CHAPTER 1

THE PROBLEM
CHAPTER I

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Importance of Science</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Place of Physics in the Secondary School Curriculum</td>
<td>11</td>
</tr>
<tr>
<td>1.4 Objectives of Teaching Physics</td>
<td>22</td>
</tr>
<tr>
<td>1.5 Problems of Science Teaching and Learning</td>
<td>38</td>
</tr>
<tr>
<td>1.6 Need and Importance of the Present Study</td>
<td>46</td>
</tr>
<tr>
<td>1.7 Statement of the Problem</td>
<td>51</td>
</tr>
<tr>
<td>1.8 Objectives of the Study</td>
<td>51</td>
</tr>
<tr>
<td>1.9 Operational Definitions of Terms</td>
<td>53</td>
</tr>
<tr>
<td>1.10 Limitations of the Study</td>
<td>55</td>
</tr>
<tr>
<td>1.11 Overall View of the Study</td>
<td>55</td>
</tr>
</tbody>
</table>
CHAPTER - I

THE PROBLEM

1.1 Introduction

In ancient times when human social life was very simple, the family used to provide the child with all the activities and experiences that he or she needed for preservation and improvement of his or her life and culture. The child was learning the vocations and life patterns from the adults, from the family, church, religious ceremonies, social functions and so on. In course of time, however as the society became more complex and life more complicated there was gradual development of human civilization and the quantum of knowledge and experience increased.

The world is becoming more and more competitive. Quality of performance has become the key factor for personal progress parents desire that their children climb the ladder of performance to as high a level as possible. This desire for high level of achievement puts a lot of pressure on students, teachers, schools and in general education system itself. In fact it appears as if the whole system of education revolves around the academic achievement of the students, though various other outcomes are also expected.
from the system. For improving academic performance, educators must identify
the factors affecting the achievement of students.

Education to day emphasizes individualization of instructional process
and thereby academic success of each individual. The academic success or
failure depends on many factors, which include environment of the child, his
unique way of processing information, curriculum and material to be learned.
Therefore, it is imperative to identify and explore various factors relating to the
academic achievement of the learner.

1.2 Importance of Science

Today the world has been facing three major problems of population
increase, pollution and poverty. Increasing population and increasing poverty
have been nullifying the developmental efforts of developing countries, such
as India. Although science and technology have improved a large number of
human beings face some of the worst problems of humanity, to date have
either been brought about or aggravated by science and technology. It may be
mentioned here that education is one of the potent instruments in the
development process, if it is properly utilised for that purpose. Science
education being an important component of the education system should
contribute in the solution of the problems of the country by developing
desirable understandings, skills, abilities and attitudes. The greatest challenge
is to humanize science that is to make it relevant to human needs and aspirations.

Science is a systematized body of knowledge. Generally, science can be divided into two categories.

i) **Natural Sciences**: Natural Sciences are Physics, Chemistry, Zoology, Biology, Geology and the like.

ii) **Social Sciences**: Social Sciences are Economics, History, Political Science, Sociology, etc.

Study of science requires the study of different natural sciences. It is this science that tries to establish relationship between various events of the world. On the basis of science, the cause of a particular effect can be easily knowing. For example, if an explosion has taken place, the science helps us to know the cause of that. Some gas may cause that explosion or it may be due to some other chemical changes. Thus, it is noticed that science establishes the cause and effect relationship. It is, thereof, obvious that the study of science is quite important and useful for the individual and the society.

Today in an age of science and all the activities are controlled and governed by science. Science has helped man to acquire supremacy over nature. The following lines very aptly describe the importance of science in everybody life.
"We live in a world of scientific achievement; we converse and carry on business daily by telephone; the telegraph provides us with a speedy means of communication, wireless apparatus is used daily in millions of homes; our houses, streets and shops are lighted by electricity and our machines, trains and trams are worked by electricity. In fact, so much depends on the application of electricity that life would be at a standstill without them. The discovery of internal combustion engine has made transport wonderfully easy and cheap. The steam locomotive, the ocean linear and the aeroplane have brought places very closer together. The cinema has provided cheap entertainment. The new triumphs and miracles in medical and surgical fields are helping to reduce the misery of suffering humanity. In short, science has brought us comforts which kings could not dream of century ago". – (Dass, 1985).

**Conquest of Nature:** A few centuries ago nature was a thing to be dreaded and wondered at. In fact, it was an awe striking and curiosity-inciting phenomena for which slowly and gradually man paved into the mysteries of nature and consequently established his supremacy over it. It has been possible only due to science. In short, it may be said that science has helped humanity to achieve conquest over nature.
Achievements of Science for Human Beings: Science has brought about a lot of achievements and it has added to the comforts and pleasures of mankind and the study of science has conferred upon us the gifts of electricity, nuclear energy, atomic energy, wireless, etc. Now, it has been possible for man to conquer the 'space' as well. All these things have added to the human comforts, longevity and security. However, these things can be used for destructive purposes as well. It is not the fault of science, but the fault of human nature and temperament.

Science and Society: Science has transformed the very structure of the society. Distances have been minimized and social contacts have become very easy. Thus, breaking the barriers of distance and social structure. All this has added to the progress of the society. It is, therefore, beyond doubt that science occupies a very important place not only in the life of an individual but in the life of the society, as well.

Science and Civilization: Science has contributed a lot towards the development of civilization. The influence of science, which pervades every aspect of human life, has, in fact, led to the growth of new civilization. From the point of view of civilization has been in the industrial era and heading towards the elimination of all kinds disparities. The first stage of the civilization was the 'Stone age'. Then came the age of 'Hunting'. From that age
human race marched into an Agricultural era' and then came the 'Industrial era'. All these things have brought about the betterment of civilization. Today it is the 'Space age'. This space age is contribution of the science.

Science and the Development of Individual Personality: The individual has caused the development of the science. It is science that forms the very basis of the development of personality. On the other hand, science is assisted in its development by the personality of the individual. This scientific outlook is nothing but an outlook free from prejudices and based on tolerance. This outlook teaches to know about the relationship of human being of cause and effect. All this leads to the development of the personality.

The contribution of the science towards the development and the building up of the personality cannot be denied. If on the one hand, science has given a lot of material in gifts, on the other, it has also helped the development of the personality. Thus, science occupies an important place in human life.

It is very unfortunate that as science educators never practically think at 'why'. The principal goal of science education is to create men who are capable of doing new things, not simply of repeating what other generations have done – men who are creative, inventive and discoverers. If that is taught
as science, then how far the science education is compatible to achieve this goal? The answer is very difficult.

The key to national prosperity lies in the effective combination of three factors – technology, raw materials and capital, of which perhaps the first one is the most important. Since the creation and adoption of new scientific techniques, technology can, in fact, make up a deficiency in natural resources and reduce the demands on capital. But technology can only grow out of the study of science and its applications. Technology serves man. It gives individuals and nations roots, a frame of reference, horizons, a worldview and inner freedom, science and technology are used to promote the establishment of the community of man to the community of nations. Thus, to teach or learn science has a variety of reasons.

1. Science is fundamentally concerned with exploring and interpreting the physical world through the three fundamental areas of physics, chemistry and biology. Physics is concerned with the exploration of energy and general properties of inanimate materials. The physical and biological world is of fundamental human interest and man has a basic motivation to understand and control the physical world in which man lives and thrives.
2. As man lives in a scientific and technological age and no citizen can function effectively in a developed society without a basic scientific literacy and certain elementary skills. Every citizen needs to live a healthy life with proper sanitation and clean surroundings. The knowledge and skills required by a modern householder in dealing with electrical, plumbing, building etc and may be cited as some justification for teaching science to all children in school.

3. Man depends upon scientific knowledge and understanding for economic and material advancement. Science has provided so many aids for 'the good life' from bicycle to jet aircraft, antibiotics to heart surgery, radar to colour television, and fertilizers to plant growth hormones. Although in beginning man realizes many follies in the large-scale application of science and technology in terms of a net environmental damage, the fact is that man needs science again to rectify these follies (like application of science and technology in a better way which would not affect the environment adversely) and to enable more people to live on this planet in conditions which do greater justice to the dignity of human being. The priority, which the developing countries like India are giving to basic science education for public health and agriculture, can clearly be seen.
4. Science cannot be used in society without a body of men and women who have been specially trained for science-based vocations in industry, research and teaching. A vocational justification is therefore possible for science teaching.

5. Science, if studied properly, develops power of thinking, reasoning, curiosity, open-mindedness, and ultimately develops scientific attitude. Thus, science could be aimed as an instrument for social change towards a better society.

Man has been trying to understand the changes going around him and has been constantly receiving a great number of impressions through his various senses such as hearing, sight, smell, taste and touch. Making an effective use of his senses and using his communicative ability man accumulates information about the surroundings to organize this information and seek regularities in it and try to find out why the regularities exist and finally transmit the findings to the next generation.

This systematized store of human knowledge is gained after generalizing and interrelating various isolated facts is known as science.

The word science has its origin from a Latin word ‘scientia’ meaning ‘to know’. Science is universal but has been defined in different ways, for example”
"Science is a systematized body of knowledge".

"Science is nothing but organized common sense".

"Science is a heap of truth".

Thus, science is simultaneously a body of knowledge and continuous, self-evaluative process of enquiry.

Science, thus, has two important approaches:

a) Science as a product and

b) Science as a process

Various laws, theories and principles are included in the category of science as a product where as scientific attitude, scientific method etc., form part of science as a process though both aspects are important in their own way. But to attain the aims of science education in schools more emphasis has to be placed on process approach where physics has been designed as the study of the properties of matter and energy.

It concerns both the macroscopic and the microscopic state of matter. The peculiarity of this subject is that it perceives both with the same set of laws and generalizations. The law of conservation of Mass and Energy holds good both in the cosmic scale as well as the sub-atomic scale.
However, man do not look at physics merely as a body of facts or some important physical laws and generalizations, which are to be investigated and applied to new situations. In fact, the notion as the subject should reflect its own true spirit. Many laws are merely crude generalizations or deductions. Through Boyle's law, for example, it is known that only perfect gases obey this law, although the fact that no gas is perfect is very well known fact.

Then what is this law about? Most of the ordinary gases do not obey this law perfectly still it is applied it in our daily life. The reason for this is that for all practical purposes, the deviation for the law under ordinary laboratory conditions is very marginal and beyond the capacity of scientific instruments to detect. So for the satisfaction with the important, although imperfect generalization such instances could be quoted in almost all branches of physics. The important thing is not the law itself but its valuable applications to new situations related to daily life problems and relationship with other set of laws and facts.

1.3. Place of Science in the Secondary School Curriculum

The importance of science all over the world is now well recognized, and it is generally accepted that some knowledge of physical sciences is an important part of a liberal education. What is called 'the scientific age'? Any education intended to fit for graceful and purposeful living will be grievously
ill-directed if it takes no account of the intellectual climate of the present day, permeated as it is with the ideas and hopes of the scientists.

The benefits derived from the study of physical sciences:

1. Physical Sciences give an essential background of knowledge for cultural development. It expounds the pupil's knowledge of the universe and his position in it; it helps in the appreciation and enjoyment of nature and life, it offers a basis for a proper and valuable use of increased leisure, and it stresses the need to take an active and intelligent share in the development of the community.

2. Physical sciences give many opportunities to foster the scientific method and discipline, since it trains the pupils to observe and think clearly, critically and carefully. This training should, whenever possible, be applied to real and worthwhile problems affecting the personal life and thinking of the pupil, so that such benefits may be transferred to his other activities.

3. Physical sciences stress the need to appropriate the meaning of scientific life spirit and endeavour – open-mindedness, intellectual honesty, self-sacrifice and devotion – which may serve as ideals to the future citizen. Contributions made to community through the efforts and all citizens should know achievements of scientists since they are a distinctive feature of modern civilized existence.
4. Physical sciences introduce the pupil to knowledge of scientific facts needed not only for many trades and professions but also to enable the citizens lead happy, well-balanced and useful life. Future citizens ought also to know the possible influence of new scientific discoveries and should realize the need for proper control. It is, therefore, necessary to understand, as a minimum, the simpler words and definitions in physical sciences, the relationship between physical sciences and other fields of knowledge, and the elementary facts and principles of this subject, so that in later life the pupil may be well informed of the important developments.

In order to satisfy the major needs of a student; the requirements of science has been classified with respect to three standpoints:

1) As a citizen, with certain civic and social duties and responsibilities.
2) As a worker, who is duty bound to bear the share of the economic load.
3) As an individual, who should have varied non-vocational interests and permits to lead a normal and well-balanced life.

Under these three headings, the effective teaching of science may help improve the student's health, his wise use of leisure, good ethical standards, and fair manipulative skills as citizen.
A physicist or a chemist obtains first hand information to a great extent, from direct contact with materials, and is able to build up the subject matter from facts, obtained personally and verified. Repeated experiments – a test carried out under certain known conditions – time after time in search for a satisfactory explanation and varied experimental conditions to find the underlying relationship. Special attention is paid to the degree of accuracy and the methods of obtaining results. Indeed many of the discoveries are due to long and patient measurement with accurate instruments. Scientist discovers and formulates laws, and verifies assumptions by studying a small number of isolated substances under precise conditions in the laboratory. In doing so scientist devises experiments to test the hypothesis and to deduce general principles.

The main object of education is to prepare a young man for life. In fact, education is supposed to present a picture of the life so that the individual may learn to live successfully. Science, which has so much of importance in life, cannot be denied an important place in the school curriculum. According to (Rai 1990).

"The future can only be secured in the hands of a race of people who grasp the significance of changes, which scientific discovery has brought. No state man, Sociologist or Economist can afford to neglect them".
Not many years back that science was recognized to be one of the subjects in school curriculum. The realization by general public of the need for science to be taught in schools was due to so many advancements in the field of Science. Every country is trying to excel in new discoveries made during the last few decades. Whereas Huxley (1825-1895) suggested educational value of science, Faraday (1858) insisted upon cultivating scientific attitude, Spencer (1820-1903) believed that science ordered the life of man so that writings of these men were also influential. In this world of booming rockets, non-scientific attitude of mind is to be thrashed out and delicate minds of students should be inspired to appreciate the glories of science. The child should be able to acquaint with the surrounding complex world.

Chemistry is a link between physical and biological sciences. It helps man to produce food, aids in its protection, preservation, clothing, shelter, maintenance of health etc. The Scientific Policy Resolution of India (1956) stated. "The dominating feature of contemporary world is the intense cultivation of science on large scale and its application to meet the country's requirements".

Science is considered as an important subject in school curriculum because the man's future depends to a large extent on scientific advances and development of productive activity. There is great felt need to teach science.
The International Congress on Science and Technology Education convened by UNESCO (1981) made numerous recommendations for UNESCO's future role in this broad field of activity:

**Africa:** Twenty-one countries of the region provided the data. It was found that in ‘primary’ classes in most of these countries time was allotted for teaching of science. The time allotted per week varied from 1 hour to 4.5 hours. Most of the countries adopted integrated approach for teaching of science. In middle classes also science forms a part of the curriculum and in secondary classes general science is a permitted alternative to integrated science. General science includes topics from physics, chemistry and biology only, whereas integrated course includes elements of astronomy, geology, agricultural science, home science and economics in addition to physics, chemistry and biology.

**Arab States:** Ten countries of the region were surveyed. All countries put science firmly on time taste of all grades from 1 to 6. The time allotted per week for science varies, between 1 to 3.5 hours. At ‘intermediate’ and secondary level courses in integrated science are provided and for classes 7, 8, 9 generally 2 hours per week are allotted. In grades 10, 11 and 12 these are taught as separate subjects and 2 hours per week is allotted for each subject.
Asia and the Pacific: Seventeen countries of the region including India participated in the survey. In almost every country, a course in integrated science is the one most favored in the early secondary school years. Three traditional science disciplines—physics, chemistry, and biology—are almost invariably offered as optional courses during the late secondary school years.

In India, through the efforts of the National Council of Educational Research and Training (NCERT), science has been made a compulsory subject throughout the school stage. In this connection, it would be in our interest to consider the views of Kothari Commission (1966) and UNESCO’s International Commission (1972) on the development of education.

Views of Kothari Commission: Kothari Commission was given the task of suggesting necessary improvements in the educational system of the country. It worked during the years 1964-1966 and made a detailed study of the educational system in India. It suggested various changes for improvement of education in India. Here people should concentrate on the suggestions made by the commission about the science education. The commission suggested that great emphasis be laid on science education and that science be made a compulsory object of the school curriculum. Following lines from the commission report make the point clear.
"We lay great emphasis on making science an important element in the school curriculum. We therefore, recommend that science and mathematics should be taught on compulsory basis to all pupils as a part of general education during the first ten years of schooling. In addition there should be provision of special course in these subjects at the secondary stage, for students of more than average ability".

**UNESCO’s International Education Commission:** The recommendations made by UNESCO’s International Education Commission (1972) are quite similar to those made by Kothari Commission (1964-1966) in India.

Thus, the recommendations made by UNESCO’s International Commission about the teaching of science and technology are given here:

"Science and Technology must become essential components in any educational enterprise; they must be incorporated into all educational activity intended for children, young people and adults, in order to help the individual to control social energies as well as natural and productive ones – thereby achieving mastery over himself, his choices and actions – and finally, they must help man to acquire a scientific turn of mind so that he becomes able to promote science without being enslaved by it".
Furthermore this commission recommended that science be incorporated as a single science. In this respect the recommendation of the commission were:

"The natural science will one day incorporate the science of man, just as science of man will incorporate the natural sciences; there will be a single science".

Science is one of those human activities that man has created to gratify certain human needs and desires. Disinterested curiosity has been the greatest motive power of scientific research. The 'search of truth' became the dominant motive in the prosecution of science. It has been pursued for so many centuries and attracted ever-wider extent of attention of a very persisted group of people. Science is valued mostly for its practical advantages though it is also valued for gratifying disinterested curiosity and as an object of great aesthetic charm. It is quite obvious that the bulk of mankind value science chiefly for the practical advantages it brings with it.

A few decades back, science was given a step-motherly treatment and was considered to be a subject meant for less promising students, the more promising students were encouraged to study the Classics and Mathematics as being more worthy and suitable subjects. Science has now established it claim to be placed in the school curriculum. It has now been recognized as a
compulsory subject right from the Elementary stage and now one of the core subjects at Higher Secondary stage. It has taken a good many years of active and persistent effort to reach this position.

It will be futile to prepare separate case for the inclusion of science in the curriculum because the reasons for its inclusion are exactly the same as those for the inclusion of subjects other than science though it has been given a core place in the curriculum because of some special values provided by science only and not by any other subject. All the school subjects are taught because they provide a liberal education; they are part of the equipment and preparation for life, which is expected from the school to give to its pupils so that they may play their part in the community as intellectual citizens. Science takes its place side by side with other subjects as an essential element of one's education. It affords knowledge of certain facts and laws and an insight into methods and data peculiar to the domain of science. However, the inclusion of any subject in the curriculum should satisfy the intellectual, utilitarian, vocational, cultural, moral and aesthetic values. Besides these, the teaching of science imparts training in the 'Scientific method' and develop 'scientific attitude', which are very valuable and at the same time are transferable to other situations in life.
The rapid advancement of science and technology and increasing need for scientists and technologists have made it all the more important to provide for science based education in the schools. Vigorous methods for the cultivation and promotion of science should be adopted. The Secondary Education Commission has recommended that every secondary school pupil should study general science as a compulsory subject, to gain a basic quantum of scientific knowledge as a part of the general education. In addition, provision should be made for providing elective subjects in science for those students who want to pursue higher study.

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

The primary goal of education should be the intellectual development of the individual. With its accelerating importance in our society science has become an increasingly important part of general knowledge. Scientific education is best fostered as a part of a general emphasis on intellectual activity.

Science has now become a compulsory subject in the school curriculum because of its multifarious value to the individual as well as the society.
1.4 Objectives of Teaching Physics

The objectives of good science teaching as designed by Thomson (2001) in his report on the position of natural science in the educational system of Great Britain is two-fold:

1) It should train the mind of the student to reason about things observed, and develop his powers of weighing and interpreting evidence.

2) It should also make him acquainted with the broad outlines of great scientific principles with the ways. These are exemplified in familiar phenomena and with their application to new situations for the service of man.

The National Science Teachers Association (1961) Washington, USA presented the following objectives,

1) To develop basic knowledge of the nature of the scientific enterprise.

2) To increase in the mathematical, observational and experimental skills.

3) To develop understandings related to the interrelations of science and society.

4) To increase understanding of concepts and theories, which describe and unify the fields of science.
The general objectives of science education at middle stage may be stated as follows:

1. The child should be able to apply the knowledge of science in everyday life.
2. The child should be able to investigate new knowledge in the field of science.
3. The child should develop scientific attitudes.
4. The child should learn how to learn a part of scientific knowledge on his own.
5. The child should be able to solve surrounding problems around him.
6. To make the child creative.
7. To brain the child in science processes.

1. **Intellectual Value:** The great value of science is that it has introduced new ways of thinking and reasoning. The chief part played by science in helping to develop consciousness of man is to be found in the new thoughts to think about. Increase in consciousness appears to have been one of the purposes of evolution. Certainly the most significant factor in the development from amoeba to man seems to have been the increase in consciousness. Huxley’s (1825-1895) statement, that scientific thinking is “organized common sense”, is applicable to all the life situations. The great merit of Einstein’s Theory, for
example, is that it has enriched our consciousness by making us acquainted with a new and a valuable way of thinking. Knowledge for the sake of knowledge; as the history of science proves, is an aim which is unquestionable. The mere fact that science does, to a great extent, gratify the intellectual universe occupied by man. And it is quite obvious that the study of science has given us a real insight of man and the things around. Science has its own discipline. It sharpens our intellect and makes us intellectually honest, critical in observation and reasoning. It teaches to arrive at conclusions without any emotional bias or prejudice.

2. Utilitarian Value: The utilitarian value of science need not be emphasized. Man is living in an age of science and technology. Right from the cradle to the grave, all our activities are controlled and fashioned by science. Science has entered in our life and daily activities so much that the existence would become impossible without it. Its achievements in almost all spheres are marvelous. There is a vast storehouse of natural power, such as the wind, waterfall, heat of the sun, etc., which science can show how to harness for the relief of human drudgery and for raising the standard of living.

Man is no longer the helpless toy of the forces of nature. Scientists unveil the curtain of nature and peep into its mysteries. Science has wrested from nature almost all the hidden treasures. It has restored eyes to the blind,
hearing to the deaf, legs to the lame, may even life to dead, so to say. It has found out ways of health. Atomic energy, such as radioactive isotopes, helps to improve crop and increase food production. By finding out new ways of hybridization, science has helped to improve the quality as well as quantity of animals and plants, thereby putting up a better standard of living. Its achievements in almost all spheres know no boundaries. Just look around to see that man is somehow or the other connected with science.

Mankind is living in an atomic age. "Atomic Age", says Ex-president Truman of America "will either be one of complete devastation or one in which new resources of power will lighten the burden of mankind". But it is a sad commentary that the energy of the scientists today is being channelized, probably by the politicians, to find out the weapons of death. Today that country is thought to be powerful which has the weapons that can kill millions of people in a second and destroy the property. They say, when the advance of destructive weapons enables everyone to kill everyone else on one will want to kill anyone at all. And thus there will be peace all over the world. It is pleasant thought but it is only a thought. "Everything depends upon the mind of man, the divine man or the devil man. It is for the man to decide whether he will kill himself or build himself with the atom bomb".

25
Taking into consideration both the aspects of science, it is, however, essential for everybody to know about the achievements of science and its impact, on the society, how to realize the gifts of science to achieve one's own ends to make life more comfortable and to raise the standard of living. So it is very essential to have some elementary knowledge of science at least, for becoming a useful member of the community. To raise the standard of living in any country; two things are needed – scientific knowledge, and a population sufficiently educated to understand how to apply it to everyday life.

3. Vocational Value: The study of science is an ‘Open Sesame’ for a number of professions. It forms the basis of so many studies, which are purely vocational in nature, for example, a student of science can choose medical, engineering, agriculture or any other profession in which is interested in and fit for. It has solved the problems of leisure. The study of science at school forms the basis of many useful hobbies and other productive activities in the later life of the students.

4. Cultural Value: Science has played an important role in determining the culture and civilization of a country from time to time. It has affected the way of thinking and way of living. The effect of science is multifarious. It has a direct influence in dispelling many traditional beliefs, and the adoption of other suggested by the success of scientific method. Then as a consequence of
new techniques of science the social organizations have been amply changed
which are gradually bringing about corresponding political changes. What is
more? The new control of science over the environments is bringing up a new
philosophy involving a changed conception of man's place in the universe.

The cultural aspect of science should be fully appreciated by science
students. Science has aided the growth of consciousness by making man more
aware of the universe lived in and more so by heightening the intellectual
discrimination just as a work of art can be valued for its effect in refining and
subtilizing the emotions.

Science has its own literature, which makes an appeal in no way less
powerful and elevating than the humanistic studies. The history of scientific
development, the thrilling adventures of scientists and their disinterested
curiosity in finding out the mysteries of the universe, their spirit of sacrifice
etc., exalt science to a position higher than the humanistic studies.

Through the practical applications of scientific discovery our civilization
is undergoing constant change. In turn, these changes bring about situations,
which threaten the well being of future generations. Welfare of the civilization
is now almost wholly dependent upon scientific progress. Society must
respond with adequate and intelligent control. The scientists take an equally
responsible part in the vital issues of the country so as to bring about
consideration and integration of scientific developments and the cultural heritage.

"If Science is to be pursued with full vigour and zest and is to become a mighty force in the Indian renaissance, it must drive its 'nourishment' from our cultural and spiritual heritage and not bypass it. Science must become an integral part of our cultural and spiritual heritage". Report of Indian Education Commission (1968)

5. **Moral Value**: Of the great values that condition human activities and make out lives worth living – Goodness, Beauty and Truth, the man of science is mainly concerned with the disinterested passion of truth. Though comparatively, in the daily activities of mankind, that is the most unpopular of virtues yet it plays an important role in science. The reason most obviously is that science is an activity where truthfulness is the most essential condition for success, where success is not possible on any other terms. A scientific man who misrepresents the observations or deliberately makes fictitious arguments to reach a false conclusion would merely be deceiving as a scientific man. It would not be prosecuting science but will be wasting the time and energy for nothing. Generalizations by concocted arguments and false observations will not stand the test of the time for long and will stand rejected. But on the other hand, a businessman may become rich by concealment, smuggling,
misrepresentation of things and such other false and stupid means. A politician, by giving the real picture of things and by sticking to the mock standard at the time of election, may not stimulate that degree of conviction and moral favour which is necessary to sway large audience. And an advocate who should have high morality and love for truth in order to save innocent from the pangs of punishment, may not have a very successful career. But all this does not mean that scientific men invariably speak the truth about their science. Men of science have been known to lie, not in order to serve science but usually, religious or anti-religious prejudices, while aiming at different type of success.

When a scientific theory has a religious, philosophic or any other kind of human interest, it no longer remains the disinterested passion for truth. The Copernican Theory and the Darwinian theory gives sufficient evidence of this. However, the moral integrity manifested in scientific work is due to the nature of the subject matter. Science is truthful because it has practically no superb moral standard, but the value of the example to the rest of mankind is limited by the fact that in work, the scientist is not a perfect man – but only a seeker of truth.

6. Aesthetic Value: To a layman, science is important chiefly because of its practical application and having no aesthetic charm. But on the other hand it
is the most important consideration with all scientific men for it meets one of the deepest needs of human nature which manifests itself as the desire for beauty. It is in the aesthetic aspect that the whole charm of science lays. To a man of science, practical application is just a by-product of the autonomous activity. The scientist feels an intrinsic charm in revealing the harmony of nature. The search for universal laws and comprehensive theories are undoubtedly the manifestation of the aesthetic motive is very apparent and many of them have written about their work in a sort of prose, poetry, and the satisfaction they get from it seems indistinguishable from those of an artist. Henry Poincare (1879) and others have gone so far to say that actual solution of the problem interests them much less than the beauty of the method by which they found the solution.

Nature exhibits an order, which is governed by general laws that can be understood. Had nature not possessed a harmony that was beautiful to contemplate, science would not have been worth pursuing. "You are young, I am old.\textquotedblright, wrote Faraday to Tyndall (1820=1893) , "but then our subjects are so glorious that to work at them rejoices and encourages the feeblest, delights and enchants the strongest". In different fields of science all the great advances have come from the desire to unveil what Einstein calls "the pre-established harmony".
Again, to a great man of science, science is an art and creation is no less a work of art because it is but a faint and incomplete copy of the supreme work of art which is nature itself. Fundamentally there is no difference between art and science; the difference is only in degree. A work of art aims more consciously and deliberately at beauty than does the scientific theory. On the other hand, science seeks after truth. Yet here are some works of art for example in literature and painting where truthfulness is relevant. And it is also true that no scientific theory has been constructed in complete absence of aesthetic consideration. It is here holds good the appropriate saying of Keat's that "Truth is Beauty". In nature, everywhere one comes across what Einstein calls "pre-established harmonies," which is beautiful, and the discovery of such harmonies is the concern of science. So, once again there is a compromise between the artist and the man of science or in other words science and art are basically the same.

Apart from the earlier-mentioned values, which are found in almost all subjects, the training in the scientific method and scientific attitudes are specific to science and which are transferable to other life situations.

7. Training in the Scientific Method: The study of science trains the students in attacking the problem according to a certain definite and distinct procedure, which is called as the Scientific Method. This training, which is received in
studying science, can be applied to solve other problems arising in new situations. In brief, scientific method involves the following steps:

(i) Making an accurate survey of the problem.
(ii) Setting up the method of attacking the problem.
(iii) Collecting data regarding the problem.
(iv) Drawing conclusions from the collected data.

It is due to this scientific method of attacking a problem that has achieved wonders in all the fields of human activity.

8. Development of Scientific Attitudes: This is the second value monopolised by science, which is transferable. The attitudes of a scientist involve critical observation, open-mindedness, suspended judgment, free from superstition and false belief. The attitude once developed in the student proves useful in later life of the child.

Apart from this the teaching of science is based on sound psychological footing. The principle of activity is the main basis of the teaching of science and satisfies the instincts of curiosity, creativeness, self-assertion, and self-expression etc., of the pupils.

Thus, it is quite clear from this discourse that a subject, which is so valuable and psychologically based and so closely connected with our daily life, is justified to be included in the curriculum.
Science is the result of an intense struggle of human intellect and has wrested from nature not only her secrets but processes also, which underlie them. It has emerged as almost a decisive force and its role in education needs to be adequately understood.

The ‘All India Seminar on the Teaching of Science in Secondary Schools’ (1956), has stated the aims of teaching general science in Secondary Schools as:

1) To familiarize the pupil with the world in which man lives and to make him understand the impact of science on society so as to enable him to adjust himself to his environment.

2) To acquaint him with the ‘scientific method’ and to enable him to develop the ‘scientific attitude’.

3) To give the pupil a historical perspective so that man may understand the evolution of scientific development.

The Directorate of Extension Programmes for Secondary Education, Government of India, in its brochure on ‘Evaluation in General Science’ sets some of the objectives of teaching general science in secondary schools as follows:
1. The pupils studying general science should acquire knowledge of the fundamentals of science useful to all in everyday life.

2. They should develop the ability to apply the knowledge in everyday life.

3. They should acquire experimental skills such as: (a) handling apparatus and instruments; (b) arranging apparatus for an experiment; and (c) preserving apparatus, chemicals, specimens, models, etc.

4. They should acquire constructional skills such as: (a) improving simple instruments and appliances; and (b) repairing certain instruments and appliances of everyday use.

5. They should develop drawing skills such as: (a) drawing and sketching certain objects, instruments and arrangements; and (b) photography in certain objects and specimens.

6. They should be able to locate reliable and recent information from appropriate sources.

7. They should be able to interpret scientific data given in various forms such as tabular, graphical, scientific, etc.

8. They should develop the power of minute observation of their surroundings.

9. They should develop the power of oral expression in science to discuss, argue, describe and raise questions, using scientific terminology.
10. They should develop the scientific method in thinking and action.

11. They should adopt the scientific attitude in making statements, accepting information and forming beliefs.

12. They should develop interest in scientific reading and hobbies.

13. They should be able to appreciate the impact of science on life, both personal and social, the struggle through which science has advanced, and the inspiring work of the scientists.

The following similar set of objectives was formulated by the principals of Delhi Higher Secondary Schools in the third summer camp organized by the Extension Department of the Central Institute of Education, Delhi.

1) To develop in the student a scientific attitude.

2) To develop in the student critical thinking.

3) To enable the student to acquire the fundamentals of scientific method.

4) To enable the student to be creative.

5) To develop in the student skill in laboratory techniques.

6) To develop in the student the ability to apply scientific knowledge and principles to problems of everyday life and new situations.

7) To enable the student to comprehend scientific terms, concepts, symbols, various tables and their uses.
8) To enable the student to construct and interpret graphs, diagrams and models.

9) To enable the student to collect and interpret data for the solution of problems.

10) To enable the student to be familiar with the natural resources of his environment and their uses.

11) To enable the student to be familiar with the trends in modern science.

12) To enable the student to appreciate the beauty and order in nature.

The "All India Seminar on Teaching of Science in Secondary Schools" organized by All India Council for Secondary Education, Taradevi (1956) gave details of the aims of science teaching at different stages of education. These may be summarized as follows:

a) At the primary level of school education, the aims of science teaching should be to arouse and sustain the learners' interest in nature and in their physical and social environment. Through learning science, the pupils should develop love for nature and observe the things in nature. Science teaching should inculcate the habits of healthy living, cleanliness and orderly behavior. It should arouse curiosity and develop in the pupils' habit of observation, exploration and systematic thinking.
Science learning should also develop their manipulative and creative abilities.

b) At the middle level, in addition to the above, the pupils should acquire clear information of nature and its events so that this knowledge serves as a basis for learning general science course at the secondary stage. They should develop the ability for generalization and an understanding of the application of science in everyday life. Science teaching at this stage should aim at inspiring the pupils through the stories of the lives and achievements of the scientists. They should be able to see the impact of science on the individual and social living and also develop interest in pursuing scientific hobbies.

c) At the high and higher secondary stage, the pupils should be able to understand and realize the impact of science on society and also learn to adjust to the environment. The most important aim is that in addition to acquiring knowledge of science, they should develop a scientific attitude in them and receive training in scientific method. At this stage, they should be familiar with the historical perspective of the evolution of science and its later developments.
1.5 Problems of Science Teaching and Learning

Science has a very important role to play in teaching and learning of education, life and research. It has a dynamic approach to its teaching and learning.

As per the recommendation of the Secondary Education Commission (1952-53), the general science occupied a critical position in the secondary school syllabus. It was required of all the students. It was thought that it might be the only science discipline that the students would take during their schooling as it (general science) determined the attitude that many students develop towards science. A course like General science has a broad scope and could be applied to broader horizon of interests. It is not necessary that a General science course should touch upon all the aspects of sciences. General science is "general" because it is free from the traditional boundaries of various areas of science. Some teachers, however, emphasize the exploratory function of general science, presenting sampling of various specialized sciences loosely tied together. There are other teachers, who emphasize the preparatory functions of general science i.e., building a course content from the introductory phases of Physics, Chemistry, Biology, Geology and Astronomy.

A study by Hunter and Knapp (1930) showed that science teachers were thinking in terms of the development of interests, desirable attitudes and
certain general stills. Some still thinking of preparatory functions and giving an understanding and an interest in the environment.

In Hunter (1932) stated, “These generalizations completely leave out applications of science to the lives of children, no reference to health or citizenship objectives as such being found. Intellectual objectives hold complete domination over practical ones”. Despite these objection, general science continued to be dominated in American schools.

“Science describes the world as it is; technology remakes the world to serve human needs”.

The broadened concept of science and society relates the achievements of science to human welfare and to human values, blending and integrating in disciplines. This couples science to operational applications within our society by using its concepts to attack persistent problems of human experience and stressing its potential for improving the “quality of living”. This goal changes forms of the established laws and concepts of science.

Science is known to most people because of its applications, not its theories. The technological innovations derived from science determine the character of a society or culture. Technology influences directly or indirectly man’s outlook towards life, expands the needs and wants, stimulates political
or economic change and forces the man to adapt fast and faster to remain current with civilization. Technology serves as a bridge between science and society. It unifies the various disciplines. It puts scientific concepts where the students confront them in everyday affairs.

The learning processes, which are the presumed object of research, are reached only through a series of inferences. Current preoccupation with deductive systems reflects this state of science. Recent improvements in the condition, which control behavior in the field of learning, are of two principal sorts. The Law of Effect has been taken seriously; it is made sure that effects do occur and that they occur under conditions, which are optimal for producing the changes, called learning. Once the particular type of consequence called reinforcement, the techniques permit man to shape up the behavior of an organism is arranged almost at will.

Extremely complex performances may be reached through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behavior. The results are often quite dramatic. In such a demonstration one can see learning taking place. A significant change in behavior is often obvious as the result of a single reinforcement. A second important advance in technique permits to maintain behavior in given states of strength for long periods of time.
Reinforcement continues to be important, of course, long after an organism has learned how to do something, long after it has acquired behavior. It is necessary to maintain the behavior in strength.

It is also important to note that through a gradual advance to complex interrelations among responses, the same degree of rigour is being extended to behavior, which would usually be assigned to such fields as perception, thinking, and personality dynamics. From this exciting prospect of an advancing science of leaning, it is a great shock to turn to that branch of technology, which is most directly concerned with the learning process—education.

There would be no point in urging these objections if improvement were impossible. But the advances, which have recently been made in the control of the learning process, suggests a thorough revision of classroom practice and, fortunately, they tell as to how the revision can be brought about. This is not, of course, the first time that the results of an experimental science have been brought to bear upon the practical problems of education. The modern classroom does not, however, offer much evidence that research in the field of learning has been respected or used. This condition is no doubt partly due to the limitations of earlier research. But it has been encouraged by
a too hasty conclusion that the laboratory study of learning is inherently limited because it cannot take into account the realities of the classroom.

In the light of the increasing knowledge of the learning process it should be insisted upon to deal with those realities and forcing a substantial change in them. Education is perhaps the most important branch of scientific technology. It deeply affects the lives of all. No longer the exigencies of a practical situation be allowed to suppress the tremendous improvements, which are within reach. The practical situation must be changed. There are certain questions, which have to be answered in turning to the study of any new organism. What behavior is to be set up? What reinforces are at hand? What responses are available in embarking upon a programme of progressive approximation, which will lead to, the final form of the behavior? How can reinforcements be most efficiently scheduled to maintain the behavior in strength?

Children play for hours with mechanical toys, paints, scissors and paper, noisemakers, puzzles-in-short, with almost anything, which feeds back significant changes in the environment and is reasonably free of aversive properties. The sheer control of nature is itself reinforcing. This effect is not evident in the modern school because it is masked by the emotional responses generated by aversive control. It is true that automatic reinforcement from the
manipulation of the environment is probably only a mild reinforce and may need to be carefully nurtured, but one of the most striking principles to emerge from recent research is that the net amount of reinforcement is of little significance.

A very slight reinforcement may be tremendously effective in controlling behavior if it is wisely used. If the natural reinforcement inherent in the subject matter is not enough, other reinforces must be employed. Even in school the child is occasionally permitted to do "what it wants to do", and access to reinforcements of many sorts may be made contingent upon the more immediate consequences of the behavior to be established.

There is more important work to be done in which the teacher's relations to the pupil cannot be duplicated by a mechanical device. Instrumental help would merely improve these relations. One might say that the main trouble with education in the lower grades today is that the child is obviously not competent and knows it and that the teacher is unable to do anything about it and knows that, too. If the advances which have recently been made in our control of behavior can give the child a genuine competence in reading, writing, spelling, and arithmetic, then the teacher may begin to function not in lieu of a cheap machine, but through intellectual, cultural, and emotional contacts of that distinctive sort which testify the status as a human
Another possible objection is that mechanized instruction will mean technological unemployment.

There is no need not worry about this until there are enough teachers to go around and until the hours and energy demanded of the teacher are comparable to those in other fields of employment. Mechanical devices will eliminate the more tiresome labours of the teacher but they will not necessarily shorten the time during which a teacher remains in contact with the pupil. A more practical objection: Can we afford to mechanize our schools? The answer is clearly yes.

World is on the threshold of an exciting and revolutionary period, in which the scientific study of man will be put to work in man's best interests. Education must play its part. It must accept the fact that a sweeping revision of educational practices is possible and inevitable.

Good teaching occurs when students teach the subject that is to be taught and desire to learn much more about the subject. Another characteristic of good teaching is that it is something an individual does, and although any individual may be a good teacher in a given situation with a given student, but may fail miserably in another situation with the same student. Teachers, of course, have twenty-five or more students at one time, not one. To be a good teacher the individual must be able to deal effectively with most of the
students be able to determine when and whom to communicate, and like a good practitioner of general medicine, identify students with symptoms, define and treat on direct them to the appropriate specialist. Becoming a good teacher, although difficult, is not an impossible task for most college graduates who are willing to make a concerted effort towards achieving this goal.

Descriptions of what good and bad teachers can do, have done, should do, or should have done could continue indefinitely. Instead of providing training on how to become a more effective teacher, these descriptions tend to promulgate the status quo. Furthermore, relying on descriptions of how others have or should have proceeded does not specifically indicate how a different individual should teach in a different situation. It is not that carefully observing others may not be helpful. Observing a skilled teacher can be useful to individuals desiring to become excellent teachers, but like any expert advice it should be a guide to, but never a substitute for, one's own thinking. Simply stated, carbon copies are never as clear as the original.

The truly effective teacher will view each teaching situation as a new problem demanding an original and unique teaching strategy. The individual teacher must design or select each strategy employed in instruction, and each design or selection should be based on the interpretation of what man thinks will constitute effective instruction for the particular population. The individual
interpretation should, whenever possible, be based on empirical evidence, past experience, and extensive knowledge of methods and materials.

An instructional strategy is defined as something a teacher arranges that is designed to establish interaction between the teacher, the students, the subject matter, or any combination of these three dimensions. As a selector of instructional strategies, the effective teacher will:

1. Plan to influence directly or indirectly the learning process by varying one’s behaviour
2. Tailor the subject matter to meet the needs and interests of each individual
3. Arrange a variety as media, including books, lecture notes, homework, visual aids, programmes, discussions and laboratory experiences.

1.6 Need and Importance of the Present Study

Science education occupies a very eminent place in curriculum both at school and university stages of education in India. Continuous advances in scientific and technological researches have led to growth and greater application of science in contemporary societies. Accordingly science becomes a priority subject. The important branches of science include Physics. It has an important role in the intellectual development of secondary school pupils.
The importance of academic achievement has raised several important questions for education and researchers. What factors promote achievement in students? How far do the different factors contribute to academic achievement? Many factors have been hypothesized and researched. The factors affecting can be summarized as follows:

1. Student characteristics like cognitive style, intelligence, attitude, aptitude, motivation, interest, and career aspiration.

2. School environment covering classroom environment, peer interaction type of curriculum and co-curricular activities provided in school, teacher pupil relationships, attitude of parents' attitude towards education.

3. Socio-familial characteristics like parent's income, cultural level, and home environment for study and parental aspiration.

The said conditions can be visualized as the input variables and the academic performance and overall development of student can be conceptualized as output.

A wide range of individual differences exists at any given age level of pupils. Children vary not only in their ability to learn and their level of achievement, but also in how they learn. Research evidences show that learning has a cognitive content and therefore, the level of cognition may
differ in different learners in varied academic tasks. Each child evolves a personal way of processing information and learning concepts that is each child perceives, thinks, remembers and solves problems according to one's own unique style. In this regard the role of 'Cognitive Style' is important. Cognitive styles are 'characteristic sets, consistent mode of functioning which individuals, show in their perceptual and intellectual activities' (Witkin et al., 1977). Whether the student is field-independent or field-dependent has a direct bearing on the way by which a student attacks a learning task.

Students cognitive processing during teaching consists of reciprocal interactions among their cognitive processing system on the one hand and curriculum and instructional cues on the other. Genetic factors school environment factors and social factors have been suggested as contributing to the origin and development of a cognitive style.

Research reports reveal that cognitive styles and academic achievement are related. Briel (1978), Sharma and Ahuja (1972), Faugua (1990), Verma and Sheikh (1993) examined the relationship between cognitive styles and scholastic achievement and found it significant. From this review the investigator selected cognitive style as one of the major independent variable for the present investigation. The effectiveness of classroom teaching will depend not only on the efficiency of the teacher and nature of teaching.
material but also on classroom environment and other special characteristics of the learner.

The central assumption in Piaget's (1967) analysis of cognitive change was his belief that development depends upon a continuous interaction between organism and environment, and interaction which involves, on the one hand, environmental forces (people, objects, events) acting upon the child, and on the other hand, the child acting selectively upon the environment. Research findings show that the factors related to classroom environment also influence the child's social and education development. The setup of the classroom, the relation with other children, formal and informal interaction of the child and the teacher, all these have certain impact. Classroom environment prevailing in a classroom when the process of teaching learning takes place. This includes the emotional, physical and intellectual climate set up by the teacher and students to create a wholesome learning situation.

Research evidence show that classroom environment and achievement and achievement were closely related Puri (1977), Christian (1984), Mianov (1991), Raymond and Jeffery studied classroom environment and its relationship with achievement. They found significant relationship, which promoted the investigator to select cognitive style and classroom environment as independent variables for the present study.
There is a widespread belief especially in India that it is undesirable for mothers to take up work outside home. The reason pointed out is that it will impair the proper physical, social, emotional and intellectual development of the child. Increase in material employment is significantly changing the quality and degree of affective interaction in the mother adolescent dyad. The adaptive changes in the family due to maternal employment have brought about modifications in child rearing and socialization process (Sinha, 1988). Most of the studies on maternal employment deal with comparison of child outcomes of working and non-working mothers. But as Hoffman (1989), Rothman (1993) and Smith (1994) argue maternal employment precise is not the major issue in child development rather the circumstances of the family, the attitudes and expectations of parents, the distribution of time available, the type of child care etc., have important effects. These aspects greatly contribute to the development of affective behaviors such as emotional adjustment and achievement motivation, which in turn are highly correlated with academic achievement.

Family is found to be the most important socio-cultural unit that effects adolescents achievement motivation (Castnell, 1984) and its roots are traced to the independent training given to children by parents (Atkinson and Raynor, 1974; Ojha, 1984). Employed mothers have been found to be encouraging independence training in children of all ages (Birubaum, 1971). Research
conducted by Powell (1963), Jones and Coworkers (1967) revealed higher achievement motivation in children of working mothers than in children of non-working mothers.

Physics plays an important role in the intellectual development of the child. A brief overview of related studies reveal that research on achievement in Physics has not yet come up to expected number as in the developed countries. The investigator therefore made an attempt to study the effect of cognitive style, classroom environment and achievement motivation on achievement in Physics of secondary school pupils.

1.7 Statement of the Problem

The problem selected for the present investigation is stated below: "Relationship Among Cognitive Style, Classroom Environment, Achievement Motivation and Achievement in Physics of Secondary School Pupils".

1.8 Objectives of the Study

The present study has been undertaken with the following objectives.

1) To construct and standardize a test in Physics for X standard pupils studying in Belgaum District of Karnataka State.
2) To find out the relationship between achievement in Physics and (a) Cognitive Style (b) Achievement Motivation (c) Classroom Environment.

3) To study the significance of difference in achievement in Physics of X standard pupils when they are classified according to sex.

4) To study the significance of difference in achievement in Physics of X standard pupils when they are classified according to the medium of instruction.

5) To study the significance of difference in achievement in Physics of X standard pupils when they are classified according to the type of management of the school.

6) To study the correlation between the Cognitive style and the following variables.
   a) Classroom Environment.
   b) Achievement Motivation.

7) To study the correlation between the Classroom environment and Achievement Motivation.

8) To study the main effects of independent variables, that is Cognitive style, Classroom environment and Achievement motivation on achievement in Physics of X standard pupils.
9) To study the interaction effect of independent variables, that is Cognitive Style, Classroom Environment and achievement Motivation on Achievement in Physics of X standard pupils.

1.9 Operational Definitions of Terms

Some of key terms used in the study are explained below.

1) **Standardized Test**: Harold (1945), "Standardization means the process of collecting and checking the content empirically, establishing the norms, developing uniform methods of administering and scoring with a relatively high degree of objectivity". Standardized test is one which has been constructed in accordance with detailed specifications one for which the items have been selected after the try out of appropriateness in difficulty and discriminating power which is accompanied by a manual giving definite direction for uniform administration and scoring, and one which is provided with relevant and dependable norms for score interpretations. Standardized tests are cordially constructed by the test specialists, with the advice of competent teachers and are offered for sale by test publishers.

2) **Standard X**: It is the last division of the three-year secondary stage of education in Karnataka, which starts with Standard VIII and ends in Standard X.
3) **Gender**: It is considered as one of the moderator variables. In the present study the term gender refers to the sex of students.

4) **Medium of Instruction**: The language, through which the non-language subjects are taught, is referred to as the medium of instruction. In this study English and Kannada are the two media of instruction considered. The purpose of the present study was to investigate the effect of medium of instruction on the achievement in physics of X standard pupils.

5) **Types of Management**: Among different types of schools, the researcher in the present study considered the following three types of management of schools. They are:

   i. Government/Corporation

   ii. Private Aided

   iii. Private Unaided

   i) **Government/Corporation High Schools**: These are the secondary schools run by the state government or the schools run by city corporation.

   ii) **Private Aided High Schools**: These refer to the secondary schools run by private management, missionaries, and other religious bodies which receive the grant-in-aid from the state government.
iii) **Private Unaided High Schools:** Secondary schools run by private management, missionaries, and other religious bodies, which do not receive grant-in-aid from the state government.

### 1.10 Limitations of the Study

The study has certain limitations. They are:

1. The present study is limited to X standard pupils studying in Belgaum District only.
2. The study is limited to X standard pupils studying in a few areas of Belgaum District.
3. The factors like intelligence, biographical factors, socio-economic status, birth, order, aptitude, interest, etc., have not been included in the study.
4. The study is restricted to 600 boys and girls studying in X standard.
5. Instructional objectives included in achievement test in physics are related to cognitive domain of 'Bloom’s Taxonomy'. The other two domains affective and psychomotor are not measured by the test.

### 1.11 Overall View of the Study

The First chapter deals with the importance of physics (science), place of physics in secondary school curriculum, objectives of teaching physics, problems of teaching and learning physics, definitions of variables, need and
importance of the study, title, objectives, operational definitions of terms and limitations of the study.

In the second chapter the researcher discusses conceptual framework of the study.

In the third chapter the researcher discusses the importance of review of related literature, reviews related to cognitive style and achievement in physics, reviews related to classroom environment and achievement in physics, reviews related to achievement motivation and achievement in physics, and review related to achievement in physics and other variables.

The fourth chapter deals with variables selected for the study, hypotheses, methodology employed, tools used for the collection of data, sampling procedure and collection of the data.

The fifth chapter deals with data analyses and results. Differential Correlational and Multiple regression analyses are used here.

The sixth chapter deals with the summary and conclusions of the study.