CHAPTER - 1

INTRODUCTION
1.1 **SCIENCE-SCENARIO**: Science occupies a very eminent place in curriculum both at school and university stages of education in India. Continuous advances in Scientific and technological research has led to the growth and greater application of science in contemporary society. Accordingly Science becomes a priority area in education, both at the compulsory education level as well as the level of specialization. Science education is supposed to perform a two-fold task. The prime objective, in individualistic perspective is the cultivation of a Scientific temper, which includes a spirit of inquiry, a disposition to reason logically and dispassionately a habit of judging beliefs and opinions on available evidence, readiness to reject unfounded theories and principles, the courage to admit facts, howsoever, unseating or disagreeable they might be, and finally, recognizing the limits of reasoning power itself. It is also expected of Science education that it would give individuals a firm grasp of the concepts and processes of science and impart to them the ability to use the Scientific method of problem solving and techniques of observation and experimentation in handling problem of comprehension or life. At the societal level one of the major objectives of science education is to equip individuals to participate in the creation of society which is free from poverty, hunger and evils, such as violence, exploitation, oppression etc. The importance of science and technology in the development of modern civilized society can not be over emphasized. All the countries of the world realize the importance of incorporating new content and techniques of instructions into Science. While most Asian countries are eager to benefit from the experiences of new curriculum programmes of countries like U.K., U.S.A., U.S.S.R. etc., the thinking in most places has been not to transplant the programmes in their entirety but to study and adopt the same according to the needs of Country. In our country attempts are being made to introduce, update and vitalize the science courses. But these facts are not amply reflected in the studies.

The present is the age of science and technology. The development and advancement of any country is measured in terms of its
technological development. The technological development of any nation depends upon its human and material resources. The proper utilization of material resources depends upon human beings. The education and training of human beings is essential. Due to this, each nation invests 5 to 6 percent or more of its total annual budget to education. Among other characteristics, scientific creativity possessed by human beings will go a long way in technological development. Scientific achievements and technological advancements which give pace to the developmental dynamics of a nation, depend largely upon the kind quality of human scientific creativity that the country holds. 21st century is the era of science and technology. The recent investigations and discoveries of science has changed the face of whole earth. It has given so many comforts and luxuries that survival of modern life seems to be impossible without it. There is knowledge explosion in every field of life including education. In this age, the welfare of our civilization depends mainly upon the scientific educational progress for human resource development. Now the programme of scientific education is assuming greater importance day by day with proper teaching and evaluation procedures in schools and colleges for the development and advancement of intellectual faculties. Science has played a tremendous role in our lives during the last century and is now changing our entire existence in such important aspects as health, communication, transportation and power. The modern world has been created by science and is being maintained by science. We even owe our existence to science. Before we further probe into numerous reasons which led us to make the knowledge of science inevitable for mankind, a brief study of the concept of science will be helpful.

Modern states especially democratic countries require men with scientific thinking and training such as engineers, chemists and doctors. These men must start their science sooner or later, and the sooner the better the governments of modern states make use of scientific-knowledge immensely for their proper functioning. In nearly every country the departments of agriculture, education,
health, police, posts and telegraphs, railways and surveys employ scientists using scientific knowledge and technology.

The most important of the reasons for learning science is that it has a value in character training. "It develops an attitude that is a habit of thinking, feeling and acting, which is a mixture of curiosity and caution, curiosity leading to correct observations and caution in arguing from the observations." Today the world is facing three major problems of population increase, pollution and poverty. The developmental efforts of the developing countries, such as India, are being nullified by increasing population and increasing poverty. Although science and technology have improved the lot of a large number of human beings problem. 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.

1.2 Attitude: Attitudes are predispositions to respond favourably or unfavourably, to a more or less predictable degree, to particular situations on the basis of ideas and feelings we bring to these situations. Many attitudes never entail any action at all. Attitudes are measurable and, within limits, consistent. Attitudes usually have both cognitive and affective components. The cognitive component is likely to be a stereotype, this is difficult to justify, but apparently necessary. Attitudes serve three principal functions; They give our world some kind of cognitive structure; they are utilitarian, in that they may be instrumental in attaining some of our goals; they are self-defensive, fulfilling some of the functions of the defence mechanisms. Attitudes are related to each other in that there is a degree of consistency among those held by any one person. They are usually also fairly consistent among the members of a given social group. One of the most distinct characteristics of attitudes is that we speak them virtually all the time. Speaking our attitudes
serves the broad function of communications and subsidiary to that, the functions of influencing others and expressing or confirming ourselves. Another important characteristic of Attitudes is that, we speak them rather than act them out, this is because their primary purpose is a Cognitive one. Attitudes are formed and changed in many ways. Some of them are the result of internalized norms and some are formed from personal experience. A new Attitude usually involves the change or relinquishment of an old one. Just as Attitudes may serve ego-defensive purposes, many of them are acquired as a response to an ego challenge or threat. Attitudes are also acquired in response to fear arousal; though there is some disagreement about the optimal level of fear arousal to effect-Attitude change, probably the greater the fear, the greater the change in most situations. Another, quite different, means of effecting-Attitude change is to change the perception of the object of the Attitude, as in changing the perception of “politician” to “statesman” rather than “ward-heeler”. Attitudes are also formed and changed as a response to uncomfortable levels of Cognitive dissonance. When we have conflicting-Attitudes towards something, we usually find it necessary to modify some or all of them. Though we disapprove of lying we may tell a lie without aversive consequences to our dissonance tolerance if we are given a sufficient reward for lying, but if the reward is insufficient and we still tell the lie, dissonance may cause us to believe the lie we told. Contrary to what Cognitive dissonance would seem to predict, however, people do not always avoid information that is incompatible with their views. In certain situations, they may even seek such information. Inspite of all the factors that have been shown to have an effect on-Attitudes, the fact is that, for most of us, they are remarkably stable, resistant to change. This is in part due to the intricate structure of our-Attitude sometimes endangers the entire network. We also hesitate to change our-Attitudes because doing so, many entail the threat of losing social sanction. Certain personality factors also tend to support stability of-Attitudes, self-defensiveness and authoritarianism tend to support to highly stable minority-group prejudices. Inconsistency of attitudinal disposition
can be due to motivational factors or to low self-esteem. Two methods of insuring against attitudinal change are:

- Eliciting a strong commitment to an-Attitude, and

- The inoculation method of exposing subjects to small amounts of counter arguments in order to evoke resistance to them. Attitudes, being invisible, must be inferred and measured mostly from verbal Behaviour. In practice, they are inferred from Behaviour. The Thurstone-Attitude scale asks a subject to check the-Attitude statements he agrees with the statements have been prerated and the subjects score is the median of the values assigned to the statements he has checked. The likert scale asks the subject to rate all the statements submitted from 1 to 5 according to the degree of his approval of them; his score, in this case is the sum of his ratings. The Guttman scale presents-Attitudes toward something in order of difficulty; the score is the number of the last item checked. Attitude scales attempts to measure both the direction and the strength of an-Attitude.

The data that emerge from-Attitude assessment may be erroneous for a variety of reasons. When certain variables affect all of subject’s responses, in a similar direction the result may constitute a response bias. One common form of response bias is “social desirability”, the subject’s attempt to show himself in a desirable light. Another is “acquiescence” or a subject’s tendency to accept or reject all statements seeking to measure his-Attitudes. Various ways have been developed to detect test responses made on the basis of response bias. An-Attitude is a tendency towards uniformity of emotional response with respect to persons, objects, institutions beliefs, or personal Behaviour, and expresses different degree of acceptance or rejection. If someone’s feelings are for or against something his-Attitude possesses both direction and force. The purposes of the school are significantly associated with children’s-Attitudes. Classroom instruction varies in effectiveness according to the-Attitudes which children bring to school and those which such
instruction creates in them. The teacher through his opportunity to
direct instruction may cultivate-Attitudes that will free children’s
thinking from ignorance and prejudice. Although he may not
without restraint dictate to them what they are to think, he may
endeavour to aid them to learn how to think. He may teach them
how to evaluate opinions critically and guide them informing-
Attitudes that encourage comprehensive treatment of reality.
Attitudes have been defined as ideas with emotional contents,
important beliefs, prejudices, biases, predispositions appreciations,
and as states of readiness, or set. Allport has defined an-Attitude as
a “Mental and neural state of readiness, organized through
experience, exerting a directive or dynamic influence upon the
individual’s response to all objects with which it is related”,
Attitudes have intellectual, biological, social and emotional
components that are derived from experience and exercise a
determining influence upon Behaviour. Any definition that includes
all of the connotative aspects implied by the term-Attitude must be
broad and vague, yet it is necessary somehow to limit this
discussion to a specific concept. For this purpose an-Attitude is
defined as a developmental state of organismic valence created by
psycho-biological processes exerting a motivational influence upon
the individual’s responsive Behaviour in situations directly and
indirectly related to it. A variety of patterns are included in an
individual’s array of-Attitudes. There are-Attitudes towards health,
life, death, people, new situations, music and art, work, play,
science, government, religion and many more that are of like
importance. These-Attitudes have been influenced by the educative
process through planned and random experiences. Since creating
and shaping-Attitudes is one of the most important functions of the
school, attention should be given to a study of their genesis, nature
and dynamic aspects. An-Attitude may be defined as learned
emotional response set for or against something. Attitude is a
tendency of an individual to react in a certain way towards a
particular stimulus, object, situation, process or phenomenon. It is
what a person feels or believes in. It is the inner feeling of an
individual which may be positive, neutral or negative towards a
designated class of stimuli. Miller and Blaydes state, “an-Attitude is a condition of mind involving imagination and emotional states which are the result of previous experiences. Attitudes condition Behaviour, establishing patterns of conduct-Attitudes are ethics”.

1.2.1 EMERGENCE AND EARLY DEVELOPMENT OF ATTITUDES: In their most primitive form-Attitudes exist as simple pleasant or unpleasant states of infant. Some of these feelings are result of satisfied or unsatisfied biological needs. Others are produced by pleasurable or unpleasurable responses from mother, father or siblings. Developmental changes produce tremendous changes in the child’s relationship with objects and situations. A child’s-Attitude towards authority figures is obviously an important element of socialization and determines much of his Behaviour in school. Witkin (1955) in a study involving 400 students and their parents, found a very significant relationship between both male and female students-Attitudes towards the father figure and the father’s acceptance-rejection of the child. Dissatisfaction derived from the child’s dependency upon parents, particularly the mother figure. R.A. Spitz (1951) and M.A. Ribble (1944) have contributed significantly to this subject. Their findings seem to be well expressed by J.Roudines co(1952) in the remark that, “any separation from the family and especially from the mother, for a young child is a painful and distressing experience which is not tolerable before he has acquired the concept of time and space H.L. Koch (1955) studied the relation of certain family constellation characteristics and the-Attitudes of children towards adults”, A.L. Baldwin (1949) studied “The effects of home-environment on Nursery school Behaviour,” Also A.L. Baldwin(1945), J. Kalhorn (1945) and F.H. Breese (1945) studied on “Patterns of parent Behaviour”. J.K. Lasko (1952) studied on Parent-Child relationships. Evidence from these studies suggests that the parents acceptance of the child and the autonomy that the child experiences in daily contacts in the home are strong determiners of later Behaviour in a school situation. H.L Koch (1956) study indicated that age spacing is more closely associated with such things as confidence emotional intensity, excitability,
moodiness, anger, decisiveness, alibing, projecting of blame and indirection. Differences in Attitudes were not significantly related to simple sex differences. Attitudes developed during the pre school years are associated with the general culture in which the child is reared as well as the direct influences of family relationship. Sister Mary Charleen (1950) to feel that children bring to school preconceived opinions about racial matters, religious differences and economic status. Her data indicate that strong factor in Attitude development must have been the indirect influence from older persons such as parents and siblings. Allport (1950) points out that in addition to the reactions to direct experiences, Attitudes are taken into the child through the processes of identification and introjection.

1.2.2 DIMENSIONS OF AN-ATTITUDE: Teachers and others who attempt to fulfill this important role of dealer-in-attitudes should be acquainted with their dimensions as well as their development. Attitudes have four dimensions: intensity, direction, extensity and duration, each of these aspects is important in understanding Attitudes and their influence upon Behaviour. Behaviour patterns provide evidence of each of these dimensions. Intensity of an Attitude is evidenced by the extent to which it motivates an individual’s Behaviour. Behaviour motivated by a weak-Attitude can be thwarted by obstacles that seem to have very little actual resistances. But an intense-Attitude is likely to find expression in Behaviour despite almost overwhelming obstacles. The direction of an-Attitude is observed in Behaviour as a force that, “repels, attracts, or fails to motivate the child in any direction”, as in the case of an “I do not particularly care-Attitude”. Extensity is observed in a broad survey of the patterns of Attitudes with in the individual. Some-Attitudes seem to have broad and pervading influences. These probably develop from a wide variety of situations that have reinforced feelings until generalization have occurred. A single potent incident of a sort that can be generalized may bring about an extensive influence. Actions that are uncommon in a
particular child may provide evidence of this type of limited-Attitude. The duration of an-Attitude is another aspect that is important to educators. 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. It is evident that-Attitudes are modified through experience. They may be changed from strongly negative to positive, strongly positive to negative or shades of change may occur between these externs.

1.2.3 MODIFICATION OF ATTITUDES: Attitudes are changed by school experiences. They may be changed by the influence of a particular teacher, another child, the peer group, a single event, curricular material, a series of extracurricular events, or any combination of these elements. Deliberate effort should be given to providing experiences that are likely to aid in the development of desirable-Attitudes. The findings of R.Lippit and C.Clancy (1954) indicate that role-playing of this kind can improve rapport between children and adults, assist in readiness for new and unexpected experiences, improve social skills, provide insights and increase understanding. Close and extended contacts between children and teachers made possible in school-camping may provide opportunities for observing-Attitude changes. P.H. Mussen (1950) studied the effects of such experiences. Sister Mary Ita (1950) expressed the idea that strongly emotional attempts succeed better than calm appeals to reason because prejudices have a strong emotional component. L.E Metcalf (1950) discussed fee emotional expression as it is effective in dealing with-Attitudes if they are distinguished from beliefs. H.P. Elliot and C.E. Moustakas (1951) have been concerned with the mechanics of creating atmosphere for free expressions. J.C Lagey (1956) concluded that there were no noticeable direct relationships between the content of courses in the curriculum and-Attitude modification. R.H Ojemann (1956)
presented the idea that text books and teaching materials do not help in changing-Attitudes because they do not come to grip with social problems by presenting causes Z.M Mahdesian (1955) tried group discussion with pupils in the grades one through six and found it ineffective over a short term. H.P Smith (1955) found that-Attitudes directly related with the experience changed significantly. General-Attitudes such as world-mindedness, ethnocentrism, authoritarianism, conservatism and-Attitude towards democratic group- processes did not change during the four to six months interval. I.S. Spigle (1955) who studied the effects of educational movies on the-Attitude of high-school boys. Pre-existing-Attitudes tend to be reinforced by experience when there are no direct attempts at interpretation and control. Although reports of attempts to change pupil-Attitudes are meager, only a few of the real efforts are reported. A desirable-Attitude toward learning will be maintained if

-- The thing to be learned is not too far removed from past leanings.

-- The learning situation is made physically and intellectually attractive to the learner.

-- The knowledge or skill to be acquired is perceived as a need satisfier.

-- Concomitant experiences do not appear to be more mediate goal satisfiers.

-- Learning is accompanied by a feeling of achievement reinforced by recognition from others. When these conditions are sustained for all learners, teachers will no longer be troubled by children who have negative-Attitudes towards school.
1.2.4 **SCIENTIFIC-ATTITUDE** : One of the chief aims of science teaching, is to develop certain Scientific disciplines or Attitude. According to N.S.S.E., "Scientific-Attitudes can be defined 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." Scientific-Attitudes include freedom from bias, prejudice and superstitions, open-mindedness, critical mindedness, intellectual honesty, beliefs when new evidence is available. A pupil who has developed Scientific-Attitude.

-- Is clear and precise in his Activities and makes clear and precise statements.
-- Always bases his judgment on verified facts and not on opinions.
-- Prefers to suspend his judgment if sufficient data is not available.
-- Is objective in his approach and Behaviour.
-- Is free from superstitions.
-- Is honest and truthful in recording and collecting Scientific data.
-- After finishing his work takes care to arrange the apparatus, equipments etc. at their proper places.
-- Show a favourable reaction towards effects of using science for human welfare.

1.3 **COGNITION AND CLASS - ROOM COGNITIVE BEHAVIOUR** : The term cognition is derived from the latin word cognoscere which means to know. Cognition is a process of knowing. It includes becoming aware, understanding and modifying one's understanding on the basis of new information. It is important to realize that cognition is an ongoing process. We are constantly taking in information from the environment and interpreting it we make continuous judgments about whether new
information requires action. We also decide about the value of information to our immediate and long range plans. The study of cognition includes the study of all these and other forms of knowing. It also includes the study of processes related to knowing, such as perceiving and making decisions. All our mental abilities—perceiving, remembering, reasoning, and many others—are organized into a complex system, the overall function of which is termed cognition. The branch of psychology that studies human cognition is called Cognitive psychology. Fundamentally, Cognitive psychology is study of knowledge and how people use it. For this reason Cognitive psychology is also called information-processing psychology. Information is a term that we will use essentially as a synonym for knowledge. We view a human being as one who seeks information, remembers it, and uses it to make complex decisions that guide his or her behavior. Cognitive abilities ordinarily refer to behaviors in which there is search for information and some degree of awareness. Thinking and problem-solving are example of Cognitive-Behavior. Cognition is based on mental representations of knowledge and processes that operate on these representations. A representation has three important assets: content (what is being represented), code (the format of the representation), and medium (the physical realization of the code). The information processing involves successive recodings of inputs from peripheral to more control codes. The central codes used for memory storage and reasoning will be the central concern of cognition. The code is intimately related to the procedures that can be performed on it. A procedure is a sequence of purposeful actions. There are two kinds of actions, recording operations and intracode operations. A recording operation transforms some content from one code to another. An intracode operation alters the content within a code. For example, the procedure causing mental rotation can be performed on the visual spatial code. Skilled reading provides a good illustration of many important concepts. Reading is based on the analysis of features of the input and involves a great deal of parallel, or simultaneous, processing. The act of reading consists of successive reading of the input through hierarchically organized levels of representation. It involves both bottom-up procedures,
based directly on the sensory input, and top-down procedures, which use higher-level information. The Logogen model of word recognition and such similar but more elaborate models as the hierarchical model of Johnston and MC-Clelland and provide examples of how these characteristics of information processing can be theoretically integrated.

Feature analysis refers to our ability to recognize patterns and meaning in the stimuli that surround us. In the Pandemonium model of pattern recognition, the responses of feature detectors are arranged hierarchically to allow recognition of complex information.

Four factors limit information processing level of arousal, sensitivity of the sense receptors the capacity of short-term memory and the time required to transfer information from short term to long term memory. The information processing is aided by redundancy the repetition of essential information. Information processing is made more difficult by entropy, the uncertainty of information embedded in the stimuli. In the Tote model of information processing, there is a continuous feedback between evaluation and action.

Mental images are a product of the visual and memory systems. Our knowledge of the properties of an object is applied automatically to our mental image of that object. In some ways, a mental image and a precept are distinct. These differences raise questions about the actual mechanisms that are involved in creating a mental image.

A concept is a category of meaning that has dimensions or criteria, that include some instances and exclude others. Two views of concept formation have been developed one view emphasizes a trial and error approach, to hypothesis testing. The other view which is coming into general emphasizes the prototype, or family resemblance, of natural categories.

The Whorfian hypothesis focuses on the role of language in shaping concepts. There is some evidence to support and some
evidence to disconfirm the hypothesis. Language and thought are two separate but interacting systems.

Problem solving occurs whenever there is some discrepancy or barrier in over movement toward a goal. There are six steps of problem solving, identification and definition, collection of information, production of alternative solutions deciding among alternative solutions, deciding among alternatives, taking action and evaluating the action. In complex problem solving, one draws on information in long-term memory. Having more informations makes one a better problem solver one does not always take the most logical or efficient approach to problem solving. Barriers to problem solving involve the inability to accurately perceive the problem or to break from old habits. Social cognition refers to our understanding of social relationships. Social perspective, effective, social problem taking appears to be a key to flexible solving. Metacognition is the capacity to monitor and evaluate one’s own Cognitive processes. The capacity for metacognition reflects the self-conscious, goal-directed nature of human cognition. Jean piaget was a swiss psychologist whose work on the Cognitive development of Cognitive functioning has been highly influential. Piaget’s theory emphasizes the continuous interaction between individuals and their environment. Jean Piaget was a swiss psychologist whose work on the Cognitive development of Cognitive functioning has been highly influential. Piaget’s theory emphasizes the continuous interaction between individual. Achievement and success in different fields of life are determined by Cognitive, psychomotor, and affective factors. The crucial role of these factors in developing educational practices have been under lined by Piaget, Bloom, Brunners and Flavell. The future success in education and work can be (Inhelder and Piaget predicted on the basis of these factors several scholars 1958, Kufsky, 1966; Brunner et. al, 1960; Wilson and Klausmeir, 1974; Flavell, 1971) have reported the effects of cognitive psychomotor and affective abilities on social and educational development of an individual. Cognitive abilities ordinarily refer to Behaviours in which there is search for
information and some degree of awareness. Thinking and problem-solving are examples of Cognitive Behaviour. (Lindgren, 1976), Intellectual abilities and educational achievement are associated with room learning is ordinarily thought of as a Cognitive process, it involves Cognitive Activities such as information seeking, concentration and thinking. Bloom has conducted a study to find out the relationship between early and later grades. Findley (1963) has also shown the relationship between the present academic achievement and later performance. Cognitive characteristics and performance of teachers in class have been found closely related. Torrance (1966) found that more effective teachers in terms of higher student achievement, had greater intellectual effectiveness, responsible, and used a variety of Activities and approaches in their teaching. Flander (1963) developed a model of verbal teaching Behaviour in terms of: (I) indirect teaching Behaviour, (II) direct teaching Behaviour and (III) state of silence or confusion respectively to give rise to teaching-learning Activities in order to make the process of teaching-learning. Comparatively more effective through interaction between teacher and pupil or learner. Vashishtha (1971,75,79,82), in many of his writings, tried to modify the system of interaction analysis. He extended the categories from 10 to 14 and systematized the Flander's system by incorporating more categories. In order to gather more informations he sought the enrichment of teaching-learning Activities through the process of interaction. the researcher is of the opinion that for simultaneous interpretation of RCEASIA and FISAC a still more extensive model might be developed. Teaching is interactive process between a teacher and taught. The Classroom teaching Activities and events can be studied objectivity by observing these situations. Recently a member of systematic observational techniques have been developed. The Classroom teacher-Behaviour can be measured objectively by employing these techniques. Prior to this systematic observations, the Classroom ratings have been used for observing and evaluating the Classroom teaching. It is the subjective for measuring the teaching Activities. The purpose of rating is to evaluate the teaching competency of teacher. The
teaching can not be diagnosed by the use of Classroom rating. Thus, the teaching can be graded but can not provide the basis for improving and modifying teaching Activities or teacher -Behaviour. The systematic observation techniques are used for analysing the teaching Activities systematically and objectivity. The flow of Classroom events can be recorded and analysed. It provides the structure to teaching events and flow to teacher-Behaviour. Thus, the teaching Activities are diagnosed and provide the awareness about the teaching events and components, but teaching or teacher-Behaviour cannot be evaluated or graded. The theory of teacher-Behaviour has oriented the concept of interaction-analysis of teaching.

1.4 CO-CURRICULAR-ACTIVITIES : In literal meaning the Activities pertaining to the school curriculum may be referred to as curricular Activities. Such Activities are part and parcel of the instructional and other educational programmes these are entirely handled by the school staff. Organisation of instructional work, guidance, evaluation, audio-visual education and library services and practical work concerning various subjects or work experience etc. may be cited as examples of these Activities. Previously co-curricular Activities were known as extra-curricular Activities. These Activities no longer looked upon as mere “Extras”, but an integral part of the school curriculum. Mohiyuddin and Sidhalingaya (1944) write, “The distinction between curricular and extra-curricular has been gradually disappearing in modern education practice and co-ordination and integration of all the experiences of the pupil-intellectual, social, moral, emotional and physical has become the object of persistent efforts of the school that aims to be a real living little world for the pupil.
1.4.1 SOME OF THESE SCIENTIFIC-ACTIVITIES ARE AS UNDER:

- **Science - Clubs:** To channelise the energies of students and to make proper use of talent of the students science clubs may be organised in schools. Such a club then forms the backbone of the co-curricular Activities in the school. Such clubs if properly organised, will be of great help to create interest in teaching of science and so now the importance and educational values of such clubs is duly recognised. Such clubs provide better chances to acquaint the students with various facts and principles of science. Students can take up any project or a Scientific hobby of his choice while participating in a science club activity. Such a participation of a student in science club Activities helps to link his theoretical knowledge to the outside world and he gets more opportunities for self-expression and creativity. Participation in various Activities of science clubs also helps to develop manual skills of the students and he gets interested in learning of science. The importance of science clubs in schools in words of Dr. W. Davis is, "If the future belongs to youth and to science, then there is a vastly more important place for science clubs, in the scheme of things". Mckown opined the advantages of science clubs over usual Classroom teachings “The club offers the pupil an opportunity for specialisation which he does not have in the Classroom”. In the Classroom his work is formal, In the club it is informal. There is complete freedom for the students to pursue his interests in a science-club and he can choose his own project and also his own method to pursue the project so chosen. The club represent freedom and expression where as the Classroom represents conformity and repression. Government also provides financial help for organisation of science clubs, N.C.E.R.T. provides non-recurring grants to the schools which have science-club.

- **Scientific- Hobbies:** - Scientific hobbies can also be undertaken as a part of Activities of science club. Now that more and more attempts are being made to give a technical bias to our education and hobbies with a Scientific basis are becoming more and more
popular, the science master can make a valuable contribution by encouraging a number of hobbies that bear directly on education in science, students will be found only too enthusiastic and even willing to spend money in addition to their time to pursue such hobbies, if the science teacher is been and knows the particular hobbies he is going to start. In the beginning an attempt be made with one or two simple and less expensive hobbies. There is a large no. of such hobbies having a Scientific basis eg. ink making, soap making, making hair oil and face creams phenyl making, preparation of James and Jellys, achars and chutneys etc. The list can be enlarged to include gardening, making of charts and models, rendering first aid etc.

**Science Fairs and Exhibition :-** Every school should organise science -fair at least once a year. This should include the exhibits of the students as well as demonstration. Talks by experts film shows on Scientific-topics, debates and declamations, music-shows, Scientific-plays etc. can also be organised. Both the teacher and pupils should collaborate towards the success of the fair, through it should be mainly an activity of the students. Because the back ground of all the Scientific work is practical, it can make an appeal to visitors, which the academic type of Activities may fail to provide. The students who take part in arranging and organising the fair get a better understanding of the purpose of experiments and method used science fairs and exhibitions are organized both by governmental agencies and non-Governmental agencies. The governmental agency which organizes science fairs and exhibitions for children is N.C.E.R.T. The N.C.E.R.T. organizes science fairs and exhibitions through extension centres in different parts of the country and through the National Science Exhibition for children which is held in Delhi every year since 1970. The national exhibition is the culmination of all the schools, district, zonal and state-level exhibitions which are held round the year through out the country. The best exhibits from these exhibitions are displayed at the national-level.
Science - Museums: The interest in science-museum in India started some time in the late fifties. The first science-museum known as the Birla Industrial and Technological Museum Calcutta was established in 1959 by the Government of India under the council of Scientific and Industrial Research. Two more museums, Visvesvaraya Industrial and Technological Museum, Bangalore, and Nehru Science Centre, Bombay, were started in 1965 and 1977 respectively. Birla Institute of Technology and Science at Pilani has also a prominent science museum. Besides having permanent galleries, these museums organize various science-activities such as mobile science exhibitions and fairs, science demonstration lectures, training programmes, etc. The government is planning to set up several such museums in the near future. It is very much desirable that every school should have a science museum of its own. The teacher should encourage the students to collect materials of scientific interest and improvise some apparatus. It should be a result of the co-operative and active endeavor of teacher and the students.

Jawahar Bal Bhavans: These institutions were opened after independence in the name of late Pandit Jawahar Lal Nehru. There are at present 12 Bal Bhavans in the 12 capital cities. The Bhavans cater to the needs of children up to the age of 14 years. Some of the activities organized by Bal-Bhavans include dancing, painting, clay work, carpentry, drama, debates, star-gazing, stamp-collection, coil-collection, radio repairs, gardening, etc. Besides organizing activities for children, the Bal-Bhavans also conduct training programmes for teachers.

Vikram Sarabhai Community Science Centre: In the memory of late Prime Minister Pt. Jawahar Lal Nehru, the Nehru Foundation for Development was opened in 1966 by Vikram Sarabhai in Ahmedabad, Gujrat. In order to promote the cause of social and educational development through the use of science and technology, the community science centre was created under the auspices of the
Nehru Foundation for Development. The main objectives of the centre are:

-- To promote Scientific thinking in science teachers and students and.

-- To inculcate the skill of observation hypothesis, experimentation, conclusions and prediction. It has organized a variety of community oriented Activities in science such as science film-shows, science-exhibitions, popular lectures, do-it-yourself laboratory, open house programmes, hobbies, science puppet shows, science lecture series etc. It has brought out a number of publications and audiovisual aids. The centre brings out periodically a wall science newspaper.

-- **Kishore- Bharati** :- This is a voluntary organisation located at Palia Piparia village in Hoshagabad District in Madhya Pradesh. The main objectives of the centre are :-

-- To infuse self-confidence amongst young villagers in agro based Activities.

-- To strengthen their faith in co-operative endeavor as an effective means of solving community problems.

-- To try to stop Urban migration of the village youth in search of scarce menial jobs.

-- Although the organisation is working for Rural development, it also has programmes in education in general as well as in science-education. It is making efforts to improve science education methods in the surrounding schools. The programme lays special emphasis on teaching science through experiments. The Government of Madhya Pradesh has given freedom to the organisation to experiment with text-books, syllabi, learning methods, examination system and teacher training techniques in the surrounding Rural middle schools. Science-exhibitions are also
organised in the village for the benefit of children and the community.

-- **Nature -Clubs of India** :- The world wildlife fund sponsors Nature clubs of India which publish News letters and undertakes nature traits in different parts of the country. Hundreds of schools have become members of the Nature clubs of India.

-- **Indian-Association for Extra-curricular Scientific- Activities (I.A.E.S.A.)** :- This association was founded in 1968 and has been actively involved in conducting out of school science programmes. It organized the first all -India students fair in 1970 in collaboration with the Indian science congress- Association. It also organized U.N.E.S.C.O. Regional Seminar for leaders of youth science-Activities in Asia in co-operation with the N.C.E.R.T.

1.5 **STATEMENT OF THE PROBLEM** :- A STUDY OF SCIENTIFIC-ATTITUDE AMONG SEC. SCHOOL STUDENTS IN RELATION TO CLASSROOM- COGNITIVE-BEHAVIOUR AND SCHOOL-SCIENTIFIC-ACTIVITIES.

1.6 **DEFINING THE TERMS** :-

-- **Class -room Cognitive-Behaviour** :- The term cognition is derived from the Latin word cognoscere which means to know. Cognition is a process of knowing. It includes becoming aware, understanding and modifying one’s understanding on the basis of new informations. It is important to realize that cognition is an on going process. The study of cognition includes the study of all types of information. It also includes the study of processes related to knowing such as perceiving and making decisions. All our mental abilities-perceiving remembering, reasoning and many others are organized into a complex system, the over all function of which is termed cognition. Classroom-Cognitive-Behaviour may be defined as the interaction takes place in the class-room, which includes teacher talk, teachers questions and pupil’s responses, analysis for
Cognitive level. It would tell the observer a great deal about the quality of thinking taking place in the classroom.

-- **Scientific-Attitude** :- G.W Allport (1935) has defined an attitude as "A mental or neural state of readiness, organised through experiences, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". Attitudes are learned in course of life-experience which make the individual behave in characteristic ways towards persons, objects or issues to which they are related. Attitudes are tinged with emotion and are very personal and complex in character. No one is born with any-Attitudes. Attitudes are learned in culture and environment in which person grows. When-Attitudes relate to standards of conduct, it may be designated as ethical or moral values influence of socio-economic & family factors on-Attitude development is also very great. Attitudes are not static, rigid entities. They change radically under certain conditions or even breakdown entirely. Scientific-attitude may be defined as person who possesses open mindedness, a desire for accurate knowledge, confidence in procedure for seeking knowledge and the expectation that the solution of the problem will come through the verified knowledge.

-- **Scientific-Activities**:- In literal meaning the Activities pertaining to the school curriculum may be referred to as curricular Activities. Such Activities are part and parcel of the inspectional and other educational programs. Scientific-Activities may be defined as these Activities of schools which are related to science. These Activities inculcate school Scientific-environment.

1.7 **OBJECTIVES OF THE STUDY** :

**Main Objectives** : The following were the main objectives of the study:
- To develop the School-Scientific-Activities test for Sec. school students.

- To study the relationship between Scientific-Attitude and Classroom Cognitive-Behaviour in Sec. School students, as well as in Urban & Rural Sec. School students.

- To study the relationship between Scientific-Attitude and School-Scientific-Activities in Sec. School Students, as well as in Urban & Rural Sec. School Students.

- To investigate the combined effect of Classroom Cognitive-Behaviour and School Scientific-Activities on Scientific-Attitude in Sec. School Students as well as, in Urban & Rural Sec. School Students.

- To study the significance of difference, if any, in the Scientific-attitude of Urban & Rural Sec. School Students.

- To examine the significance of difference, if any, in the Classroom-Cognitive-Behaviour patterns in Urban & Rural Sec. School students.

- To investigate the significance of difference, if any, in the School-Scientific-Activities of Urban & Rural Sec. School students.

**Secondary Objectives:** Following are the secondary objectives of the study

- To appraise the extent of Scientific-Attitude of Sec. school students, as well as in Urban & Rural Sec. school students.

- To explore the level and quality of Classroom-Cognitive-Behaviour of Sec. school students, as well as of Urban & Rural Sec. School students.
To investigate the level of School-Scientific-Activities of Sec. school students, as well as of Urban & Rural Sec. School students.

1.8 HYPOTHESES: Under the plan and procedure of the present investigation the following research hypotheses have been formulated.

- There is no significant relationship in Scientific-Attitude and Classroom-Cognitive-Behaviour of Sec. school students.

- There is no significant relationship in Scientific-Attitude and Classroom-Cognitive-Behaviour of Urban Sec. School Students.

- There is no significant relationship in Scientific-Attitude and Classroom-Cognitive-Behaviour of Rural Sec. school students.

- There is no significant relationship in Scientific-Attitude and School-Scientific-Activities of Sec. School students.

- There is no significant relationship in Scientific-Attitude and School-Scientific-Activities of Urban Sec. School students.

- There is no significant relationship in Scientific-Attitude and School-Scientific-Activities of Rural Sec. School students.

- There is no Significant relationship among Scientific-Attitude, simultaneously with Classroom-Cognitive-Behaviour and School-Scientific-Activities of Sec. school students.

- There is no Significant relationship among Scientific-Attitude, simultaneously with Classroom-Cognitive-Behaviour and School-Scientific-Activities of Urban Sec. school students.
There is no significant relationship among Scientific-Attitude, simultaneously with Classroom-Cognitive-Behaviour and School-Scientific-Activities of Rural Sec. school students.

There is no significance of difference in Scientific-Attitude of Urban & Rural Sec. school students.

There is no significance of difference in Classroom-Cognitive-Behaviour of Urban & Rural Sec. school students.

There is no significance of difference in School-Scientific-Activities of Urban & Rural Sec. school students.

1.9 **DELIMITATIONS OF THE STUDY**: The proposed study is delimited with respect to area discipline, method, sample and tools. However some of the delimitations are listed below:

**Area**: The study was confined to 20 Govt. & Non-Govt. Sec. school situated in Urban & Rural areas of Gurgaon & Rewari District.

**Grade**: The Study was delimited to Xth grade students.

**Discipline**: The study was confined to only science discipline.

**Sex**: No gender distinction was considered.

**Tools Used**: The study was confined to following tools:

**Classroom-Observation**: Based on Bloom's Taxonomy
**Schedule**
1.10 **SIGNIFICANCE OF THE PROBLEM:**

The main aim of education is to modify the Behaviour of the child according to the needs and expectancy of the society. Behaviour is composed of so many attributes one of these important attributes is Attitude. One's Behaviour to a great extent depends upon his Attitude toward the things, idea, person or object in his environment. The entire personality and development of child is influenced by the nature of his Attitudes. Learning of the subject and acquisition of habits, interest and other psycho physical dispositions are all affected by his Attitude. Therefore it is important to understand the meaning and nature of Attitude, the factors responsible for their formation and development and techniques of their measurement. So, by knowing the factors forming, influencing and developing the Attitudes can bring the change in Behaviour in particular direction.

The study will fill a vacuum. Since no such study has been conducted in this aspect, findings of the study are of the immense help to science teachers, educators, administrations to improve the quality of Classroom teaching, developing science Attitude and creating Scientific Activities which are remarkable and of great importance in science education. The study appears to be useful for teachers of science, guidance workers and research scholars. It can be used by the curriculum specialists to measure the outcomes of teaching science. The students of Psychology and Education can also use it to study the development of their Attitude.