CHAPTER I
CHAPTER-I
INTRODUCTION

Right from the beginning a child acts with curiosity to know about living things and his interest in them is spontaneous and natural. No sound educational system can afford to ignore and neglect curiosities and interests of children in their environment. In the light of this fact, science education in schools can never be overlooked. Besides this, it should not be forgotten that the primary aim of science, apart from the satisfaction of intellectual curiosity, is the survival and welfare of man. Nothing has contributed more to human welfare and to the very emergence of man from his animal behaviour than the knowledge of sciences.

Presently, scientific literacy has become an educational necessity for survival of man in the modern technological society. As we approach the 21st century, science must be accepted as a core school subject and it must be taught in an understandable fashion to all students. There are many issues which require our attention for their solution in a democratic society. Some of the major issues of current importance are: population growth, environmental problems, need of modern business and industries for scientifically literates in the increasingly technological society competing for world markets and development of scientific attitude among children.

1.1 MEANING OF SCIENCE

The curiosity of man to know about nature and to unveil its mysteries led to the establishment of certain knowledge based upon facts.
Genius persons, by their persistent efforts, careful experimentation and exact reasoning have collected a mass of scientific informations.

In the words of James B. Conant (1957), “Science is an interconnected series of concepts and conceptual schemes that have developed as a result of experimentation and observation and fruitful for the experimentation and observation”.

According to Frederick (1960), “Science is a cumulative and endless series of empirical observations which results in the formation of concepts and theories, with both concepts and theories being subject to modification in the light of further empirical observations. Science is both a body of knowledge and the process of acquiring it”.

According to Vashista and Gill (1987) the word Science is derived from the Latin word ‘Scientia’ which means knowledge. Thus knowledge is acquired by the scientific method or the procedure of science. Science may be defined as knowledge, which is generally accepted because it has been proved to be true and which has been classified and arranged so as to demonstrate general truths or the operation of natural laws.

From the above definitions three basic principles of the nature of science can be identified:
1. An accumulated and systematized body of knowledge.
2. The scientific method of inquiry.
3. The scientific attitudes

The first point indicates the product of science while second and third points indicates the process of science. In other words, science is both a product and process.
Henri (1947) explains the idea this way “Science is built of facts as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones”. The true nature of science is revealed more in the way it is sought rather that what is found, although the two efforts cannot be truly separated. In another way, it could be said that science is more a verb than it is a noun. Science is the cyclic enterprise consisting of the formulations of model of explanation from facts which in turn predicts the occurrence of unsuspected facts. If these new facts are indeed found, the value of the model is increased. If the facts are not found, the model is changed and a new model is suggested to predict new facts and so on.

Science is also defined as “Science is what scientists do”. In order to understand this definition of science, we have to understand how scientists work. There are at least three basic things that scientists do. These are:

1. **Scientists make descriptions**

   Scientists always search for the answer to questions such as what is the universe? How many? How much? How long? How frequently? etc. by using scientific method. The descriptions made by one scientist on the basis of his observations and critical thinking are open to verification and change by other scientists.

2. **Scientists make explanations**

   Scientists after having described an event or a phenomenon, attempt to find out the ‘reason’ or ‘why’ such event and phenomenon occur the way they do.
3. Scientists make predictions

Extending our knowledge to new situations involves prediction. Making use of a concept of generalizations or law in a situation which has not yet been tested involves predictions. Thus the scientists use ideas of their own and of others as tools for testing and gaining knowledge. They use many resources to get valid answers to their questions and problems. They design their own experiments and invent new tools with which they observe and check phenomenon. In other words science can be defined as “the process by which we increase and refine understanding of ourselves and of the universe through continuous observations, experimentations, application and verification”.

So we conclude that science prefers problems where variables can be rigidly controlled, science is able to win wide and almost universal support for its conclusions and in reaching the prized advantage of reliability and objectivity.

1.2 ATTITUDES

Attitudes are important keys in understanding the long range organization of behaviour. The prominent role of attitudes in determining our thought, memory and learning processes has been recognized by various psychologists. Good (1973) said that, “attitude is readiness to react towards or against some situation, person or thing or resentment to a particular degree of intensity”.

Attitude is a specific mental state of the individual towards something according to which his behaviour towards it is moulded. Allport (1935) has defined an attitude as a “mental and neural state of readiness
Attitude results from personal desires and group stimulation. They actually are a part of individual’s own personality. An attitude is a complex affair which cannot be wholly described by any single definition. Thurstone and Chave (1929) believe that “attitude is complex of man’s inclinations, feelings, bias, ideas, fear, threats etc. Opinion is verbal expression of attitude. Some attitudes are so deeply ingrained as to appear permanent, while others are nearly transitory and may change overnight”.

According to Crow and Crow (1991), “Attitudes are personal and related to feelings of a person”. Attitudes are uniquely organized in each person. Like other aspects of personality, attitudes are acquired and not innate. No one is born with an attitude; they are learned in a culture in course of individual’s development. Attitudes can exert a potent influence on an individual. They act as cause as well as results of behaviour. They represent the way one feels or thinks, acts or talks in a situation. In simple words, it can be summed up as”.

a) Attitudes underlie many of the significant and dramatic instances of man’s behaviour.
b) Attitudes when fully developed function as internal frame of references.
c) Attitudes work as state of readiness for motive arousal.
d) Attitudes serve as fabric for the philosophy of life.
e) Attitudes give continuity to human personality. Human existence is not conceivable without them.
f) Attitudes give meaning to one’s daily perception and activities.
Kuppuswamy (1993) made an analysis of attitudes and revealed that they have four dimensions – direction, intensity, extension and duration. The direction of an attitude is either positive or negative, i.e. for or against some object or value. This is the aspect of the attitude which is usually measured. The intensity of a positive or negative attitude is the degree to which it motivates the person’s behaviour towards the activity component. People who are strongly in favour or strongly opposed to a certain object naturally have more intensity than those closer to the center of the continuum. The extension of an attitude is the degree to which it is generalized or the number of cases it covers. The duration of an attitude is a length of time it endures. These dimensions can be discussed as follows.

**Dimensions of an Attitude**

Attitude have four dimensions: intensity, direction, extensity and duration. Each of these aspects is important in understanding attitudes and their influence upon behaviour. Assessment of these characteristics is done most frequently by observations of behaviour, but attempts have been made to develop tests to evaluate attitudes. Behaviour patterns give evidence of each of these dimensions.

Intensity of an attitude is evidenced by the extent to which it motivates an individual’s behaviour. Limits of intensity can be determined by the nature of the barriers needed to inhibit a response. Behaviour motivated by a weak attitude can be thwarted by obstacles that seem to have very little actual resistance, but an intense attitude is likely to find expression in behaviour despite all overwhelming obstacles.
Extensity is observed in a broad survey of the patterns of attitude within the individual. Some attitudes seem to have broad and pervading influence. These probably develop from a wide variety of situations that have reinforced feelings until generalizations have occurred. A single potent incident of a sort that can be generalized may bring about an extensive influence.

The duration of an attitude is another aspect that is important to education. A function of education is the modification of existing negative attitudes and the creation of new ones that are positive and enduring. Attitudes may endure for only a short time because they have not been reinforced by experiences. In fact, new experiences may bring about a complete reversal of a previous attitude. In general, it can be said that an attitude endures as long as it promotes the goal objectives of the individual.

Attitudes are powerful sources of motivation and are capable of arousing and sustaining concentrated efforts. They determine our pattern of life as well as our success and happiness. Not only they determine the conclusions one derives from the facts but also influence the very facts one is willing to accept.

Attitudes can be classified depending upon the degree of emphasis. In the first theoretical approach, emphasis is on ‘set to respond’. Good (1959) defines attitude as “a readiness to reaction towards or against some situation, person or thing in a particular manner e.g. love or hate”. According to Newcomb (1948) “attitude is not a response but a more or less persistent set to respond in a given way to an object or situation. It is organized and consistent manner of thinking, feeling and reaction with regard to one’s environment”. Likewise, Drever (1961) conceives of
attitude as “a more or less stable set of disposition of a certain kind of experience or readiness with wider sense of tendency to appreciate or produce artistic result or social duties or social opinions”. Here the environment plays a great role in framing one’s attitude.

Attitude also vary in quality and intensity on a continuum from positive through neutral to negative as reported by Kretch et al. (1962) and McDonald (1965) who regard attitude “as a predisposition of an act in a positive and negative way towards persons, objects, ideas and events”. Worchell and Copper (1976) states, “An attitude is an expression of the intensity and direction of effects towards a psychological object”.

Within the second conceptual framework, attitude refers to a subjective or mental state of preparation for action, thus containing cognitive, affective and behavioural components. Allport (1935) defines attitude “as a mental and neural state of readiness organized through experience, exerting a directive and dynamic influence upon the individual’s response to all objects and situation with which it is related”. Similarly Katz and Stotland (1959) view attitudes as an individual tendency or predisposition to evaluate an object or symbol of that object in a certain way, as having affective, cognitive and behavioural components, that is, as involving feelings and emotions, beliefs and actions. Laycock and Munro (1966) conceives emotional, intellectual and motivational components of attitude and Back (1977) describes attitude as a predisposition towards any person, idea or object that contains cognitive, affective and behavioural components.

Ausekar (1995) points out that positive attitude promotes growth; negative attitudes hinder growth; critical attitude helps in taking wise decision and tolerant attitudes help in adjusting to new situations.
Positive attitudes are essential if one wants to gain from study of science. Negative attitudes are more influential than positive once.

An attitude thus may be described as an enduring organization of beliefs and a learned tendency to react favourably and unfavourably, varying in degree to certain class of objects which determine the actual and potential responses of an individual. As the individual grows, his cognitions, feelings and action tendencies with respect to various objects in his psychological world becomes organized into an enduring system called attitudes.

Thus, attitudes provide us with a personal outlook on the world through our feelings, biases, preconceived notions, ideas, fears, threats and convictions.

1.3 SCIENTIFIC ATTITUDE

Education is the main instrument for any social change and the science education plays a vital role in any educational system. Time and again, our educational committees, commissions and policies have identified the place and importance of science education. It is only through the development of scientific attitude among the students, we, the teachers, will be able to develop and nourish the all round personality of our students.

Scientific attitude is one of the key objectives of science teaching and it is one of the major outcomes of it. Scientific attitude makes people live as efficient citizens in the present society. It also helps the people live up to their expectations and satisfactions. Understanding the role of scientific attitude in the life of a successful man, it is incorporated in all types of instructions and in all walks of education as a compulsory
part, directly or indirectly. Many ways and means are used and applied to develop scientific attitude at various levels of education.

Comte (1968) had defined scientific attitude as “the highest level of intellectual insight”. According to Vaidya (1971), “Scientific attitude has been defined as a set of emotionally toned ideas about science and scientific methods and related directly or indirectly to a course of action”.

According to another view, scientific attitude includes freedom from bias, prejudice and superstitions, open-mindedness, critical mindedness, intellectual honesty, beliefs when new evidence is available. Scientific attitude are certain mind sets in a particular direction. So by adopting varied techniques, such mind sets in a particular direction can be developed.

For John Dewey (1933) a scientific attitude is linked with “an ordent curiosity, fertile imagination and tone of experimental inquiry”.

According to Diederich (1967) scientific attitude includes, “a desire for experimental verification” as a component labeled “skepticism”, as “unwillingness to accept the statements which are not supported by evidence defined as verification of prediction”.

Nair (1971) said that “scientific attitude is characterized by intellectual honesty, objectivity in drawing conclusions, adoption of scientific and systematic procedure, open-mindedness in receiving new ideas and facts, curiosity, readiness to reconsider one’s own judgment, spirit of team work, self help and self-reliance, intellectual satisfaction from scientific pursuits, economy in use of materials, honest recording and reporting of observation, faith in cause and effect relationship, pursuing
activities with consistency, preparedness to face hardships and difficulties, a sense of dedication and faith in specialists in their respective fields”.

According to Kohli (1986), “the person possessing scientific attitude looks for natural causes for the thing that happens, curious concerning the things he observes, open-minded towards work and other’s opinion, evaluate techniques and procedures and make the opinions and conclusions based on adequate evidences”.

Vaidya (1999) explained that “scientific attitudes are open-mindedness, curiosity, judgment based upon scientific facts alone, willingness to test and verify conclusions, faith in cause and effect relationship, honest reporting, rejection of the principle of authority and more faith in the books written by specialists in their respective field etc”.

According to Kohli (1986) qualities of a person who possess scientific attitude are:

1. The person having scientific attitude does not believe in superstitions, such as charms or good or bad luck.
2. He is curious concerning the things he observes.
3. He is open-minded towards work and opinions of other and information related to his problem.
4. He evaluates techniques and procedures used and information obtained.
5. His opinion and conclusions are based on adequate evidence.

Good (1973) had defined scientific attitude “as a set of emotionally toned ideas about science and scientific methods and related directly or indirectly to a course of action”.

NCERT conducted a workshop at Chandigarh in 1971 and evolved the following scientific behaviour of a pupil who have developed scientific attitude. The pupil:
a) Is clear and precise in his statements and activities.
b) Bases his judgment on verified facts (not on opinion)
c) Is willing to consider new ideas and discoveries (free from prejudices).
d) Reacts favourably to efforts made to use science towards human welfare.
e) Is prepared to reconsider his own judgments.
f) Arranges the apparatus, materials etc. in their proper places at the end of the work.
g) Suspends judgment in the absence of sufficient data.
h) Is free from superstitions.
i) Is objective in his approach.
j) Is honest and truthful in recording and collecting scientific data.

Ausekar (1995) had defined scientific attitude as “open mindedness, a desire for accurate knowledge, confidence in procedures for seeking knowledge and the expectation that the solution of the problem will come through the use of verified knowledge”.

1.4 COMPONENTS OF SCIENTIFIC ATTITUDE

Srivastava (1980) had given the following major components of scientific attitude :-

1. Rationality

a) Commitment to the value of rationality.
b) Tendency to test traditional beliefs.
c) Seeking of natural course of events and identification of cause and effect relationship.
d) Acceptance of criticalness.
e) Challenge of authority.
2. Curiosity
a) Desire for understanding new situations that are not explained.
b) Find out the ‘why’ and ‘hows’ of observed phenomenon.
c) Give emphasis on the questioning approach of novel situations.
d) Desire for completeness of knowledge.

3. Open-mindedness
a) Willingness to revise opinions and conclusions
b) Desire for new things and ideas
c) Rejection of singular and original approach to people, things and ideas.

4. Aversion to superstitions
a) Rejection of superstitious beliefs.
b) Acceptance of scientific facts and explanations.

5. Objectivity-Intellectual Honesty
a) Demonstration of the greater possible concerns for observing and recognizing facts without any influence of personal pride, bias or ambition.
b) In interpreting results, does not allow any modifications according to present social, economic or political situations.

6. Suspended Judgments
a) Unwillingness to draw inference before evidence is collected.
b) Unwillingness to accept facts, things that are not supported by convincing proof.
c) Avoidance of quick judgment and jumps to conclusion.
7. Cause and Effect Relationship

The person with scientific temper looks for the natural cause for things that happens i.e. he

a) Does not believe in superstitions such as charms or good or bad luck.

b) Believes that there is no connection, necessarily between two events just because they happen at the same time, one after the other.

8. Evaluation

A person with scientific attitude evaluates techniques and procedures used and information obtained i.e. he-

a) Uses planned procedures in solving his problems

b) Seeks to use the various techniques and procedures which have proved valuable in obtaining evidence.

c) Seeks to adopt the various techniques and procedures to the problem at hand.

d) Personally considers the evidence and decides whether it relates to the problem.

e) Infers whether the evidence is sound, sensible and complete enough to allow conclusions to be drawn.

f) Selects the most recent, authoritative and accurate evidence related to the problems

9. Seeks Evidence

His opinions and conclusions are based on adequate evidence i.e. he-

a) Is slow to accept as facts anything not supported by convincing proof.

b) Bases his conclusions upon evidence obtained from a variety of
dependable sources.
c) Searches for the most satisfactory explanation of observed phenomenon.
d) Sticks to the fact and avoids exaggeration
e) Does not allow his personal pride, bias, prejudice or ambition to change the truth.
f) Does not jump to conclusions.

10. Skepticism:

   Scientific attitude includes skepticism i.e. not taking things granted.

11. Faith in the possibilities of solving problems

   A person with scientific temper would tend to look at the problems as things that we can solve a little bit at a time, where most people believe that there are problems that human intelligence will never solve like war, poverty, ignorance, sickness and all sorts of misery.

12. Desire for experimental verification

   The average man, having once decided that something is true, has no desire to carry the matter further. But person with scientific attitude always desire for experimental proof.

13. Loyalty to truth

   A scientist is sometimes subjected to humiliations as his findings shift and invalidate some conclusions to which he has committed himself but his loyalty to truth would never suppress the new data.

14. An objective attitude

   A person with scientific attitude has a high regard for facts and tries to behave in accordance with them, while an unscientific person
tends to see only the facts he wishes to see and to react emotionally against others.

15. Desire for completeness of knowledge
   A scientist is often impelled to round out his knowledge of a subject; to fit every piece into its place, like a jigsaw puzzle.

16. Keen observations
   Scientific attitude means a determination to be careful and accurate in all one’s observation.

17. Critical mindedness
   A man with scientific attitude is critical in observation and thought including self-criticism.

18. Impartial
   The person is unbiased and impartial in his judgment.

19. Faith is Scientific Method
   A person with scientific attitude adopts a planned procedure in solving a problem.

20. Accuracy
   The person would have readiness to calculate accurately, use words correctly, read carefully and is accurate in statements.

1.5 FACTORS INFLUENCING THE DEVELOPMENT OF ATTITUDES

1. Maturation
   While the formulation of attitudes is unquestionably conditioned by experience, the effect of environmental stimuli is conditioned by prior organic growth. This applies not only to the growth of the nervous system but also to the growth of the entire body. The crippled and undersized boy of sixteen years is unlikely to form the same attitudes
as those formed by another boy of sixteen who is large, well proportioned and strong for his age. Age and sex are important factors in determining just what attitude responses will be made to a given environmental situation.

On the intellectual side, attitudes are conditioned by the growth of intelligence. Development of attitude will depend on memory, understanding and reasoning. The young child has only a very limited capacity for understanding the world around him and he is consequently incapable of forming attitudes about remote, complex or abstract things or problems.

At the age of four or five years, three characteristics especially deserves mention. These are curiosity, contra-suggestion and independence. The child at this age is likely to express his curiosity by asking an endless series of questions. He is trying to understand the concrete world around him, and he consequently bombards his elders with questions as to what things are, where they come from and how they operate.

At about the age of ten or twelve years, there is an increase in self-confidence which is associated with a tendency to criticize older people, both parents and teachers.

At about a mental age of twelve years the child begins to understand abstract terms such as pity and justice, and is capable for both inductive and continuous increase during adolescence.

2. Physical Factors

Clinical psychologists have generally recognized that physical health and vitality are important factors in determining adjustment, and
frequently it has been found that malnutrition or disease or accidents have interfered so seriously with normal development that serious behaviour disturbances have followed.

Low vitality is an important factor in producing poor social adjustment and poor social adjustment will inevitably have an important effect on the formation of attitude in many different directions. Such children are much more likely to have anti-social attitudes and are less subject to group influences in the formation of other attitudes.

Malnutrition and diseases are to a considerable extent responsible for these cases of low vitality.

3. Home Influence

It is generally accepted that attitudes are determined largely by the social environment but home influences are especially important. In a study of intra-family similarities in attitudes, Newcomb and Svehla compared parents and children on Thurstone’s Scale for measuring attitudes towards the church, towards war and towards communism. Correlations between the parents were highest, those between parents and children were next and those between siblings were lowest. The fact that the correlations between siblings are lower suggests, to some extent at least, the importance of outside social influences.

4. The Social Environment

Through social contacts, as well as through the home, the individual acquires a large proportion of his attitudes, stereotypes and prejudices. A church group, or a social club, or a college community may come to have a particular kind of emotional intellectual atmosphere, with
the result that individual who gains membership in a group also tends to appropriate the characteristic attitude of that group. These group influences are very strong in case of some attitudes, and, in case the school attempts to develop attitudes that are opposed to such group-supported attitudes, the results are not likely to be encouraged.

5. School Government

The form of the school government seems to be an important factor in determining attitudes. In an experimental study, Lewin and Lippitt concluded that there were more tensions and more evidence of egocentric feelings in a group under autocratic control, whereas there were more co-operative endeavour, more expression of objective attitudes and of praise and friendliness, and more constructiveness in a group with democratic control.

6. Cognitive Factors

Certain cognitive factors such as intelligence, creativity, achievement of the child, achievement motivation may also affect the development of scientific attitude among children.

7. Affective Factors

Factors such as interest of the child, parent-child relationship, emotional stability, attitude towards education may also affect child’s attitude towards science.
1.6 OBJECTIVES OF SCIENCE TEACHING AND SCIENTIFIC ATTITUDE

A report on School Science Teaching by Rai states the main objectives for science teaching and scientific attitude as:-
1. To arouse the curiosity of the student about the world we live in and to encourage him to understand the various phenomenon.
2. To train to acquire the habit of making observation in a planned way.
3. To develop in him scientific attitude.
4. To give him an idea how a scientist works.

The aims and objectives of teaching general science according to All India Seminar on Teaching of Science, should be:
1. To familiarize the pupil with the world in which he lives and make him understand the impact of science so as to enable him to adjust himself to his environment.
2. To acquaint him with the scientific method and enable him to develop scientific attitude.
3. To give the pupils a historical perspective, so that he may understand the evolution of scientific development.

The following similar set of objectives was formulated by the principals of Delhi Higher Secondary School 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 develop ability in 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 be familiar with natural resources of his environment and their uses.
8. To enable the student to appreciate the beauty and order in nature.
9. To enable the student to be familiar with the trends in modern science.
10. To enable the student to collect and interpret data for the solution of problems.

National Policy on Education (1986) states that “Science Education will be strengthened so as to develop in the child well defined abilities and values such as the spirit of inquiry, creativity, objectivity, the courage to question and an aesthetic sensibility”.

The importance of scientific attitude along with scientific aptitude, skills, abilities and interests are stressed by above mentioned aims and objectives.

1.7 STATEMENT OF THE PROBLEM

The present study is stated as, “Scientific attitude in relation to certain personality traits, cognitive and affective variables”.

1.8 OBJECTIVES OF THE STUDY

The present study was undertaken with the following objectives.

1. To find out the relationship between the variable of scientific attitude and personality trait E (Humble vs. Assertive, Independent), M (Practical vs. Imaginative) and Q₁ (Conservative vs. Experimenting).
2. To find the relationship of scientific attitude with the cognitive variable of intelligence, achievement in science and achievement motivation.

3. To find the relationship of scientific attitude with the affective variable of interest in science, attitude towards education and parent child relationship.

4. To examine the difference in the scientific attitude of the students on account of sex-differences, medium of instruction and difference in the school management.

1.9 DELIMITATIONS OF THE PROBLEM
1. The present study has been delimited to IX class students studying in government, government aided, private schools and navodaya vidyalayas.

2. The study has been restricted to Punjab state only.

3. The study has been delimited to 789 students of government, government aided, private schools and navodaya vidyalayas on the basis of randomization technique.

1.10 OPERATIONAL DEFINITIONS OF THE TERMS USED
1. Scientific Attitude

   It consists of attitude or readiness to be confident that universe is a self-sustaining unit and human intelligence is capable of understanding natural phenomenon. It is readiness to accept tested human knowledge, attack problems with reason to look for truth, cause and effect relationship and readiness to love knowledge for its own sake. It is readiness to have broad and versatile interests and sensitively curious. It is
readiness to seek correctness in work and thinking so that truth may be discovered, to seek a factual basis for all conclusions and to avoid assertion. It is also readiness to be carefully and painstakingly accurate in all work and thinking. In other words it is curiosity, open mindedness, faith in scientific method, to seek evidence, to be objective, suspended judgment and aversion to superstitions. Its measurement is the total score on scientific attitude scale given by Kaur (2002).

2. Personality Traits

In the present study, the relationship of only three personality traits i.e. E (Humble vs. Assertive, Independent); M (Practical vs. Imaginative) and Q1 (Conservative vs. Experimenting Nature) with the scientific attitude of the students has been explored.

Personality to a layman conveys an impression of what an individual represents or typifies. In this sense, personality is taken to refer to the outward aspect of an individual and how it attracts other. But an educator who studies personality and its many faceted relationship to human behaviour is usually concerned with something more than social stimulus value of an individual.

For the purpose of present study, personality has been taken as defined by Cattell and Eber (1967) that is, which permits a prediction of what a person will do in a given situation and is concerned with all the behaviour of the individual, both overt and under the skin. Its measurement is the scores given on 16PF questionnaire (Cattell and Eber, Indian adaptation by Kapoor & Tripathi, 1981) for factors E, M & Q1.
3. Cognitive Variables

In the present study only three cognitive variables i.e. intelligence, achievement in science and achievement motivation have been taken up.

(a) Intelligence

In the present study intelligence has been operationally defined as, “the ability to deal with numbers, analogies, opposites and synonymous to make categories, to draw inference”. Its measurement (verbal) is the total score on Tandon’s (1971) Group test of General Mental Ability.

(b) Achievement in Science

According to Crow and Crow (1956), “Achievement means the extent to which a learner is profiting from instruction in a given area of learning”. Therefore, achievement in science means marks of the students in the subject of science of the preceding year (i.e. VIIIth class).

(c) Achievement Motivation

This concept was developed by McClelland and refers to the motive to achieve some standard of accomplishment or proficiency. People with a strong achievement motive prefer moderate to easy or hard goals or risks, want concrete feedback regarding task performance, prefer tasks where skill rather than luck determines the outcome. Its measurement is total score on achievement motivation inventory (Deo and Mohan, 1985).
4. Affective Variables

Affective variable in the present study has been interest in science, parent-child relationship and attitude towards education.

(a) Interest in Science

According to Dubey and Dubey (1986) “Interest may be defined as a tendency to choose one activity in preference to another or to seek out an activity or object”. Science interest cover such things as our preferences and diversions or likes and dislikes in the field of science”.

For the purpose of present study, interest in science is the measure of scores obtained on science interest test by Dubey & Dubey, 1992.

(b) Parent Child Relationship

The parent child relationship or environment has been object of study and analysis for many years. Present day national involvements with such widespread social problems such as ignorance, unequal educational opportunities and social drop-outs have contributed to the development of new orientation in the study of parent child relationship.

Parent – child relationship includes the parent’s attitude towards the child related to freedom vs. destructiveness, dominance vs. submission, acceptance vs. rejection, trust vs. distrust, and warmth vs. coldness, partiality vs. fairness, expectation vs. hopelessness, open communication vs. controlled communication. It is also suggested that the development of any particular human characteristics is related to a subject of the total set of the environment forces. Its measurement is the score obtained on parent child relationship scale by Rao, 1989.
c) **Attitude towards education**

Attitudes have been defined as ideas with emotional content, important beliefs, prejudices, biases, predisposition, appreciation & as a state of readiness or set.

For the purpose of present study, attitude towards education is measured as the scores obtained on attitude towards education scale by Chopra, 1982.

5. **Background Variables**

Three background variables, in addition to the above variables, have been taken i.e. sex, type of management and medium of instruction and their effect on the development of scientific attitude among students has been studied.

(a) **Sex**

Sex differences in the present study means both boys and girls of IX class.

(b) **Type of Management**

Type of management in the present study means government, government aided, private schools and Navodaya Vidyalayas.

(c) **Medium of Instruction**

It means Hindi, Punjabi and English as the medium of instruction.
1.11 NEED AND IMPORTANCE OF THE STUDY

Attitudes determine the negative or positive character of our responses to various kinds of stimuli or diverse types of situations. Their importance in life cannot be overstated. Attitudes offer greater possibilities for successfulness of achievement as well as failure in life. They are an important motivator of behaviour and affect human values. “Efficiency results, when a person is impelled by his attitude to start, continue and complete a project rather than to avoid an unpleasant task. His attitude towards his work affects his worthwhileness in the activity”. This has been given by Crow and Crow (1991). Attitudes are important because they determine the action of human beings. There is hardly any object, procedure or idea or occupation towards which we do not have any attitude. Furthermore, attitudes supply principles on the basis of which choices are made. Attitude towards an object, idea or a thing is important in our satisfied or dissatisfied living. Attitude helps one in keeping one’s mental health. How you look at a thing is a matter of attitude which is very important. Attitudes are acquired dispositions and no one is born with attitudes. Education helps a lot to form and mould one’s attitudes.

To achieve this important aim, education should be organized in such a way that each child is inspired to participate actively in the economic reconstruction of society. They should understand the development of modern society, which in turn depends upon the development of science and technology. Hence, they should try to develop themselves technologically so that technological efficiency and high level competence is developed in them and they are able to enjoy maximum advantages of science in their daily life. Great advancement in science and
technology and use of the scientific achievements in promoting the well-being of mankind through their application in the field of industry, communication, transport, engineering, agriculture, medicine has made science more important than before. Science has in fact, radically transformed the physical environment of the citizens of the modern world. Every advancement in science deepens our understanding of nature and it also heightens the scientific knowledge. To understand the world around us and to improve the quality of life of the society, the youth today needs scientific attitude.

Therefore, science educators have included the development of scientific attitude among the general aims of teaching science. It is considered as the basic goal for teaching of science no less important than cognitive goals. In modern times, the chief aim of education is to enable a citizen to develop a scientific attitude of mind, to think objectively and base his conclusions on tested data. With the development of such a scientific attitude, an individual is able to have the understanding and intellectual integrity to sift truth from falsehood, facts from propaganda and to reject the dangerous appeal of fanaticism and prejudice. In short, the more developed is the scientific attitude of an individual with regard to a particular idea or object, the more objective his decisions and conclusions become on the basis of his tested data. So, teaching of science should be aimed at inculcating scientific attitude besides to provide knowledge of science, because students are already getting knowledge from different sources such as books, educational programmes on television, computer etc.

But, it has been usually observed that these children usually lack open mindedness and objectively in observation, and sometimes, they
are superstitious and usually lack scientific attitude. It means that science teaching is not solely responsible for the development of scientific attitude. There may be some other influential factors like home environment, socio-economic status, study habits etc. which affect the development of scientific attitude.

Although there are a few studies on the relationship of achievement and scientific attitude, SES and scientific attitude, scientific attitude and sex-differences, yet these studies are scarce, insufficient and inadequate in themselves to make any generalizations regarding the role of these factors in the development of scientific attitude.

Moreover, studies in the field of relationship of scientific attitude with personality traits; cognitive variables such as intelligence and achievement motivation; affective variables such as attitude towards education, parent-child relationship and also with certain background variables such as management of schools, medium of instruction etc. are practically inaccessible. Relationships of scientific attitude with cognitive variables have been explored by a few researchers but these studies are available on perspective teachers. No one has tried to link the personality traits, cognitive and affective variables with the scientific attitude of secondary school students in detail and depth. Thus seeing the gaps and voids in the research literature, the investigator had planned this study.

1.12 ORGANIZATION OF THE RESEARCH REPORT

Having presented the importance and need for studying the present study along with objectives in the introductory chapter I, theoretical viewpoints about predictors have been given in Chapter II. Chapter III deals with the review of related studies and hypotheses whereas Chapter
IV provides detailed account of method and procedure employed in the present study. Chapter V presents the nature of score distributions. Chapter VI gives details of analysis of data and discussion of results and Chapter VII deals with the summary, conclusions and suggestions for further research.

The bibliography and appendices have been given at the end of the research report.