurcated into private and government schools. Private schools are the schools managed by private organizations or persons, either partially or totally. While the government schools are under sole management of government officials.
There are two levels of academic achievement viz. high and low. When the academic performance of the child is above the expected level, it is called high achievement (an academic success), when the academic achievement of a child is below the expected level, it is considered as low achievement (an academic failure). In one’s life academic success is highly valued as all intellectual capabilities of an individual are assessed by his scholastic achievement. Academic achievement is the product variable which gets toned up or bogged down by the positive or negative influences of a host of independent variables. The study of these factors related to academic achievement has been a problem of continuing interest to the psychologists convinced of the practical usefulness of predicting the future academic success of pupil in school by means of information related to his abilities and personality qualities. They have gone on with unending zeal to find out which factor or factors combination is the most promising in prediction work.

In the present context of education achievement in academic subjects is the main concern of the teachers, students and parents. The scholastic achievement is the basis of selection and differentiation among students for different openings and avenues for advancement in various fields. Academic achievement is important as it helps the students to understand the hierarchy based on academic achievement i.e. higher the academic achievement more are the openings for the students and they can go for better lines and better jobs in all fields like science and technology, medicine, management, literature, education etc.

Higher scholastic achievement is of paramount importance for progress and promotion in any field. As students with higher level of academic achievement can have better chance to get higher level of jobs and the type of work i.e., given to them, provides still better chance of their growth in the professional field. It also plays an elevatory role in socio-economic status of an individual as well as family because of higher/better occupational opportunities. It also acts as an indicator of the teachers’ and the overall effectiveness of any institution.

The world is becoming more and more competitive and the quality of performance has become the key factor for personal progress. It is the parents’ desire that their children climb the ladder of performance as high as possible. This desire for a high level of achievement shapes their attitude towards educational system. In fact, it appears as
if the whole system of education revolves round the academic achievement of students though various other outcomes are also expected from the system. Thus, a lot of time and effort of the school are used for helping students to achieve better in their scholastic endeavors.

Academic achievement refers to the attainment of the pupils in the so called academic subject as reading, writing, arithmetic, science and history as contrasted with skill development in such areas as industrial and physical education. Thus there are various aspects of the concept of academic achievement which have a great bearing on the personality of a student. Hence the academic achievement is concerned with the quality and quantity of learning attained in a subject or group of subjects, after a period of instructions.

Academic achievement at its best represents intellectual growth and the ability to participate in the production of knowledge. At its worst it represents inculcation and mindless indoctrination of the young into the orthodoxy of the old. (Landson and Billing, 1999). Achievement tests how well students have mastered the subject matter in a course of instruction. (Magargee, 2000)

Social scientists classify Indian society in many different ways to analyze how it responds to the forces of modernization. The emphasis on caste and class categories and the rural-urban distinction often blinds us to the sharp divisions inherent in the education system, otherwise supposed to act as an egalitarian force. Our education system has many kinds of schools and universities. A few occupy national space while others function as provincial institutions. The former carry the label central; the latter are associated with specific states. The difference between the two is stark, both financially and in terms of functional standards. It would be strange if the differential treatment they receive did not have significant social outcomes.

Each state has a few hundred schools affiliated to the Central Board of Secondary Education (CBSE), but the majority is affiliated to a state board. On the face of it, both follow the usual procedures for conducting public examinations, and the marks they allot to students have pan-Indian validity. From a purely administrative point of view, it would seem that schools’ being divided between CBSE and state boards is merely a matter of managing education in a huge country like India. The real story is different. The two systems represent two India’s that live together yet separately. It would be simplistic to say
that they represent the private and public spheres of educational governance since both spheres can be found in either.

Research has come to our aid by looking into what variables (personal, home, school, teacher etc.) promote achievement and what are the deterrents to it. It has been thus indicated that a good number of variables scholastic and personality, character of learners, the socio-economic status from which he hails, the organizational climate of school, curriculum, planning etc. to mention a few influence achievements in different degrees. These variables are generally referred to as correlates of achievement. Therefore, the researcher has taken these three factors for the present study i.e. aptitude, socio economic status and study habits.

Academic achievement is a multidimensional and multifaceted process. Hence it is not possible to attribute the difference in academic achievement to a single factor. This is true especially in a developing country like India. However it can be generalized that different factors are affecting academic achievement and these can be studied under two broad categories viz. personal and social factors.

Personal factors- these are the factors pertaining to self of the individuals. These include cognitive and non-cognitive factors as described here. Where cognitive factors includes interest, motivation, creativity and learning capacity and the non-cognitive factors includes aptitude, level of aspiration, physical and mental health, self concept of learner and heredity. As Rajni (2006) found in her study that study habits, aptitude for and attitude towards subject is the predictor of achievement in that subject.

On the other hand, social factors include human environment/ family environment, school environment, classroom environment, friends and socio-economic status. These factors affect the academic achievement both positively and adversely. There is a deep impact of family and socio demographic variables on their academic achievement. (Casanova et al, 2006). There is a positive correlation between school environment, socio economic status and academic achievement. (Walker et al, 2005)

Science has many branches with different areas. Biology is that branch of science which deals with the study of life of plants and animals i.e. living things. It is divided into two branches i.e. Botany (study of plants) and Zoology (study of animals). Study of Biology is very vast and divided into several branches like morphology, anatomy,
histology, physiology, ecology, taxonomy, pathology, embryology, genetics, evolution, paleontology etc. Study of Biology has greatly contributed to the welfare of the human race. Early man satisfied his needs by taking nature’s offerings as he found them. He met his food requirements by hunting or by eating forest foods.

With the passage of time new discoveries led to still newer discoveries and the present day mode of existence is due to continued exploration of our environment. Study of Biology is a requirement for many careers like bacteriologist, doctor, dentist, lab technician, nurses, plant breeder, farmer, entomologist etc. So, Biology is an effective weapon in the hands to ward off the main ills of pestilence, war, disease and famine. Physics and Chemistry are most preferred subjects followed by Mathematics and Biology. (Kumar, 2008)

A student opting for any stream must have aptitude for that. Some individuals are found to be precocious in some field of work, due to specific aptitude, such as for music, art, mathematics, mechanical work or scientific studies. So, it is concluded that to get success in a particular field or activity, an individual must possess aptitude for that particular field or activity.

The word aptitude is derived from the Latin word, ‘Aptos’ which means ‘fitted for’. It can be defined as the measure of probability of success of individual with training in any type of situation. The success of an individual in an occupation or vocation depends upon his choice in the light of his aptitude. Scientific aptitude and achievement in Biology play a major role in moulding a child’s character and decision regarding pursuing a career in science. (Rao, 1990)

Aptitude is the measure of the probability of success of an individual with training, in certain type of situation (Bingham, 1993). So if an individual wants to be successful in the field of science, he must possess aptitude for science and the aptitude towards science is generally known as ‘scientific aptitude’. Scientific aptitude indicates the possibility of future success or failure in the area of science learning. Therefore, learners’ felt urge in learning science along with their sound scientific aptitude only may result in expected achievement. (Ghosh, 1986) Scientific aptitude is the major outcome of science education. If it is endowed with in an individual in its fullest form, he will be in a position to pursue science education efficiently with which he can climb the ladder of success with
ease and effect. It is not taken as unitary quality, but as capacities constituted by certain components or sub qualities for which assessment techniques had been now evolved. Scientific aptitude is the application of general intellectual capacity to the scientific materials and problems.

Aptitude for science constitutes namely clear thinking, mathematical computation, understanding laws and principles, ability to perceive & to have visual imagination. Without good scientific aptitude an individual does not perform much in science. Scientific aptitude predicts the achievement of pupils in science and allied subjects. Thus, scientific aptitude is considered as the capacity to acquire proficiency in science with given amount of training- formal & informal.

A person with scientific aptitude has an experimental bend of mind, clear thinking, is free from bias, can differentiate between right and wrong, better knowledge to use scientific method, know the value of time, has a specific perceptual ability in methods and procedures of formulation of hypothesis, logical reasoning and problem solving behavior, ability to detect illogical conclusions from provided data, ability to analyze and synthesize data accurately.

Scientific aptitude is the native capacity of the learner as it is developed in nurturing environment. Inculcation of scientific aptitude is one of the objectives of teaching science, because it decides the future of the individual in the field of science. The future of students in the field of science can be judged from their aptitude in the field of science and the scientific aptitude of the students can be checked by the administration of scientific aptitude tests.

Scientific aptitude in use implies that persons possessing certain characteristics can be identified and that much individuals, can succeed in scientific endeavour. Thus the characteristics of able scientists suggest some of the criteria for opting by the individuals with aptitude for science. These characteristics include mental ability, creative ability, capacity for critical thinking; ability to see relationship, suspended judgments and open mindedness, factors that predispose to such traits constitute at least a part of scientific aptitude.

A person who possesses scientific aptitude has an inbuilt operational ability to predict his success (with training) in the specific fields of science and scientific vocation.
Scientific aptitude varies from individual to individual, some possess high scientific aptitude, some has average and some possess low scientific aptitude. (Rao, 1994). About 70% pupils possess average scientific aptitude, 15% each possess high and low scientific aptitude. (Jose, 1987)

Sometimes aptitude is confused with achievement. Achievement looks to the past indicating what has been done. While the aptitude looks to the future, predicting what he may become. Aptitude is the present condition with a forward reference. Aptitude is a condition or characteristic regarded as indicative of potentialities but one can’t be very sure that a person possessing a particular aptitude is going to succeed later in the job or occupation. Aptitude is a person’s ability acquired or innate, to learn or develop knowledge or a skill in some specific area. (Singh, 1987)

Scientific aptitude is the ability - mechanical comprehension (mechanical aptitude), the ability including information regarding the use of tools and machines and also the application of reasoning to mechanical problem. (Muchinsky, 2004) On the other hand to succeed in the job in the field of science a person must possess the aptitude in science which would lead to his success in the particular field. It is endowed with an individual in its fullest form. He will be in a position to pursue science education efficiently with which he can climb the ladder of success with ease and effect. It depends on variety of factors such as ability to learn a subject, socio-economic status and cultural background.

Scientific aptitude in science can be checked by the administration of scientific aptitude tests. A test of scientific aptitude is regarded as a device intended to estimate probability of success in science related occupation. The scientific aptitude tests can be used for the purpose of providing guidance in the selection of subjects and various types of professional training as teaching, medical, engineering etc. It predicts the achievement of pupils in science and allied subjects.

Human beings are known as the creature of habits. It is rightly said that character is the bundle of habits. This reveals the importance of habits in character. Education helps the learner in the development of their self concept etc. with the attainment of knowledge by way of good study habits. As the study habits and skills play a critical role in individuals’ success. Therefore it becomes mandatory to inculcate
healthy study habits in oneself. Study habits have become the base of success in some academic courses.

As the word ‘Study habits’ comprises of two words i.e. Study + habits. Where, the term ‘Study’ means application of mind to the requirement of knowledge, study -a kin to be eager, a diligent, and a state of absorbed contemplation. The term ‘Habit’ refers to a sense of behaving that has become more or less fixed. Habits signify a way of acting or thinking frequently enough leading to unconscious behaviours. Thus study habits refer to acquisition of knowledge and skills through more or less permanent modes of studying.

Effective study habits includes learning to learn i.e. managing time, stress, avoiding procrastination, thinking critically, thinking genius, developing self discipline, motivate oneself, studying with multiple sources, developing a positive mood and schedule a productive time as well as selecting a less distracting space.

The task of learning is not dependent on teacher alone. It is not only the teacher’s responsibility, but it is also the responsibility of the pupil. Efficient learning depends not only on good teaching alone, but on satisfactory learning procedures also .It also depends upon the learner’s ability to schedule his time, the plans of his study, the habit of concentrating, note taking, mental review over learning, the judicious application of whole and part method, massed and distributed learning and so on. In other words, learning involves the development of proper study habits and skills.

Study habit implies a sort of more or less permanent mode or method of studying. Individuals have their own way of studying. It has also been found that those who have good study habits excel others of equal intelligence in academic achievement. Study habits have an impact upon the academic achievement and the high achievers were having better study habits as compared to low achievers. (Patel and Patel, 1996). Study skills are the tools students use to absorb the materials which they are expected to learn. (Stephen, 1998). To enhance the quality of education and improve academic achievement, it is necessary to improve the study habits of students. To improve study habits those factors are needed to be identified which affect the character adversely. (Hussain, 2006)
Effective learning depends upon the development of efficient study habits and skills and as such one of the continuous objectives of teaching should be the improvement of study habits and skills of students. From the practical point of view the problem is all the more important. Very often teachers come across such students who appear to have above average scholastic aptitude, yet they are doing very poorly in their course of study. A large majority of these seem to have faulty study habits. Proper guidance to them would be expected to change their faulty study habits into the desirable ones, as much study habits are important for higher academic achievement of students as much it is important for their fruitful use of leisure time. Thus study habits as a concept is more generic than specific in terms of its importance. It has very long reading effects into the life of individuals and by communicative and interactive effects in the society. (Jamuar, 1974).

In fact a study habit is a very important character of all human beings who are ‘being educated’ and ‘are educated’. Study habits are essential to learning and fundamental school success. The chief purpose of study habits are:

1) To acquire knowledge and habits, those will be useful in making adjustments and creating new ideas.
2) To perfect skills
3) To develop attitudes

It implies a sort of more or less permanent mode or method of studying. The study habits can be known from seeing the actions in different acts. The study habits are the end product of activity engagement. It is a common belief that a man who does not have good study habits, howsoever interested, capable and pushing he is can’t be an efficient student. Study habits and strategies refer to the activities carried out by a learner doing the learning process for the purpose of improving learning. This definition has two components concerning the what, when and why of study behaviors that the learners produce and second, they intended as aids to learning. (Brandtt, 1989)

Examples of study strategies for reading a text book, lesson, include underlying key terms, creating an outline and taking elaborated notes for students including children in elementary schools, youngsters in secondary schools and adults in colleges or training programs. Learning from teachers and books becomes a dominant
activity in their lives. They are expected to become professional, learners, but they are rarely given any training in how to learn. (Normal, 1980; Winston & Mayer, 1986; Mayer, 1992)

In spite of their importance, study habits often remain a part of the hidden curricula (i.e. material that is not heavily taught but that student is expected to learn). Successful students somehow acquire study strategies even though "strategy instruction has not been incorporated into the curriculum on large scale". (Pressly, 1990)

Study habits and strategies are intended to elicit and guide ones' cognitive processes during learning. A self directed learner possesses appropriate study strategies and use them at the appropriate times and placing them during learning. Knowing when to use them or modify use of study strategy is a kind of meta-cognitive skill. (Mayer, 1995)

Pressley et al (1970) have suggested several study strategies that could become part of curriculum. They include summarization strategies, text structuring and question asking strategies. Summarization strategies involve stating the content of a passage or lecture in a condensed form. Since summarization strategies can be expected to activate the cognitive processes of selecting relevant information, they should improve students' retention and performance. Research supports this expectation. For example, students who were asked to write a single sentence, to summarize a paragraph retained more of the information than students who simply read the paragraph. (Doctorow et al, 1978). Study habits play an important role in human performance in academic field (Verma,1996; Stephen,1998; Verma and Kumar,1999; Satapathy and Singhal,2000; Vyas,2002).

Factors affecting study habits
Study habits of all persons differ from one another similarly the study habits of students differ. Moreover these are affected by a number of factors relating to attitude, interest, level of interest, age, sex, qualification, job requirement, aptitude, socio-economic status, parents’ educational background academic position of student, teacher attitude, methodology of teaching and certain personal factors such as personal interest and
So, the problem of study habit is of immense importance both from the theoretical and practical point of view. Theoretically, efficient learning depends upon the development of efficient study habits and skills of the students.

Of the social variations that are likely to affect career maturation process, socio-economic status seems to be a potentially powerful contributor. Children from well placed families are sure to go in for elite vocations where as those from the mediocre families choose vocation consonant with the kind of background they have. But whether vocational maturity in terms of readiness to choose, prepare and plan for a vocation has an association with socio-economic status needs to be checked.

It is a matter of common experience that if the students are not provided with the proper facilities both at home and school for doing their work then their results will be unsatisfactory. It has been found that the family conditions & home environment also have a contributory role in the achievement level of the student.

Socio-economic status is a blanket term implying as many factors in the life of an individual as an investigator can possibly know about him. It may refer to the individual’s past and involve a study over a period of time concerning the socio-economic conditions of his home. It may involve considering such factors as the death of a member of a family, divorce or any other crises of social or economic nature, which influences the development of the child for the time being or permanently.

Socio-economic status refers to social and economic standing. A person who has high standing in the community, has good income and lives in a well furnished house of a good quality is said to have a good socio-economic status.

It is generally found that achievement of a person is founded on the bedrock of his surroundings and other environmental factors. The scholastic performance of most people pursuing studies i.e. achievement is the result of the influence exerted by his immediate and other surroundings except in case of men of genius. The future potentialities of a person are hidden behind his family background and environment.
They generally affect the capabilities of an individual directly or indirectly. It is observed that socio-economic status of the family have great influence on study habits of the students.

Socio-economic status influence difference in home management and table manner, in husband and wife relationship, role of parents, children and relatives, monthly expenses, child training and attitudes towards family life (Benedict, 1949; Mass, 1951), performance of children in examination (Singh, 1962), level of alienation (Neal and Groat, 1974) social participation and motivation for improvement (Pareek and Trivedi, 1964) ego strength (Bhardwaj, 1995) verbal fluency (Pradhan and Akhani, 1997) value conflicts (Kalpana, 2000). The children of high socio-economic status, talk sooner, talk better (Hurlock, 1964) and more aggressive and less regressive than those adolescents of low socio-economic status. (Helode and Ghosh, 1995). At every age, the articulation of children of the high socio-economic status group is superior of that of children of low socio-economic status group (Landreth, 1958; Bernstein, 1960). It favours intelligence (Frayer, 1922; Laird, 1957; Shanthamani, 1971).

An important consideration in regard to the family background relates to one’s status in the socio-economic hierarchy comprising of variables such as education, income and occupation. Family status conceptually refers to the socio-economic position of the family and its location in the social strata. The social hierarchy determines the social status of a family which as mentioned above is determined by the education, income, occupation as well as the property owned if any, size and type of the family. (Macever and Page, 1975)

Socio-economic status is the scale that determines for its possessors, apart from its personal attributes or special service, a degree of respect and prestige. Socio-economic status has usually been confined to the five components.

1. Education of parents and other family members.
2. Profession of parents and others.
3. Income of family from all sources.
4. Size of family.
5. Total socio-economic status of the family.

(Grandi, 1975)
Socio-economic status of a family influences to a great extent the development of child’s personality. It is because of this that a number of studies from India and abroad had pointed out the influence of this important factor on the various aspects of the personality of adolescents. Educational level of parents could be a predictor of a kind of subjects students will choose at senior class level based on experience and what they want their children to become in later life. (Kirk, 2000) It has been seen that the parental education and socio economic status seems to have an impact on students’ academic performance and subject selection. (Davis Kean, 2005)

Most of the studies have proved that the social class background of the students has a significant bearing on the academic achievement. (Charter, 1963; Rao, 1977 and Sujatha, 1989) These studies have reported that there are significant differences between students belonging to different classes in terms of academic achievement. It has become well recognized that wealthy and well educated parents ensure their children’s future earning by providing them a favourable learning environment, better education and good jobs. In contrast to this belief, children from low socio-economic status parents do not have access to extra learning facilities. Hence the opportunity to get to the top of their educational ladder may not be very easy. (Becker and Tomes, 1979)

On the basis of Socio-economic status there are two different groups of students. One with high socio-economic status i.e. advantaged students and other with the low socio-economic status i.e. disadvantaged students. Higher socio-economic status carries with it, not only its own pattern of behaviors but also a complex of advantages not enjoyed by the other strata of society. The higher socio-economic status group has its own characteristics, outlook and consequences that stimulate child’s academic achievement. In general lower socio-economic status causes higher dropouts particularly of minority youth, which predicts lower occupational status. Adjustment with examination and curriculum, socio-economic status, parental encouragement, family atmosphere, lack of facility, poverty and unrealistic aspirations were prominent among dropouts at senior basic level. (Asthana, 1993)

Here it can also be mentioned that the students from lower middle class families may be more prepared mentally for a prestigious career so as to be able to rise
above their own and parental status. For this purpose they are required to have clearer vision and planning so far as career is concerned. Those with high levels of socio-economic status are generally supported by their parents in respect of their future careers and these are likely to be marked out already, the needed opportunities being available in abundance. The officer class, of course, has high aspirations for their children and therefore, provide rich and stimulating exposure to build up in them vocational orientation suited to their status. Parent’s qualification, sex and place of birth contribute substantially to achievement. (Palchandra, 1995)

On the other hand, the parents belonging to middle class can afford up to a certain limit where the liabilities pertaining to the financial opportunities are considered because they have a limited source of income, from which they have to spend for their families and rest income is spend over their children’s’ education. Parents are more likely to incur private expenditure for sons than daughters (Kapoor and Mehta, 2004). And if the cases of lower middle class groups are considered they are not able to provide much financial help for their child’s academics. Most of the times, finance becomes a major impediment in the progress of a person. It has been observed that the families with low income consider the number of children in the family as their earning hands. More the number of children, more will be the earnings.

So the present study is a humble effort to assess the scientific aptitude, study habits and socio-economic status of secondary school students through which parents can be made aware of their child potentialities which will ultimately make them resourceful enough in helping their wards in choosing a course of study which will ultimately help in showing better academic achievement that will reduce the rate of dropouts and failures. So encouraged by these considerations, the researcher has choosen the present field of investigation.
1.2 RATIONALE OF THE STUDY

India is going through rapid transformation, so significant changes in our institutions are perceptible. Since the utilization of human resources is the key factor, it is imperative that these resources don’t get underutilized or wasted. Academic achievement is the unique responsibility of all educational institutions established by society to promote a wholesome scholastic development of pupils.

The area of academic achievement has not only aroused the curiosity of modern educationists and psychologists but even educationists and psychologists of past years have shown their ingenuity in choosing various methods and techniques assessing knowledge of their disciplines.

Achievement in any subject, skill or area is influenced by quite a large number of factors like interest, attitude, motivation, methods of teaching, study habits, socio-economic status and aptitude etc. students feel a strong urge to enroll themselves in science courses particularly in secondary stage due to number of causes, among which to ensure their well acceptance in surroundings is also a major one. Parents are also driven strongly by this type of external motivation, considering science learning of their children as a symbol of social status. (Shukla, 2005) In order to strive for achievement in any subject the student must possess the aptitude for that subject. Considering the importance of scientific aptitude in all stages of human life, it is tried to identify the level of scientific aptitude possessed by secondary school pupils aged between 16-17 years, the age in which the scientific aptitude begins to take a concrete shape. These days choosing medicine as a career, has become so popular that the students don’t mind even dropping their one year to clear the entrance exam. These scarce resources should be maximally utilized. Otherwise the result will be mere wastage of time, effort and money. As a result the students may get frustrated or may develop into maladjusted personalities.

On the basis of socio-economic status, students can be divided into two categories-one with high socio-economic status i.e. advantaged students and other with low socio-economic status i.e. disadvantaged students. Socio-economic status has great influence in achievement in any subject. Study habits of the students also affect achievement. Sometimes the parental attitude, parent’s qualifications, influence of friends and aptitude
becomes the major determinants of opting for medical stream. Sometimes parents compel their children to opt for scientific courses irrespective of whether the child possesses medical aptitude or not. In other words, most of the times career choice of a student is tailored by parents regardless of the fact that every child has certain interests, aptitude and level of intelligence. Many parents are in the habit of determining virtually all academic decisions for their children. They choose the school to attend, the books to read and even the subjects to study in school.

(Owoyele, 1999)

In the present system of school education, at the time of admission in the various fields of study in secondary stage, students’ aptitude in that discipline is hardly recognized as the matter of consideration. (Department of Science and Technology, 2010). As a result, in spite of gradual increasing rate of enrolment of students in science courses, the scenario of students’ achievement in science is not as per the level of expectation. This failure in science learning increases the possibility of wastage of human resource and therefore has become a major concern of school teachers, administrators and also science educators. (Ganguli and Vashistha, 1991; NAEP, 1979)

The school needs to identify the aptitude in order to provide the child with education best suited to his needs and social welfare. There are at least two main concerns that the school should be responsible for identifying- firstly the general or specific abilities of each pupil and secondly the school should then encourage maturation of aptitude. So it is the responsibility of the school to help the students to know and understand their aptitude. On the other hand, other factors like socio-economic status of family and study habits also show their influence on the achievement of students. Students belonging to socially advantaged class i.e. well-to-do families get more facilities than the students coming from socially disadvantaged sections of society. This prompts the researcher to do the present study.
1.3 STATEMENT OF THE PROBLEM

STUDY OF ACHIEVEMENT IN BIOLOGY IN RELATION TO SCIENTIFIC
APTITUDE, STUDY HABITS AND SOCIO-ECONOMIC STATUS AMONG
SECONDARY SCHOOL STUDENTS.

1.4 DELIMITATIONS OF THE STUDY

1. The study was confined to 500 students selected as per the design of the study.
2. The study was confined to boys and girls of +2 class of medical group.
3. The study was confined to the students of Government and Private Institutions.
4. The study was confined to the students studying in school under Central Board of
Secondary Education (CBSE) and Punjab School Education Board (PSEB).
5. The study was confined to the students of schools of Amritsar, Tarantaran, Ferozpur
and Bathinda districts.
6. In the present study four variables i.e. achievement in Biology, scientific aptitude,
study habits and socio-economic status were taken up.

1.5 DEFINITIONS OF THE KEY TERMS USED

**Achievement** – Achievement tests how well students have mastered the subject matter in a
course of instruction. *(Magargee, 2000)*

In the present study achievement in biology refers to the scores obtained by
them on achievement test in biology which is based on the contents which they are
expected to have learnt by the instructional program at secondary stage.

**Scientific aptitude**- Scientific aptitude is the potentiality for future accomplishment in
science without regard to past training and achievement. *(Dressel, 1993)*

In the present study scientific aptitude was assessed on the basis of the scores
obtained by the students in the areas of general science i.e. Physics, Chemistry and
Biology.
**Study habits** - It refers to activities carried out by a learner during the learning process for the purpose of improving learning (Brandtt, 1989).

In the present research study habits cover all related aspects of study such as reading habits, learning techniques, memory, time schedule, definite plan, physical conditions, use of various study strategies like self-testing and re-reading, examination, evaluation etc.

**Socio-Economic Status** – Socio-economic status is the measure of an individual or family’s relative economic and social ranking. Socio-Economic status would therefore be a ranking of an individual by the society he lives in, in terms of his material belongings and cultural possession along with the degree of respect, power and influence. (Chapin, 1998)

In the present study socio-economic status covers the following areas such as parental occupation, father’s education, parents’ annual income, household possession, books and magazines, cultural sub possession, education of testee’s brothers and sisters, level of aspiration, concept of social prestige and belief in caste and total assets.

### 1.6 OBJECTIVES

**1.6.1 Related to Achievement in Biology:**

1. To find out the difference in achievement in biology among boys and girls.
2. To find out the difference in achievement in biology among students of government and private institutions.
3. To find out the difference in achievement in biology among students of CBSE and PSEB.

**1.6.2 Related to Scientific aptitude:**

4. To find out the relationship of achievement in biology with scientific aptitude.
5. To find out the difference in scientific aptitude among boys and girls.
6. To find out the difference in scientific aptitude among students of government and private institutions.
7. To find out the difference in scientific aptitude among students of CBSE and PSEB.

1.6.3 Related to Study habits:
8. To find out the relationship of achievement in biology with study habits.
9. To find out the difference in study habits of boys and girls.
10. To find out the difference in study habits among students of government and private institutions.
11. To find out the difference in study habits among students of CBSE and PSEB boards.

1.6.4 Related to Socio-economic status:
12. To find out the relationship of achievement in biology with socio-economic status.
13. To find out the difference in socio-economic status of boys and girls.
14. To find out the difference in socio-economic status among students of government and private institutions.
15. To find out the difference in socio-economic status among students of CBSE and PSEB boards.

1.7 HYPOTHESES

1.7.1 Related to Achievement in Biology:
1. There exists no significant difference in achievement in biology among boys and girls.
2. There exists no significant difference in achievement in biology among students of government and private institutions.
3. There exists no significant difference in achievement in biology among students of CBSE and PSEB.
1.7.2 Related to Scientific Aptitude:
4. There exists no significant relationship of achievement in biology with scientific aptitude.
5. There exists no significant difference in scientific aptitude among boys and girls.
6. There exists no significant difference in scientific aptitude among students of government and private institutions.
7. There exists no significant difference in scientific aptitude among students of CBSE and PSEB.

1.7.3 Related to Study habits:
8. There exists no significant relationship of achievement in biology with study habits.
9. There exists no significant difference in study habits among boys and girls.
10. There exists no significant difference in study habits among students of government and private institutions.
11. There exists no significant difference in study habits among students of CBSE and PSEB.

1.7.4 Related to Socio-Economic status:
12. There exists no significant relationship of academic achievement in biology with socio-economic status.
13. There exists no significant difference in socio-economic status among boys and girls.
14. There exists no significant difference in socio-economic status among students of government and private institutions.
15. There exists no significant difference in socio-economic status among students of CBSE and PSEB.

1.8 PLAN OF RESEARCH REPORT
The plan of the research report has been framed under five chapters. Chapter 1 gives the introduction of the problem taken for study and hypotheses. Chapter 2 deals with the
review of related studies. Chapter 3 deals with the Plan and Procedure employed in the collection of data. Chapter 4 describes the analysis, interpretation of data and discussion of results. Chapter 5 deals with the Summary, findings and suggestions for further research. References have been given at the end of research report along with the psychological tests used.